

Antonella Contin  
Paolo Paolini  
Rossella Salerno *Editors*

Sxi

# Innovative Technologies in Urban Mapping

## Built Space and Mental Space



***Sxi – Springer per l’Innovazione***

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Editors

# Innovative Technologies in Urban Mapping

Built Space and Mental Space

 Springer

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# Introduction

Antonella Contin, Paolo Paolini and Rossella Salerno

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## 1

### Introduction

Imagine a pebble: a rough, rugged pebble, some three inches of diameter. Do you think it is interesting? Would you stop by were you to stumble upon it? Would you take a picture of it? Would you put it in a museum? Of course not. Unless, you were to know, by any means, that this little insignificant stone is the stone used by the later-to-become king David to kill Goliath. This piece of news would change everything and any good-sensed museum in the world would no doubt be more than happy to host the little insignificant pebble in a specially-dedicated room.

Most cultural heritage ‘objects’ do not talk by themselves except maybe, in cases where beauty prevails. Most cultural heritage objects are, in fact, in desperate need of ‘stories’ about them since their value is not self-evident. Therefore, communicating their value is ‘the’ – not just one – role of cultural heritage institutions; their ‘raison d’être’.

Imagine a large metropolis: a Metropolitan Net City, several kilometres wide. Do you think it is easy to live there or to discover its hidden values? To detect, learn and show the importance of informality as a source of resilience and adaptability? New information technologies are changing the planning and design activities on both the architectural and urban scale by giving access to information through interactive digital environments.

*The whole new media environment creates a communication mood through different display codes: new virtual design tools and new meaning derived from figures/images integration and narrative texts.*

We begin with the idea that to valorise cultural heritage means to generate values for the addressee when the contemporary urban space – using new technologies –

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could gain a fundamental role in the information and teaching field. This occurs in many senses:

- understanding: the addressee better understands the meaning of the ‘object’;
- appreciation: through understanding, the addressee feels the importance of the object;
- knowledge: the addressee gets more information about the object and related issues (e.g. history, sociology, art, movements, etc.);
- curiosity: the addressee now ‘wants to know more’;
- care: the addressee feels as if s/he owned the object;
- contact: the addressee wishes to get in contact with the object – through a visit to the institution.

In this way, contemporary urban spaces, consisting of heritage values, ‘prophecy places’ and using new technologies can be integrated with the information and teaching field. This happens in two ways: directly and indirectly. The first way relates to the daily fruition of urban space giving information about society and ensuring integration. In the indirect way the urban space, through its self-preview – provided by new media – becomes the very first tool of ‘distant’ information.

Our aim is to investigate these modalities, in order to make the urban space – especially its hidden heritage values become understandable not only visually but also to all of the senses and mostly when moving inside the city.

---

## 2

### **Heritage Valorisation and a Concept of Information Ecology**

This book aims at suggesting the theory that valorisation of cultural institutions is the highest kind of communication. In other words, today technologies can greatly help to tell wonderful, enticing stories about cultures as they can potentially reach a vast range of audiences which was hardly possible before. On the other hand, this book intends to study mapping projects closely, not only as design operations but also as analysis, knowledge providers and expressive tools able to extract those hidden enshins beyond the ecology of cities. Such knowledge needs to be disclosed and brought to the user’s attention, in order to get a feedback and a deeper understanding of these places.

The book also proposes a definition of ‘Information Ecology’, where the contemporary digital technology system must be integrated into a larger topic of housing as ‘participatory and sustainable management’ of the ‘own place’ through an integrated systemic prospective. The virtual and sensitive result of information, the process and the modalities of translation/filtration of abstract data into fascinating images, require a limited use of resources and a soft physical impact towards an economic and spatial sustainability, maximizing the interactive nets that are able to promote simulations and immersive experiences in valuable contexts – both well-known and

not so common, both close and distant. Considering these media as extension of our body through time and space, we can reduce distances and synchronise all the elements of a whole complex and enlarged informative deployment. This book investigates the construction of a ‘sensitive reactive network of proactive nodes’, following alternative mapping instruments, such as augmented reality, GPS, Embedded Technologies, Fast Tracking Systems, etc. in order to define the reading layers of the city through: Preview Maps, Field Maps, Immersive and Sensitive Maps.

The goal of our research is an effective image to understand, conceive, design and project the physical city, in order to define the traits of one ‘structuring image’ of the contemporary city through the use of digital interactive technologies.

This book is also about ‘mental spaces and heritage’: let’s hope that digital stories can create in people’s minds mental spaces which make them feel closer to their cultural heritage and cultural roots.

---

### 3

## Translation, Internationalization, New Technologies

### 3.1

#### Translation

We intend to propose, with this book, a translation work. We know that in every discipline relations are always mixed and urged by a whole set of operations: these include synthesis, comprehension and mediation which we must do in-between our horizon and that of others. Nowadays a researcher is more than a mediator but an academic figure who must connect his world and that of others in a hermeneutical way. Of course, there is still a problem of untranslatability among disciplines, which actually shows the borders within which we are used to moving because of our belonging to such hermetic disciplines. Discourse tends to meet and translate the experience of different disciplines, which, integrating with urban design can concur towards a vision, and realization of methods and tools for *a building art of the Metropolis*.

We are especially interested in the setting of those operations which let us define the ‘*public realm*’ as a more porous space, through the construction of a layer, which we are used to calling meta-city (Shane 2011), and which once was called meta-space: “When a part of a city is designated a meta space, it becomes an Urban Gallery a fluid form of public space that evolves in time, generating different definitions of public space and different ways of participating in it. These definitions yield ‘floors’ in the spatial structure of the urban gallery. Meta-spaces make it possible to bring the dynamic structure of scenarios into the flows of the second skin. A meta-space in the second skin is a public space, a public matrix” (Bunschoten 1998).

### 3.2

#### **Internationalization**

The book we propose is an international book. We refer to the international scene because it allows us to compare and focus on our identity, in a contemporary way, when international professors' points of view – as international good practices, cases and new disciplinary openness – will meet the Italian professors' classes.

### 3.3

#### **The Role of New Technologies**

The book we propose is a work which attempts to integrate new technologies into the urban design discipline. These materials have valuable effects on daily urban life since it is considered as a construction offered to individual and social activities of the citizen-actor inside the city, representing in a common view an exclusive place where mediations of urban forms play a basic role. In other words, the dimension of the meta-city is necessary to recognize urban space as a desirable object from faraway, and as appropriation field from close-up. Then the urban space will no longer be used with regard to the housing/factory, as a radical theme of the city, but as the substitution of that relationship with the public/communication space theme in real time. This will have an impact on:

- economic and social aspects;
- institutional aspects;
- search for approval;
- local and global values and their influence on the citizenship concept itself.

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## **Part I**

# The Academic Question of Research

# The Project of a New Cartography: Patterns of Use, Spatial Experiences and Perceptions of the Urban Environment

Antonella Contin

The objective of our research is to pursue the development of students' design skills, the construction of a design and development platform. Innovation is a result of a plural, and ethical process, not sequential. First we must decide if the innovative solution – achieved through interdisciplinary expertise – is inserted: (a) in a defined technological environment, for which there is an 'already tested' application of a technology, so we can produce feasibility studies and prototypes; or (b) in a known context from which we extract a problematic issue and choose what kind of technological world can support it. In this case we will produce feasibility studies.

Our field of action is the new metropolitan scale of the city. Large metropolises are growing. Sometimes the old heart of the city is dismissed and transformed into a symbolical mediator. The new settlements have become huge and full of neglected spaces where the informal sector is increasing. The mapping of dynamic urban processes through digital open interactive platforms has become very important to facilitate self-management dynamics for the lack of services.

When dealing with new technologies it is necessary to point out: (a) mapping and displays (available or generated by citizens) which give new ideas about infrastructure and space-use, making sure that information is available and that structures are adaptable and understandable; (b) interaction tools among people-matters-spaces, in order to create situations and processes (from the widespread museum to social art and participatory design); (c) mobile and fixed technologies which modify the inhabitants' spatial experience of public space, based on their needs and desires (for example mobile device applications which collect, offer and trade information between context and inhabitant, or among users); (d) augmented reality and similar new technologies as identity-image intensifier of built and natural heritage; (e) people's virtual navigation and the dissemination of information as a connection moment between unit and function, not only on the urban scale, but also at territorial and global level.

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*If we are blind in our capacity of imagining, the technological equipments are mute; which means that their appearance does not reveal anymore their real potentialities*  
(Anders, 1980)

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## 1

### **The New Information Technologies and the Concept of the Reality**

In order to produce a new mapping project, the first question we ask ourselves is: how does it change the concept of reality through new information technologies?

Today, in fact, culture is objectified in the technical tools rather than in individuals, so technology seems to be the new subject of History (Anders 2011). Our question then becomes: what can we do with technology (Galimberti 1999)? We might answer that humans are the protagonists of the processes of self-management (Ferraris 2009) only through new trends in collaborative technologies, sharing information, which form the basis of an adequate level of description of a complex reality. So, in addition they can promote chances of cooperation between different disciplines.

The first value which we grant to technology is a documentary value, related to the power of maps – starting from the historical Atlas – which lets us conceive images. Maps then enable us, today more than ever, to see quantitative data, such as a sensible form of a concept or an idea. But, we are most interested in the fact that, with new technologies, we can produce maps consisting of new signs – irrespective of the language and conventions of the picturesque characteristic of landscape – which are a huge resource in multi-language and multi-cultural contemporary societies (Ferraris, 2009). New technologies then – especially in the so-called developing countries – can facilitate the dynamics of self-management to overcome the lack of services and to stimulate society through ‘informal’ dynamics, which can improve new functions in the territory. Accordingly, technology allows us to get closer to urban themes by allowing for a proactive approach, based on the analysis extracted from data mining. These make it possible for us to adapt to the environment – through a series of feedback analyses – according to a reactive approach.

---

## 2

### **An Information Role for Contemporary Urban Space**

Therefore we have started from the idea that even the contemporary urban space – using new technologies – could gain a fundamental role in the information and teaching field; directly and indirectly. In the direct way, the daily practice of this space shapes society, ensures social integration, when the economic, social and epistemological structures are inscribed in this new space. We argue, however, that it is crucial to find a new way to inlay the level of the *meta-city* (Shane, 2011) within the urban

ground, so that the information, which it hides, can be decipherable not only by the eye but also through all our senses, and particularly through movement inside the city.

The indirect way occurs due to the fact that the urban space still functions as information provider, lending itself to human contact, interacting with it and becoming media *par excellence* of the near and distant accessible information. In short, the contemporary city offers a space of contact, which simultaneously and ‘im-mediatly’ informs and forms citizens and ‘media-tely’ – as a tool – links the streets of circulation and of information together.

According to the mapping project we want to pursue, we have to produce very powerful evocative images. Then – through the use of new technologies – we determine some sensory inputs in the context area, which can cause specific memories of a particular situation. The observer’s senses are transformed into a conscious perception and knowledge, which means that the feeling must be conceptualized. The observer then, doing so, develops the ‘scene’ with the variation of his body, enriching a project that, on the contrary, is based on the permanence and durability of physical contexts.

What we propose, then, is a project for sensitive maps of the cities: a new generation of maps that can record, critically analyze and represent, in a dynamic and renovated way, the complexity and heterogeneity of new territories in order to produce ‘sensitive’ images. The aim is, therefore, to disclose ways of territorial accessibility and to predict and calibrate ‘pro-active feedbacks’ of the various urban events, on a territorial scale. The concept of time, for instance, may be different from the ‘just in time’ mood, able to turn the city events into a durable process that significantly transforms the city structure. This means stimulating through new technologies and strategic design a value of *long duration* for the entire metropolitan area. This fact establishes a strong perceptual and programmatic link between specific sites, the entire city, and the extended territory of the urban region in its various connotations: identity – social, productive – economic, recreational – tourist, connective – infrastructure, regenerating and strengthening the entire network of actors involved, from public to private, from local to global. In this case, we attribute to technology a pro-active value, which stimulates the active involvement of citizens.

---

### 3

#### **The Project of a Sensitive Mapping**

Therefore, our project is a Sensitive Mapping project, which is not only a representational operation but also the analysis, the awareness and the translation of the knowledge layered over time within a territory and often implicit in the ecologies of the city. The shape of the territory is thus considered as an intermediate state, an emergent, ecological and in-progress asset. How can we represent, therefore, this instable territory?

Rethinking a mental and technical operation to map the space of the ecologies through a series of maps coinciding with the complexity of the metropolitan context is fundamental. The new map is a process. It is a morphogenetic process. So, detecting the elements of the complex context is the first act of mapping. Its aim is to determine the relations between the existing matter and the generative process; this is a cultural and not a material device. It is the meaning of the research answer that determines the final result of a map. This issue has to be revealed and brought to the user's attention leading to a greater appreciation and a deeper understanding of places through deep involvement on the part of citizens.

We, thus, presuppose the concept of 'information ecology' with which we will recover the deep meaning of two following words: οἶκος, 'house' and -λογία, 'study on'. In this way, also the information system conveyed by the new current digital technologies must be reduced to the broader issue of living, such as 'participatory and sustainable management' of places in which it was rooted, according to an integrated system perspective. Moreover, we present the concept of eco-pastoral landscape (Contin 2012) defined as the use of technology that allows us to return to ecological nature. In other words, it allows us to be shepherds again, but through a personal choice. In particular, technology is needed to live in balance with nature, so that we can become 'natural' again, using the necessary resources, through technological advances with all the limits and thresholds of a possible coexistence with nature.

We then need to build and represent an eco-pastoral landscape as a new kind of nature. We need to ally ourselves with the natural landscape, adjusting also our aesthetic tradition to our renewed environmental knowledge. All that is possible through new technologies.

The virtual and sensory information, the mapping process and the ways of translation and filtering of abstract data into images with a high value of involvement, require a limited use of resources and a low physical impact towards a spatial and economic sustainability. Instead we try to maximize interactive networks capable of promoting simulations and immersive experiences in relevant contexts – known and unknown, near and distant. Conceiving of these media, and of the mapping that their permit, as an extension to our body in time and space, we can reduce distances and effectively synchronize all the elements of a complex and dilated information apparatus. So we are able to represent through a synchronic map a diachronic reality – which was also the aim of ancient maps.

We intend to interpret, then, the entropy of all the territorial exchanges – such as a light infrastructure for the meta-city or as a tool for the upgrading and the transformation for the entire city – through a process related to the rediscovery of the deep memory of places and characters involved: a cognitive process related to the present condition, and a mapping in progress project as a projection of the implementation of its potential. We are thinking of a territory as a field of pressures and of a map like a weather report map.

Thus, we propose the construction of a 'sensitive reactive network of proactive nodes' into the metropolitan city, through the use of alternative mapping tools such

as augmented reality, GPS, embedded technologies, fast tracking systems. The reading levels of the city will be defined as follows:

- maps of forecasting;
- maps of field;
- immersive map / plural-sensorial map.

The goal is to find a suitable pattern to understand, conceptualize, design and represent the physical city, in other words, to define the characteristics of a 'structuring figure' of the city – the informal or neglected side of the metropolis mostly – through the use of interactive digital technologies.

**Forecast Maps (scale 1:50000)** Maps dedicated to the visitor interested in knowing a remote site and the catalysing presence of various natures surrounding it, via the Internet and from a laptop. These representations are intended to stimulate the interest and imagination of the user, without having seen the places (Atlas). These maps build a mental map of the spatial structure, assuming and sharing areas of interest and specific expectations, which the designer can incorporate into the programmatic systemic configuration of an event or a place. The activity environment is the user's own room and the device is a PC.

**Field Maps (scale 1:5000)** They are graphic diagrams showing the actual structure of urban spaces. The main value of this work will be identified in the translation of possible scenarios and the relationship between the urban biography, calendar of events of the city and visitor's interests, including places dedicated to characters/tonalities of the city representation or its potential future development: in this way, the event or the place builds the 'reverberating actions'. They are maps that will be used by those coming into the town in order to access places through a map that is clear in terms of connections and interesting nodes. The activity environment in this case will be a sustainable moving vehicle – such as train, bike, public sharing car, electric bus, metro –, the device is a smart-phone, an ePad, a tablet, etc.

**Immersive Maps / Sensorial Maps (1:500)** These maps are for those who will be physically in the place and will want to learn more about them by following physical paths designed according to the principles of accumulation and sensory integration. Through these maps it is possible to have an overview of the previous conditions of the project framework and its projections on the future city's life cycle. These maps represent the level where the city and city users relate with information flow, producing micro-urban prototypes – patterns – of transformation and regeneration, conceived as tactile and sensitive effect of these media on the body. Not only will one particular site will be closely involved with the project, but also a number of available unconscious spaces of the city – perhaps peripheral or peri-urban – will be affected by a renewal participative action with a performative and shared value, including also the use of organized and social networks.

---

## 4 New Maps: An Ontological Reversal

The opaque and untranslatable track of the singularity of each territory mapped and the *philia* that it produces, face the *mathematization* of the *Euclidean* space: there is, then, related to the real places, something intangible that cannot be considered only as ‘it is’, but also as ‘it would be’ otherwise. The new maps are born from this inversion, this sudden ontological reversal. The fact is that the world can be seen and interpreted through new and different forms of hermeneutics, and, therefore, through configurations of elliptical meaning, inevitably. Ultimately, what emerges is not so much the security – and, in fact, the illusion – of a stable and accomplished foundation of the territory map, but the certainty of a ‘having-to-understand’ a metropolitan territory always open and renovated. It is a matter of fact that, beyond any ‘subjective’ and ‘relativistic’ perspective, the *dynamis* (Aristotle) is the original and further foundation that is before and beyond the *energeia* (Aristotle). Today, in fact, we are much more interested in the extreme possibility of thought – the more cruel and radical chance, the chance that exposes thought to the risk of a complete reversal of meaning and, therefore, displays in the same categories of thought, the insuperable limit which thought breaks again and again.

This ‘intrinsic possibility’ of reality shows the failure of an only objective thought; then, nobody can conceive the “truth” understood as a correspondence, as the ‘*adaequatio*’ of reality to its representation. Therefore, the failure of a possible total representation of thought, its deconstruction and dismantling of its globalizing claims appear. The new map, then, is the symbol and the icon of an ‘un-representable’ matter that every representation guards inside. This is the meaning of our choice. A choice that requires the ability to feel both the appeal of ‘nature’, but being, however, in a space that has been defined and circumscribed by the objectifying and categorizing action of ‘culture’. We deal, therefore, with orientation maps much more than with traditional topographical or itinerary maps. So we want to interpret and represent the development of the territory starting from initial data much more than the final result, the fixed portrait of it. Therefore, the structure of the map shape allows to answer to the variation of parameters in the territory, regardless of whether the reasons which determined them were unpredictable or pre-determined (Figs. 1 and 2).

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## 5 The Projects of the Measure and Scale Laboratory of the Contemporary City

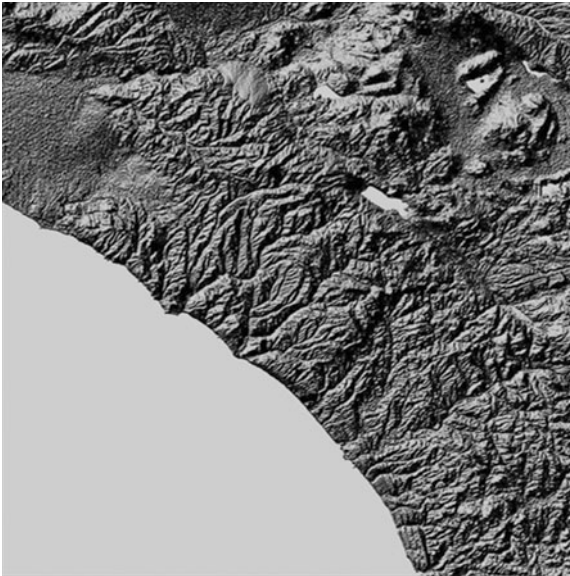
### 5.1 Smart Map: New Mapping for XXI Century Citizens

This is an applicative project done inside the High School of the Politecnico di Milano (ASP). After quite a long time spent in defining an original interpretation of



**Fig. 1** Madrid ( $40^{\circ} 25' 0.39''$  N  $3^{\circ} 42' 13.64''$  W) (A. Musetta, S. Bovio)

The cast of the geographic region of Madrid shows clearly the geometry of its landscape; we distinguish the geographic, topographic and topologic elements



**Fig. 2** Los Angeles ( $34^{\circ} 3' 8.04''$  N  $118^{\circ} 14' 37.27''$  W) (A. Musetta, S. Bovio)

Imagine to lift the epidermis to Los Angeles city and to drain all the water; the result is the nude Earth. The Digital Elevation Model gives us a map without popular ontology, which is a grayscale image that we recognize as a specific location on the planet because the nuances look like valleys, rivers and mountains

the general topic, we found a good definition for the project's specific aim: to re-discover territory hidden values for which mapping and technologies are the main tools; we try to state our two project assumptions:

1. technology as a tool to 'stock' documents – Heritage/Cultural path;
2. technology as a pro-active system; as a tool for the implementation of the meaning of a territory-waterway – EXPO.

Working on the first assumption, means to explore the role of technology to offer an innovative experience in discovering cultural heritage. We set up technological issues regarding 'contents' and 'content-display' parts. With this in mind, we needed to carry on a second analysis phase to focus precisely on the innovative dimension of the relation between 'tool' and contents and proceed to 'prototype making'. Working on the second hypothesis, means to work on the defined context of the project for the new Expo Waterway. We pursued a series of analysis meeting actors from the selected field of application with a clear plan of action. Then we focused on the 'feasible' innovative issues of our chosen strategy and proceeded to 'prototype making'.

Designing maps for Milan Expo2015 means designing patterns of urban usability for an interactive experience of the city during and after the event. The goal is to *build a learning development framework* for the city through the creation of a device which learns from the city and will return sensible information to the city at integrated scales.

The project will start with a phase of problem setting that will explore the development of 'potentials' and 'expectations' of a place and then will use existing technologies to enhance the potentials of the EXPO event and leave a heritage to the city. In an attempt to define a place or a series of places – as fields of experimental applications – we selected the theme of the 'water system' as a strong groundwork to integrate the event EXPO 2015, the city's identity and a range of environmental, touristic and economic issues altogether – existing, future, disappeared waters, water landscape, water budget, etc. The theme of water stated in general terms and through the suggestion of some possibilities of development, has been addressed critically to identify opportunities for the project.

The project for Expo2015 aims to offer thematic tours, discovery trails inside and outside the exhibition site to determine a richer visitor's experience. Through forecasting – a treasure map, field and immersive maps, the project wants to mark places within narratives of interactions and exchanges, physical or not. The SMART characterization of these maps must illustrate them as maps of exchanges rather than containers to administer contents. Particularly, we envisage activating those regarding new horizons of the IOT -Internet of Things.

The tools to deliver contents and promote interactions will be smart-phones, tablets, totems, but the fundamental aim of the project will be the creation of a prototype of web architectures that move in real time such as immersive space design.

The project will consist of the following phases: harvesting data, data mining, synthesis, mapping of the environmental potential of the district according to some narratives. The maps, in fact, are designed based on four Narratives: history, en-

vironment, economy and society, which will intertwine to produce the three maps: forecasting, field and immersive maps on the different scale of speed/time: walking or biking, going by car, by train, by tram.

The application framework is related to thematic paths and set of landscapes which describe specific territorial situations. The goal is to make the territory tells its story as compensation for citizens, city-users and super tourists taking care of it. We thought about starting the project from a loop circuit formed by stakes – such as a protected perimeter with rights and exclusions – to circulate only with electric vehicles and to create interactive moments between citizens and institutions. Today’s sophisticated communication technologies will increase the permeability of places including the involvement of different disciplinary points of view–curatorship. To this first path into the center of the city other paths will be linked: architectural, playful, etc. Then, we will get a link between paths and places. For this purpose, the places become occasions for a narrative and an event; an event which explains the advent of and the need for new technologies. They are identified through an analysis of the territory, a protocol procedure, which we have called ‘spectrograph analysis’. This is divided into three phases:

- data definition and sources;
- data search;
- production of analytic maps.

Thus we have: a first basic narrative, or information, which we decipher with the body and a second narrative that is the information that we decipher through knowledge. We get a map that represents not so much the static form of the territory, but its con-figuration and con-formation from the initial parameters. Even the map, then, is a product of the generative process and not only a composition. These are *maps of orientation*, not based on fixed coordinates, but intermediate because, being linked to characteristic points of unstable landscapes, are in constant re-definition. These maps do not arise from a combination of simple notions, but they show a possible “to be” of the territory, its own “possible being” if it is viewed from a certain perspective and in a certain way. At this point, however, the intervention of two actors it is necessary: the photographer and writer to identify the way in which another way of narration conveys through new technologies. What interests us is to understand how the image changes, if we understood it as a scene, which must be arranged in order to communicate through new devices. The image that will evoke the hidden values, existing in the site, must be re-conceptualized because it lacks a defined character. So, it becomes a manipulated and distorted image like that of Nunzio Battaglia (Fig. 3), allowing us to identify places, because it marks the tectonic accurately, but then distorts it, creating an outstanding landscape, memorable and poetic that is fixed in a mental map possible also at the metropolitan scale.



**Fig. 3** Segrate, Stabilimento Innocenti. Photo by Nunzio Battaglia, Segrate 2013

## 5.2

### A New Image Concept for the New Media

It is very important to take into account the problem of the image that we should use to communicate some contents through the new media. We want to determine a total reversal of any traditional perspective parameter. In fact, according to Robert Smithson the representation of the landscape must take into account the changing of the nature of the phenomena that the subject “cannot” or “should not” control completely. His photographic experiments redefine the landscape that, from a product obtained from a model of representation or external pre-vision, becomes a performance of *inter-somaticity* between subject and space in real time; a very active experience. This fact is gained through the random position of the observer, and from a point of view that becomes an internal point of the landscape instead of an external one. In fact, any traditional perspective parameter is overthrown.

The photographic representation, according to Smithson, opens onto an open landscape that cannot be represented through a formal rational synthesis, but only through traces, material stratifications, a partial sequence of discontinuous and photographic prints. To defer the experience of the landscape, Smithson invents the *non-site* device that consists of maps, photographs, diagrams and structures containing materials such as a product from the actions carried out by the project in the field. The attempt is to maintain a strong relationship with the real place, where all the components, which are present in the setting, necessarily originate (Smithson 1968).

### 5.3

#### Cairo Ard al-Liwa New Centrality Project

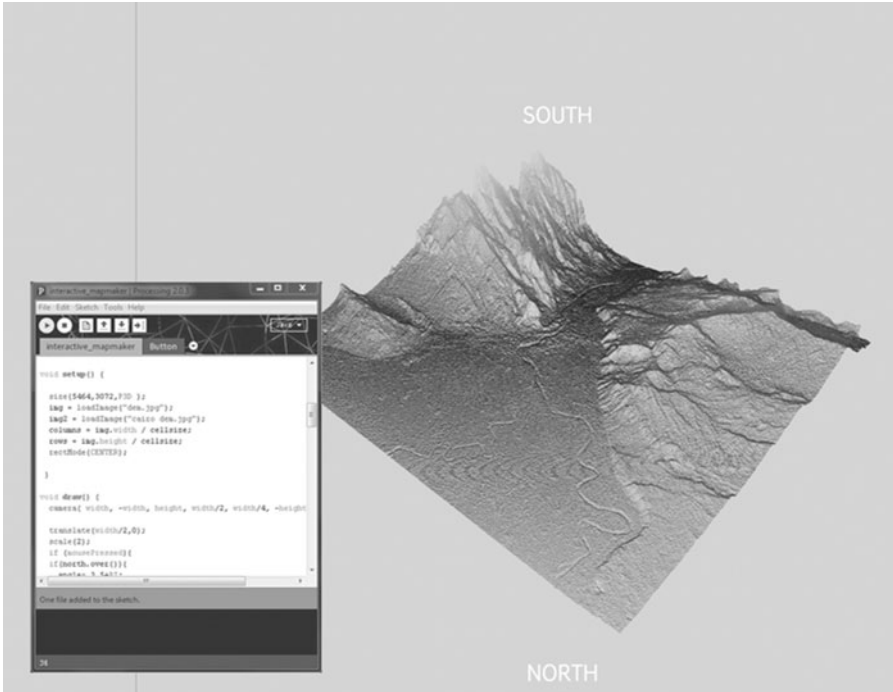
In the framework of the second year Master Thesis Laboratory course, pursuing our collaboration with Grahame Shane from Columbia University and Pedro Ortiz senior urbanist consultant of the World Bank, we decided to organize the Cairo Workshop on *Cairo Ard al-Liwa New Centrality*. The project involved the transformation of the informal settlements, which are at the fringed edge of the Cairo metropolis, constantly changing and characterized by a variable degree of informality. That part of the city is a place in which we have a loss of energy in every sense: electrical energy, water and cultural energy. The administration needs to know how much energy is available, how to add benefits and achieve a multiplier effect on the complementarity of both the formal and informal, using them for optimizing their effective performance in the context. It is not just a possible aggregative outcome, but indeed achieving synergies and multiplier effects can be the outcome that will benefit the city, the metropolis, the region, or the country (Ortiz 2012). According to Pedro Ortiz, without denying the final objective of the formal realm, informality can be seen as an imperfect intermediary stage that should not be interpreted as the enemy of formality, but as a stepping-stone to the more desirable stages of formality. In this respect, informality can and/or should be fostered, with the necessary controls in mind, instead of being denied or persecuted. The objective then is to establish the harnessing processes to avoid the flagrant breach of human rights and social duties informality could hide, and to establish the procedure to allow for an incremental path towards formalization in an undetermined time horizon. The approach is no longer to prosecute and illegitimatize informality. It is a real change of paradigm. New technologies can help us improve it in two ways: as an analysis tool, and as an instrument that allows for the production of a more porous city, improving informal dynamics and new metropolitan relations.

The scale we were pursuing was the metropolitan dimension. We also used the *Locast platform* developed by prof. Casalegno of the mobile Experience LabMIT, and Paolo Patelli arch. PhD. of the Politecnico di Milano: a mapping project within several universities<sup>1</sup>, a powerful tool for engaging the Cairo community with our students' work. Moreover such a platform can design a way to facilitate this process (Fig. 4).

Cairo is a metropolis that has missed the middle phases of urban evolution. It was built along the Nile Valley, but now the city is eating its fertile soil, crossing the Nile toward the desert. The territory in between is disappearing as it has been covered by informal settlements. The *Ard al-Liwa New Centrality* is meant to be a new 'center' for the western area of Cairo where the integrated infrastructural scale of the metropolitan net-city will appear. Accordingly, the whole city of Cairo has to be considered as a 'brand' and the new railway station for the national and regional trains will be an emblematic big project as a vehicle for redeveloping the centrality of the west. We studied a way to regulate its growth: the evolution in scale of the

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<sup>1</sup> <http://locast.mit.edu/U/>



**Fig. 4** Cairo ( $30^{\circ} 2' 39.91''$  N  $31^{\circ} 14' 8.56''$  E) (A. Musetta, S. Bovio)

A simple code which produces a three-dimensional interactive model that allows the analysis of a space-territory thanks to its kinetic representation

informal settlement of Ard al-Liwa. This consists in a design method that allows us to describe and design urban phenomena related to the change of scale which determines the mutation of types of urban space morphologies and landscapes. It is a paradigmatic reform of the city shape: the new paradigm for growth is not linear but a net. We started by studying the geographical and historical situations, which represent the specificity of the support point, considering the scales of the metropolis as its potential uses of time. Then we selected various topics:

- the design of integrated functions;
- the design of a city fabric at different scales;
- the issue of “time thickness” in the urban biography;
- the scene of the public realm as a section of landscape.

In short, our research concerns the study of cities which grow in size with a view to establishing a clear synergy between the parties, considering the moments of crisis and the strengths. So we define potential scenarios, through a Vision – moral idea for the city. For this reason we consider the importance of the genotypes of the city fabric as a system that determines a state:

- sampling of agricultural land (urban theme): built in the field, or field into the city, to define some geographical units of the past, and geographical units today;
- sampling of the urban landscape (environmental issues), so the relationship between public spaces.

We consider first the invariable backbone of the city: mobility, services, spaces, as a dorsal figure, a support of the city, on which to verify a problem of scale. Then we add the theme of the new presence of a culture that interprets the image as a new urban interior landscape. To do this, we wanted to use new technologies. One of the main issues of the project is the continuity of a network of public spaces through different types of green voids which creates a movement from the inside out and vice versa, determining a network of continuity, facing a public but not social space.

The *Ard al-Liwa New Centrality* is between the highway and the railroad, where the city should thicken to express the importance of what is happening there: a new urban articulation. The question of the project is how to get this side of Cairo back in the game involving mainly informal parties: an integrated junction of the parties by adequately equipping the area. In fact we think that everything can be put back in the game through a new rule of the form. The net allows for the continuity of the network in the territory through precise engagement for rebalancing and the grid of the water system becomes a form of writing as it is rich of programmatic intentions and undefined figuratively. All this, determines new nuclei that are oriented in a net and are capable of attraction, while the old poles are changing their use and enhancing their symbolic value. There are points between different landscapes which establish a new way for urban dynamics: the metropolitan dynamics re-connect sides through the design of the areas of transition.

Our approach to the issue of density is a qualitative one. Actually, we speak of *epicentres* as potential qualities distributed into the city and which constitute the basic structure to which atmosphere, landmark and fabric quality are to be added. The informal is considered as body art in motion: temporal and rhythmic quality of experience that defines the deep sense of belonging to a place of citizenship that stimulates the creativity of generations with the presence and the memory of the past. This is what quality of life means: cultural identity, social solidarity are factors of productivity and efficiency for society as a whole. Its exchange value is not an economic value linked to the promise of becoming the city, but a value in use: familiarity between places and people able to share aesthetic and symbolic issues, shared symbols. We need, then, to improve a micro-project through new devices.

The background of one of the project lines is the growing production and availability of cultural information with geo-references, generated by non-professional web users and supported by technologies commonly known as Web 2.0. Citizens are now capable of producing cultural localized knowledge and to contribute through local engagement and by using new, widespread technologies such as mobile phones to sensing and monitoring aspects of the urban environment. Hence, ICT technologies can be deployed to integrate data-sharing platforms into the spatial dynamics of the city. ICT technologies can then be deployed to integrate data-sharing platforms into the spatial dynamics of the city. As the spaces and places of twenty-first century

cities provide contexts for communication-serving not only to shelter and protect their inhabitants, but also to ground and sustain meaningful interaction among them, and to construct community. Emerging critical practices have proposed new models to describe the city that stress the collaborative, constructionist dynamics of the mapping processes. Web 2.0 applications, the growth of online mapping tools and the development of networks of “sensors” capable of recording and geo-referencing a variety of signals can turn human beings into potential “sensors” that not only have the intellectual ability to process and interpret what they “feel” but also to geolocalize the information (sometimes involuntarily) and spread it globally through the Internet. The combination of these factors produces and disseminates an immense amount of geographical information which can be: voluntary/conscious and involuntary/unconscious. The first type stems from web mapping activities, while digital footprints generate the second type. Web users in cyberspace, in fact, leave these traces, without being aware they are producing geographic information. Traditionally, experts and institutions have produced geographic information: so certain types of information have been preferred and other types ignored or marginalized. VGI (Volunteer Geographic Information) represents a powerful shift in sources, content, characteristics, and modes of data production, mining, sharing, dissemination and use.

In particular, these could allow for an awareness of the presence of renovated cultural opportunities related to the sound and music in the Mediterranean area, reinforcing the need for new professional figures such as cultural private and public administrators, curators, and producers. The possibility of finding meaningful ways to investigate citizens’ patterns of use, cultural spatial experiences and related perceptions of the urban environment brings in fact many important promises to the fields of urban design and planning. Starting from the historical physical manufacture and passing through instruments, sounds and performances, the project focuses consequently on the contextualization of cultural heritage. Through natural language and network analyses, the project identifies a cultural behavioral and semantic background for the entire city, related to the sound, rhythms, music of a place, making it possible to extract and depict specific patterns of subjective perception and use. In this way the proposed digital platform would also help the whole range of stakeholders involved in decision-making processes related to planning activities, urban design and urban policies, in order to improve the responsiveness of urban systems to the cultural requirements of citizens and customers.

From this perspective we consider cultural heritage from being defined as a ‘product of time’ to ‘a process for future city life’. The heritage and the landscape are the Common Good: an environmental issue that transcends the immediate interest. Finally, this project aims to define new visual paradigms able to determine infective effects on the informal settlement, through the new map image conveyed with the new devices. It is a way of defining the art of blending: to change, to attend, to transform the existing city through recoding languages and to define cities such as experiential territory. The metropolis, then, becomes a set of interchangeable possibilities.

To sum up, our concept for the informal settlement project is the gradient of formality. This means starting from the infrastructural hinge where we have to face real

estate development; we have to go down to the different grain size of the informal settlement, in which we improve the water and waste chain system, the energy system and social mobility. Then, we act on the section of the tiny streets. We thought about a flexible infrastructural system that can transport all the energies, defining a sort of “natural interchange” to support the traditional market along the informal street, and delineating small basic urban services as stamina cells within the informal settlement. Such an agile structure is produced by a set of components but as Alexander said: “We create a structure that emerges complete, but lightly, which gradually strengthens, but remains flexible. And only at the end it becomes quite strong and robust” (Alexander 1977). The new technologies are a part of this project. We try to project the public realm within the net, this means that, for example, considering Wi-Fi as a space, the public space has to be re-thought considering new topological relational geometries, new functions, and then is possible to integrate the informal mechanisms into the urban management of culture inside the informal/illegal settlement; following Pedro Ortiz we named it “the uncontrolled independence of Peter Pan’s shadow” and we have to be able to analyze it, and show its potential to the rest of the city.

#### 5.4

#### **Yenikapi New Istanbul Centrality. The Immersive Map Applied to an Archaeological Site. Augmented Reality: What Scene for the City?**

“The contextualization of historical and architectural information about historic buildings aims to provide multi-dimensional and vivid experiences of physical space throughout time for inhabitants, tourists and visitors as well as a sophisticated and specialized knowledge base for students, historians and archaeology experts. The process of contextualization will take place through the recognition and convergence of two series of dimensions of historical artifacts within the urban context: Spatial Dimensions that consist of ‘Codes’, ‘Contents’ and ‘Language’ and Immaterial Dimensions which include ‘The Narration of Information’, ‘Time’ and ‘The Simultaneity of Presence’. We address the convergence of these two dimensions by introducing Sensitive Maps. In particular we are pursuing the setting of those operations which define the cultural heritage as a more porous space, through the making of a layer, which we are used to calling meta-city” (Shane 2011).

The empathetic relationship between infrastructure and development of the city and the region is the underlying theme. More often than not, projects for infrastructure nodes become places where the traces of ancient civilizations resurface and then their conservation becomes an opportunity to establish some general principles. The design of infrastructure nodes, therefore, opens two profound questions: the power of new infrastructure projects that, producing a kind of ‘zero degree’ for the site, can organize a new geography; the possibility of not preserving the past. In fact, we cannot always preserve the past and keep it, as it requires an awareness that we must earn every day and tools that we sometimes do not have. Archaeology is not a stable thing. In short, the archaeological past is primarily a strong document of

the life of a city or of an area grown over the past – where old generations disappeared and become ghosts. And then, there is natural degradation, which shows us how archaeology is an instable world.

We must therefore find new intervention strategies, languages / technologies which are able to present a scenario where it is possible to show an idea of ‘identity as a process’. We want to present a landscape which is not only conceived aesthetically; an archaeology which is not only a philological document and an infrastructure, such as architecture which, is available, through new technologies, to be another sign of the biography of a place: respectful, but not subordinate.

Actually, the new nodes are strategic infrastructures of the city to find languages which are capable, today, of presenting a scenario in which it is possible to show a process-based view of identity. The ‘scene’ is the question. In other words, the materialization of an evocative scene that is conceived through new technologies – most notably Augmented Reality – as instruments capable of determining an augmented image of a context, which must be reactivated for achieving an experience of identity. Keywords to define the strategy are: context, memory, experience, space, able to determine an awareness of the psycho-geographical places – according to Focillon: the psychological landscapes of art – and therefore the awareness of an identity for the contemporary city that is set in a stratification: in the track of history.

In Yenikapi, through our project, we superimposed – according to geo-referenced associations – two images. The first one is so called ‘real image’ and expresses the silence between the new context and estranged archaeological essence of the city. The second image interacts with reality and changes it, in real time and in three dimensions. The resulting image is not only meant to superimpose a layer of words to guide disseminated information, but could also turn it into a sort of control issue, or rather, our image will be indistinguishable from reality, but not coincident with the imaginary, as the ultimate goal is the definition of a scene through multiple languages. The new-layered image will be a tool for poetic reaction. Starting from the definition of the ‘imprint’ of the building on the ground, the new image would replace ‘architecture in situation’, reporting the situation in architecture. In short, it describes architecture as being reactive to the context able to determine a new environment. To involve the visitor of the Yenikapi archaeological park we devised a mobile application loaded on ‘*Layar*’ through which, targeting the park from a pre-defined point of view, it could be possible to see: the real context, the new project of the railway station and the ancient roman wall rebuilt. The result was an image that reminds the Star Wars Eden in which we see the Bellagio Panorama, plus a new place and that is... Eden, a third reality that is the sum of the previous one. It is a real invention<sup>2</sup>.

<sup>2</sup> [http://www.eni.com/it\\_IT/azienda/enicultura/iniziativespeciali/symposium/symposium.shtml](http://www.eni.com/it_IT/azienda/enicultura/iniziativespeciali/symposium/symposium.shtml);  
<http://www.yenikapi-ynkp.com/>;  
<http://www.sabah.com.tr/Yasam/2011/09/16/yenikapinin-mirasi-ve-donusumu-tartisildi>;  
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# Rethinking Kevin Lynch's Lesson in Mapping Today's City

Rossella Salerno

The paper reflects about the new technologies impact on the city, on changing of social relations, giving a special space to a new reading of Kevin Lynch's *The Image of the City* (1960): the book, written in the age of Kennedy's democratic policy for racial integration had as major result that still today, in the north American cities, it cannot decide any public plan of urban redevelopment without consulting people about crucial issues like identity, the possibility of communicating a sense, the readability, etc., all issues that Lynch put at the core of his research.

As result of these experiences and practices it came out an idea about urban design that is impossible to restrict in the hands of few technicians or public administrators, but it has rather to refer to communities consultancy practices and to projects to be shared, in other words to projects are closely related to the field of democracy processes. So the drawing language proposed by Lynch in mapping assumes a specific care for the communicative not spoken codes, in any case codes able to convey information toward a wide range of people.

It seems clear enough, that the crucial point of communicating information allows us to get in touch nowadays to the internet age trends and put thus the question: are digital tools useful to approach a growing multitude of people to decision democracy processes about transformation of parts of cities, both central or periphery areas?

The multimedia communication is able in fact to convey not only not spoken contents but iconic ones too: in other words, the images language can reach a wider number of people rather the written information can do. From this point of view, the "internet revolution" concerns both the capacity to connect huge quantities of citizens and the possibility to use a language that can be simplified even applying to media easy for their approachability.

Inside then the relationship among information and communication techniques and social groups, it may be appropriate to reflect not only on a theoretical point of view but also showing some meaningful examples.

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What is a map today? Can the maps help us in understanding the contemporary city? Behind these questions we can see some issues that the geographers Amin and Thrift asked themselves at the beginning of their text *City*: what is still the city? And above all, how can we represent it? Apart from the social dimension and by physical factors in reality – the two scholars say – the city (also in the past, but today even more evident) is made, at the same time, of a large variety of elements ‘other’: technologies (in particular those that make possible the interaction at a distance), images, representations, procedures, organizational schemes, software, etc.

Among the technological innovations, the mobile phone undoubtedly has led new behavioral styles and social practices: what has changed in the way of understanding cities and urban landscapes since mobile smart phone allow for example reading on the display geo maps, differently usable by groups of users?

An instance can better help us to explain some of the potential; there are in fact commonly used application able to use iconic device and information for commercial purposes and not only, that can both draw on information related to a specific location, but also, at the same time to produce: the relationship between “innovative technologies” and sharing of information leads us to rethink the possibility of realizing configuration and ways of living, which appear between the new media and new forms of urban space.

It is clear that the role of technology is becoming increasingly important, which must be addressed through critical approach, to that effect setting to the problem given by sociologist François Ascher, that in the nineties, in his book *Metapolis*, opened important opportunities for reflection: “Les techniques font rarement irruption dans une société. Elles ont une histoire. Ce sont des acteurs sociaux qui les sélectionnent, qui en choisissent les propriétés qui les intéressent, qui les mettent en œuvre et qui pour ce faire mobilisent des savoirs, des savoir-faire ou des connaissances scientifiques particulières. Les techniques sont supports et expressions d’enjeux; elles sont saisies et agies par des acteurs”.

It is in this light that in fact today we can consider a map a medium to share urban images and at the same time, a device able to express visions and ways of living in the city. It is certainly not without consequences the opportunity that nowadays groups of friends or of people, not necessarily people in the same geographic location, have in developing information clearly legible on a two-dimensional layout. These actions now widespread, at least among the younger generation, acquire an interest if they arise from an interpretation of urban landscapes continuously re-invented by practices: these are in fact constantly changing and supported by technological devices and media, combine to give new meanings to spaces and places, to describe new boundaries blurred and different scale topographies.

In all probability the practice get and return spatial information via smart phones, helps to create those urban rhythms, whose “mixité” of uses and density of times, are unavoidable dimensions at present to understand the changing contexts: in this perspective makes sense to question the representability of certain practices.

A key point then becomes the use of iconic codes of easy access to convey information: the possible transformation of a photographic image of a map in which visual references are translated into topographical signs.

Is well known however that the maps of decision-makers employ quite differently, highly formalized codes, for example, the conventions of the geographic institutes, having long been assimilated into urban plans: the mode of simultaneous sharing of images and information or voluntary information, overturn instead the approach, allowing a useful comparison with the communicative practices employed by Kevin Lynch in *The Image of the City*, whose lesson, rethought in a new context of technological possibilities, may be susceptible to further interesting insights.

As is known Lynch relies on a frame consisting of Paths, Edges, Districts, Nodes and Landmarks key points for the urban analysis, with the aim to investigate the construction of one or a multiplicity of urban images by groups of populations. In the process of focusing an urban path, the key point lies in the constitution of environmental images, that is, the mental representation formed in each individual as a result of recent feelings and memories of past experiences, useful to recognize and give shape to what surrounds us with the emotional charge that this entails.

The environmental image – Lynch wrote – is the result of a mutual process between the observer and its milieu. The environment suggests distinctions and relations, the observer – with great adaptability and for specific purposes – selects, organizes and gives meaning to what he sees.

Just this consideration opens interesting comparisons on the potential of information voluntarily offered by mobile telephone and which we will return later in the text.

Yet in the text of Lynch we read that every individual creates and brings an image that is proper, but there seems to be considerable agreement among members of the same group. These are images of the group, gathering consensus among wide layers of population, affecting urban planners, who aspire to shape an environment that is used by many other people.

We will not focus on the cultural context in which the ideas of Lynch take shape, rather the aspect that is relevant to emphasize here is the attention given to the people and their activities, as well as to the physical spaces: citizens, residents are not, in this sociological perspective, only witnesses, but urban actors, worthy to stand on the stage, like the other stakeholders.

Lynch is fully aware that the city is not only an object of perception, but the result of multiple operators which, with their different interests, become responsible for the ongoing changes; this does not detract that the visual character of the American city, in terms of mental image of its citizens, remains crucial in order to make visible the urban landscape.

The use of a graphic “alphabet” also moves the focus on non-verbal codes, capable by their nature, to transmit information through wide community. Thus, communication plays a dual role: in focusing ideas and urban images and at the same time sharing content and ideas among a growing number of people.

Going back to the issue of contemporary relevance of mobile phones in understanding city change, it is interesting quoting some comments of Michiel De Lange, in the website *themobilecity*: “Lynch can be seen as a precursor to the influential thesis by Henri Lefebvre from 1974 that space is not just ‘out there’ as a mathematical entity or *a priori* category but always socially produced. Lynch’ work has many

implications for urban design and raises various questions about the present role of mobile and locative media technologies in the urban context". And furthermore De Lange states that locative media add invisible layers of social meanings to the city, usually only visible through the mobile screen and accessible to others elsewhere, although often only to those who are members of that service or community. As result these devices can affect general legibility, the public and private character of mental images, and social inclusion/exclusion.

So in a broader way, the sequence mapping/learning/shaping that we assume from Lynch's experience may be crucial still today in analyzing and planning the contemporary city.

With regard to the Italian context, two interesting planning experiences of Patrizia Gabellini team seem to refer themselves to Lynch's ideas: the first, Jesi's Plan (2004) is a case in trial of processes, both in terms of the stages of preparation of the plan proper techniques and for practices sharing proposals from citizens. The second one, the Piano Strutturale of Bologna (2008), utilizes some Lynch's principles of analysis to focus different ideas about the city, settled in the collective imagination of the city, trying to discover how they can play a strategic role in planning: in particular, short movies, edited by Filippo Porcelli, made by drawing on archival images, unfold an interesting tale of the stories and perceptions, sometimes even stereotypes, which are layered in the life of the inhabitants.

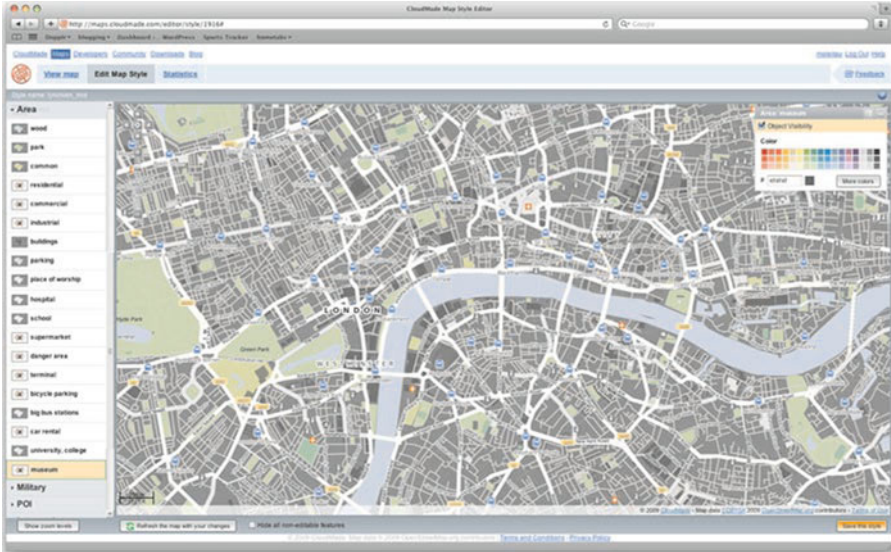
It appears quite clearly the importance that communication processes and information therefore assume in "internet age", in the contemporary era of the global network: however, is not without interest, on the topics that we are trying to lead, which has been drawn an exercise of "translation" in the vocabulary of a Lynchian map of the city of London (Fig. 1), in which information and communication combine in transmitting multimedia iconic contents before than verbal ones; to some extent seems a proof of the fact that the language of pictures may achieve in terms of numbers a wider audience compared to written information.

In this sense, the "internet revolution" involves both the ability to connect a growing number of people, and the ability to employ language that can be simplified by using communication tools for easy accessibility.

As a result of the changes introduced by the network and social media, at least two issues become relevant: first, groups of people can communicate more quickly and more easily than in the past, promoting and sharing use of the city and lifestyles (through maps); in second place, this type of information can result of some use to designers and planners in preparing housing solutions.

Of course in addition to the techniques of mapping, the field of digital technology offers several other communication tools: the digital image, the 3D visualization, can become useful both to show a state of fact of the sites, and the spatial dimension of planning actions; then the connection between innovative techniques of representation and communication possibilities given by the social network open a new creation of images, easy to communicate, simple to understand, and ultimately more immediate to share.

As mentioned previously, for example, the teaching of Kevin Lynch can be translated into "network language" through the iconic codes of Google maps, thus inaugu-



**Fig. 1** Matt Jones, *A map in Lynch's style* (from Google, 2012)

rating a new way of recording symbolic values and sense of place for groups taking as a reference the perception and uses of a given space.

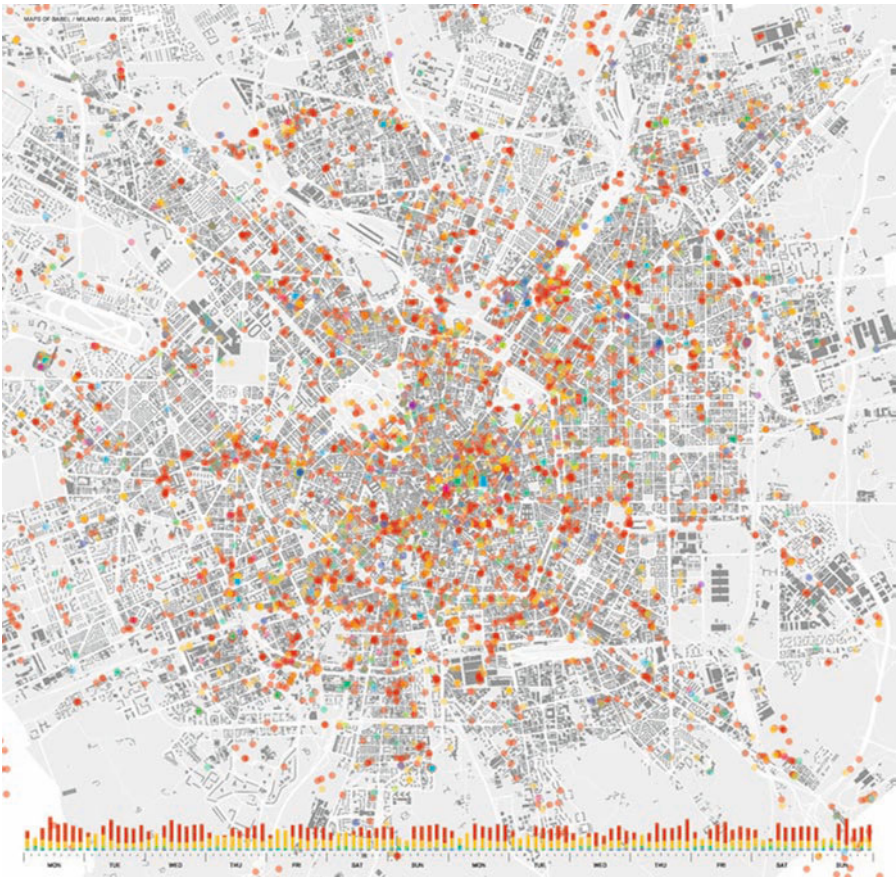
We are now facing a growing number of individuals capable of generating images, maps, to propose uses of sites and places, to suggest real-time “housing practices”: are planning and urban design able to grasp these new dimensions?

The use of analytical supports anchored to the traditional cartographic codes, is probably an instrument passed or at least not very suitable with respect to these scenarios in evolution.

In this context appear to be interesting lines of research and work conducted by the Danish team Gehl Architects, which place social groups, people at the center of the design proposals through an inclusive approach, attentive to the values of the multiplicity and diversity.

This cultural line aims to work closely with local organizations and implements participatory actions, methodologically assigning priority to housing practices from which morphology and functionality of urban spaces and then the construction of buildings. In this process the communication strategy assumes a central place, addressing it to the achievement of successful living standards for urban development.

The design strategy of the Gehl group, because of the importance assigned to the social space in focusing on the most appropriate housing solutions, also associated with the communicative potential of the iconic language, brings us back to the central theme of this paper: that is the growing role that social media, through processes of communication and sharing of information, play in the relations between places and people, in identifying new housing and urban practices.



**Fig. 2** *Maps of Babel*, an experiment on geo-localized User Generated Content gathered within the city of Milan. Maps of Babel tries to identify meaningful multi-cultural pattern on the city of Milan (Giorgia Lupi, Salvatore Iaconesi, Paolo Patelli, Luca Simeone, May 2012)

But how are these relationships changing? Can maps still today be helpful in understanding and interpreting the urban changes? For a long time, it is known, mapping described cities and territories using languages, tools and specific theories, with respect to which the operations made by Kevin Lynch represent an innovation, shifting the mapping process from top-down to bottom-up.

However, it should also be kept in mind how changed the relationship space / time that has traditionally managed the “map production”: the quantitative dimension – the foundation of our maps – needs to be reviewed in the light of new epistemological paradigms. The world has changed and the spatial pattern of modernity, defined on the separation between subject and object, does not help to understand the new coordinates “space-time” of the network.

Since the early eighties of the twentieth century the incremental growth of the system of electronic flows that convey real-time information, began to reconfigure topographic-Euclidean space, establishing new connections between it and the multiplicity of places, generating different models of space and place.

So the production of voluntary information provided on individual and collective maps by groups of people (Fig. 2), shows uses, preferences, ideas, images, leading to shift our focus beyond the physical dimension of urban transformation in the direction of the potential that the network can offer: the most obvious outcome at the time, is that cities and communities do not seem to correspond necessarily with the same place or the same space.

Even the thinking of geographers on this issue, especially Italians, therefore, invites us to take note that the changes in what we call cities are closely related to the changes introduced by technology, the effects of which are detectable in the appearance fragmented and not isotropic of urban landscapes.

The traditional categories of space and time do not appear more significant and therefore the appearance of the sites and their traditional topographical description ultimately is no longer able to produce convincing explanations.

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# Storytelling for Cultural Heritage

Paolo Paolini and Nicoletta Di Blas

Digital storytelling is emerging as the most relevant way to deliver content in the digital age. In essence, a digital story combines visual communication (slideshows, videos or animations) with audio. Optional text can be used for additional details. Most people agree today that digital stories are the best way for engaging users across several devices: from tablets to desktops, from smartphones to even phones, for audio only. Different narratives styles can be used and different situations can be envisioned, including immersive storytelling or augmented-reality storytelling.

In this chapter, we describe what digital storytelling is about (in general), how it is currently applied to cultural heritage and architecture, how technologies can support it, and how design can be guided by a proper methodology. Specific reference is made to 1001stories, the authoring environment for digital storytelling developed by HOC-LAB at Politecnico di Milano.

## 1

### Interactive Multimedia Digital Storytelling

The need for *Multimedia Communication for Cultural Heritage*<sup>1</sup> is becoming more and more evident and for several reasons: reaching a wider audience, exploiting the possibilities of impact offered by new devices (e.g. tablets or smartphones), combining culture and tourism, etc. “Urban studies and Architectures” clearly fall in the wider domain of Cultural Heritage, and therefore the opportunity for an effective

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<sup>1</sup> We prefer the more confined notion of “cultural heritage”, over the general notion of “culture”, since the former is closely related to objects and artifacts, while the latter may also include abstract concepts.

multimedia communication, not widespread for the time being, can be discussed and this discussion is the purpose of this chapter.

The essence of the advantages provided by multimedia communication is the involvement of the audience (whatever the intended audience is), capturing attention and propagating a cultural message (whatever this message is).

Different technologies can be used for multimedia communication: the most “venerable” one can be considered the printed book, with its combination of text and images; it is in fact an early example of multimedia communication.

In this chapter we advocate the adoption of a specific approach: Interactive Multimedia Digital Storytelling, or MDST in short. Multimedia means combining text and images with audio, video, graphics, and whatever medium is most appropriate for a given content or a given purpose. “Digital”, obviously, means to exploit the possibilities offered by modern devices (tablets, smartphones, MP4 players especially), but also by social spaces like YouTube and Facebook. Storytelling is a crucial keyword: it implies that the user is not provided just with information or data but that she will get a story or, better, several stories, conveying cultural messages. Telling stories (since Homer or the 1001 nights saga) is well-known as a way to capture attention and engage audiences.

In the field of cultural heritage, storytelling is being acknowledged as “the” way of engaging audiences (Proctor and Cherry 2013). There are several ways to tell a story today: videos, interviews, fiction, etc. The well-known “ARTbabble” site ([www.artbabble.org](http://www.artbabble.org)) can also be considered a large collection of stories, of different kinds.

In this chapter we focus on multimedia storytelling with a specific additional feature: interactivity. Standard videos (fictions, documentaries, interviews, etc.) can be considered “linear” artifacts, in the sense that they have a starting and an ending point, as well as a flow of progression. Users are expected to make use of linear stories in the way they were meant to be: from beginning to end. Authors can count on the fact that there is a clear sequence and that at minute “x+1” what has been said at minute “x” should be known. Modern devices, of course, allow even for linear media a limited amount of interactivity: users can move forward or backward in the narrative, they can skip unwanted parts, etc. Despite this, however, the notion of linearity is clear both to users and authors: each part is dependent and strongly related to previous parts.

Real interactivity is different: a narrative can be considered fully interactive<sup>2</sup> if it exhibits some basic features:

- it consists of “semi-independent” multimedia fragments (episodes). A fragment can consist of videos, images, audio, text, graphics, or any combination of them. Different versions of the same fragment can be used for specific needs (e.g. audio only for blind users);

<sup>2</sup> We warn the reader that there is a field of research where “interactive storytelling” is intended even more radically: for these researchers a narrative can have different plots and through interactivity the user can decide what version suits her better.

- each fragment makes sense on its own and it can be (at some extent at least) rewarding (and understandable) just by itself. Individual episodes carefully avoid explicit reference to other episodes, since a pre-defined user path cannot be taken for granted;
- different “architectures” can be used to glue episodes together: linear structures, hierarchical structures, inter-linked structures (with an episode linked to other relevant episodes) etc.;
- episodes can be used in different ways:
  - automatic play, going through sequences of episodes. Different strategies are possible: “short” play (a set of episodes providing a quick overview of a given topic), “long” play (a more in-depth description of a given topic), etc.;
  - interactivity: users can select what they want, jumping here and there, interrupting episodes, etc.;
  - the set of fragments can be de-structured, with all of them offered at once. Users can select any of them with no specific order nor specific purpose in mind;
  - episodes can be indexed according to some suitable taxonomy;
  - ...

Truly interactive narratives can support a variety of user experiences. Systematic browsing, linear walk-through, random selection, search, exploration, etc. This property them makes them specifically attractive for the cultural heritage domain, where different users with different needs access the same content: experts, scholars, students and teachers, visitors, tourists, etc.

The flexibility of organization of the fragments, coupled with the flexibility in the selection of a suitable device (large displays, interactive screen, laptop, tablets, phones, audio-guides, etc.) make interactive narratives very attractive for the users and very useful for cultural institutions.

Section 2 will introduce HOC-LAB’s approach to interactive digital storytelling and the authoring environment that supports it; Section 3 presents specific case studies where interactive multimedia storytelling has been used in the domain of cultural heritage; eventually Section 3 will provide a few hints for an effective authoring of interactive digital storytelling.

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## **2 The 1001 Stories Approach to Digital Storytelling**

The activities by HOC-LAB of Politecnico di Milano in the field of digital storytelling for cultural heritage began in 2006. The core idea was to develop an approach (and a tool to support it) that would allow a quick, not expensive yet of good quality production of multimedia, multi-channel “narratives”, to introduce real and virtual visitors to exhibitions, permanent collections, archives and cultural topics in general.

Since 2006, more than 30 professional productions have been completed for various partners in Italy and Switzerland.

At first, the approach was baptized “Instant Multimedia” (Di Blas et al. 2007; Caporusso et al. 2007; Di Blas et al. 2008; Campione et al. 2011) to underline the similarity with instant books and the difference with respect to traditional, long-term and expensive productions like catalogues and standard museum websites.

At the core of the approach stands an authoring tool called “1001stories”. 1001stories is an authoring, generation and delivery tool to create multimedia, multi-channel narratives. It consists of 3 main elements:

1. an authoring environment (previously written in PHP and Java Script, and now being rewritten in Python and web2py) where the content elements are authored;
2. a generation engine, that creates the information architecture to organize the content items in a structure suitable for the final delivery. The information architecture is described via a number of JSON files, according to the various versions the author is creating;
3. a delivery engine, implementing the various interactive formats over various platforms (audio guide, multimedia guide, web version, web for smartphone, app, etc.).

The narratives created using this tool are “multi-channel” in the sense that they can be used over virtually all modern devices and channels, online and off-line: web for PC, web for mobile, podcasts, iPad (and tablets in general), multi-touch tables, YouTube, standard phone (audio-only), paper (brochures and posters), etc. The multi-channel delivery allows to support quite varied user scenarios (Figs. 1 and 2).



**Fig. 1** A multimedia narrative over an interactive table



**Fig. 2** A multimedia narrative over a smartphone, used as interactive guide in an exhibition

The stories are made of audio, text (the audio's transcript) and images; all these content elements are transformed by the tool into videos. The stories are not turned into a single, long linear video: they are split into a number of content elements to guarantee interaction and to leave the user free to select what she is most interested in, also according to how much time she has. Each content element is quite short, lasting between one and two minutes. The overall goal of all the narratives created within the frame of this approach is to raise interest and curiosity, providing the essential information plus anecdotes and interesting facts; they are not “encyclopedic” in nature nor structured like a traditional website.

The quickness of the production is guaranteed by a simple way of gathering content, which is an essential part of the approach. All professionals in the field of cultural heritage communication are well-aware of how difficult, cumbersome and long it is to gather content from experts, if they are asked to sit down and write a text (about an exhibition, the items on display etc.). In our approach, instead of asking for a written text, we ask for an interview. The interview is recorded and then the transcript is made. Starting from the transcript, the short texts needed for the various content items are created by professional writers and the final result is sent to the expert for final check. A 2–3 hours interview can provide the bulk of a medium-sized story: production can thus move on in quick time. It must be clear that the experts' responsibility is on whether the content is correct from a scientific point of view, while the responsibility for the communication quality of the text is on the writers' side.

Another important point to stress about the content is that our content items are like building blocks that can be re-used when the user-scenario changes. Let us make a simple example: in the case of an exhibition, we create content items for each specific work on display; if the delivery is over the web, than they can stand alone (of course with other elements introducing the exhibition and the main themes, for example, as we shall see below). If they are to be used for the multimedia guided

tour onsite, further elements have to be introduced, like instructions on where to find the works of art in the real place. But what matters is: the basic content elements are done once and for all, they can be reused, they do not need to be re-created from scratch (as it is the case in many museums around the world).

In the next paragraph, we introduce some examples of real productions to show what the main characteristics our approach.

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### 3

#### **Some Case Studies**

In this paragraph, we introduce some examples of interactive multimedia narratives for cultural heritage made with 1001stories and following our “Instant Multimedia” approach. Interactive multimedia artifacts, with respect to linear productions, provide additional challenges. If in a linear product, like for example a movie, the message can be either put in one specific “place” or slowly unveiled all along the way, in an interactive product the message (i.e. what the sender really cares for) must be distributed all over the various content elements, since the user will be free to select what she wants and to linger as much as she prefers over the pieces of content she feels more curious about. From a communication point of view, this is not easy to handle. It must be noted that this situation does not exclusively pertain to technological interactive products: even a very traditional product, like a museum or an exhibition catalogue, works this way. It is very rare in fact that readers read such books from the first page to the last; more likely, they will browse around, catching a glimpse over pages here and there: it would be useful if catalogue authors would keep in mind this “interactive” way of consumption too.

#### 3.1

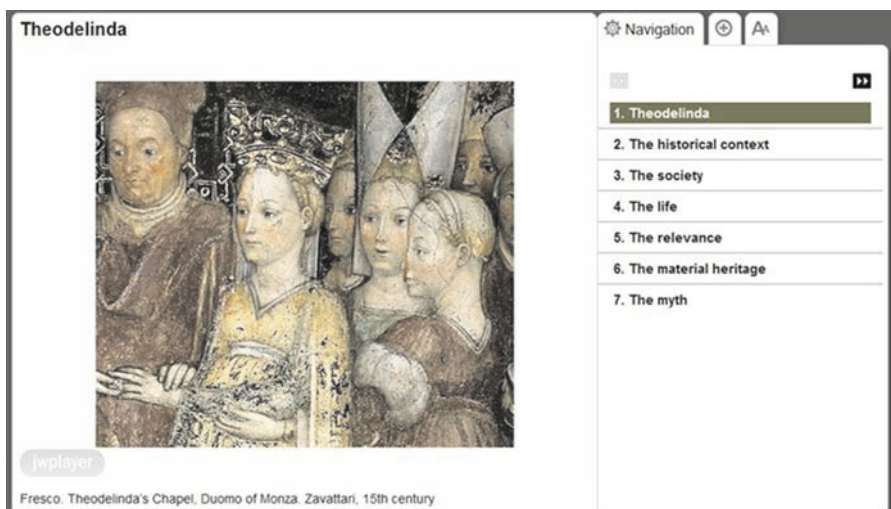
##### **Case Study 1: “Roman Milan”**

2009; in cooperation with the Archeological Museum of Milan – [hoc.elet.polimi.it/vitamilano/index.html](http://hoc.elet.polimi.it/vitamilano/index.html)

Roman Milan is a multimedia narrative about the city of Milan in Roman times. The goal is educational: to introduce students (of junior-high school, roughly) to the basic notions about Milan in Roman times, in the 4<sup>th</sup> century after Christ. Major sociological and historical issues are dealt with: what it meant to be a woman or an ex-slave, how the passage from paganism to Christianity took place, etc. The narrative is two-layered: first, the user meets with a set of five fictions about five characters (a law officer, a matron, a freed slave, a deacon, a pagan patrician). The second layer consists in a set of background information that clarify crucial aspects, like for example what was a circus in Roman times, clarifications about religious doctrines etc.



**Fig. 3a** The narrative about “roman Milan”. On the left, the topic and sub-topics; on the right, the list of background information. Source: [http://hoc.elet.polimi.it/vitamilano/project/la-vita-quotidiana-a-milano-alla-fine-del-iv-sec-d-c\\_home\\_nav-short.html](http://hoc.elet.polimi.it/vitamilano/project/la-vita-quotidiana-a-milano-alla-fine-del-iv-sec-d-c_home_nav-short.html)



**Fig. 3b** The narrative about “Theodelinda”, from the work “Queens of Italy”; the interface is optimized for tablets. Source: <http://www.regineditalia.net/en/theodelinda/>

The whole narrative can thus support quite different user scenarios: a user can listen to all the characters presentations (following the list of main topics), or she can listen to the tale of how each single character spent her day (following a chapter: i.e. a sequence of topics and sub-topics – Fig. 3), or she can select the background information that are either attached to topics and sub-topics or collected in a separate narrative.

### 3.2

#### Case Study 2: “Queens of Italy”

2012; [www.regineditalia.net](http://www.regineditalia.net); in cooperation with the Inner Wheel Club of Monza

Queens of Italy is a set of four multimedia narratives about four relevant female historical characters who had a prominent role in their times: Theodelinda queen of the Lombards (570–627 AD), Constance of Hauteville (1154–1198); Eleanor of Arborea (1340–1400 circa) and Matilda of Canossa (1046–1115). The goal is again educational: to introduce students (high-school level) to the life and relevance of these characters; the underlying message is that women can play a fundamental role within society, at political level.

Each character has a special section, with a narrative and a set of background information, like in the case of Roman Milan. At the same time, all the characters are seen as part of the same picture: they share the same content schema (the historical context, the life, society of the time, the relevance, the material heritage, the myth, etc. – see Fig. 2) and for all of them the content author has been careful to convey the underlying message: women can play a great role in society and politics.

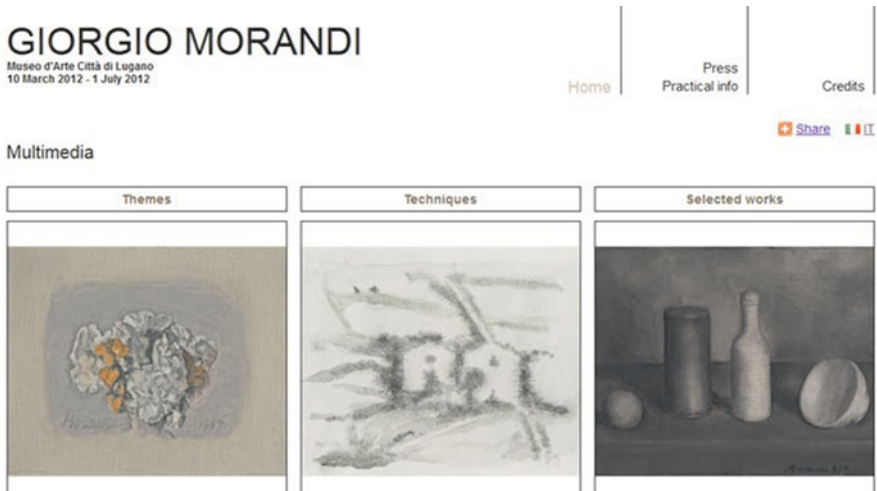
For each character, the user can choose whether to access the main narrative or the set of “highlights” (additional information). The main narrative is a linear sequence of topics lasting 9 minutes approximately. Following this sequence, the user can get an overall idea of this character’s life and deeds as well as some background information about history and society. Were the user to want to “know more”, s(he) can access additional material – borrowed from the “highlights” narrative – by clicking on the “plus” command up right. In this way, different user experiences can be supported. With respect to Roman Milan, a novel communication strategy was introduced: a very short multimedia fragment summarizing the core content about each character; this fragment can be put on YouTube as an appetizer for driving visitors to the website.

### 3.3

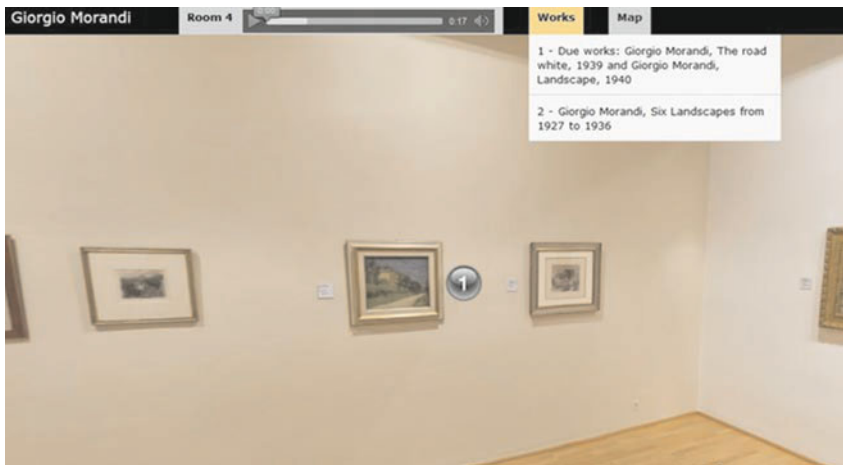
#### Case Study 3: Giorgio Morandi Multimedia

“Giorgio Morandi Multimedia” is yet another interpretation of the digital storytelling approach. It consists of three interconnected narratives, created on the occasion of the exhibition “Giorgio Morandi” held at Museo d’Arte, Lugano, March 10th – July 1st, 2012 ([www.giorgiomorandilugano.ch](http://www.giorgiomorandilugano.ch)). There are three main narratives: (1) the exhibition’s themes; (2) some highlights (in catalogue-style) and (3) additional information about the techniques used by the painter (Fig. 4).

The three narratives are interconnected in the sense that while going through the themes, the user can also access a specific highlight or a specific technique. In the case of this exhibition, a virtual tour was created (optimized for tablet) allowing the visitor to spot where relevant works of art were located and getting information about them (Fig. 5). Again following the building blocks approach, the content they get in the virtual tour is the same they get in the website.



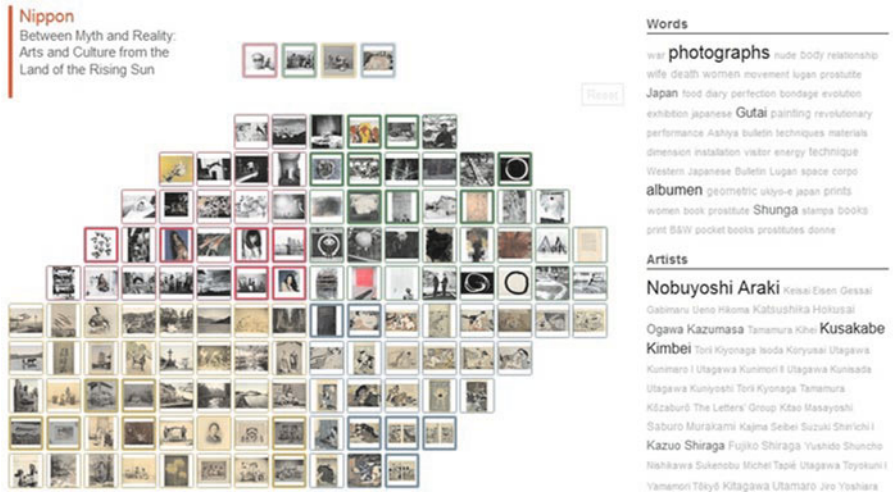
**Fig. 4** The home page of “Giorgio Morandi Multimedia” with access to the three narratives. Source: <http://www.giorgiomorandilugano.ch/en/multimedia.html>



**Fig. 5** The virtual tour of the Giorgio Morandi exhibition, based on panoramic pictures. Source: <http://www.giorgiomorandilugano.ch/en/virtual-tour.html>

### 3.4 Case Study 4: Nippon

“Nippon” is quite a sophisticated example of re-use of content following the building block approach from different narratives about four exhibitions, all revolving around the theme of Japanese culture ([www.nipponlugano.ch](http://www.nipponlugano.ch)). First of all, the four narratives were created: for each exhibition, there was a main narrative telling about the exhibition’s theme plus an additional narrative about some selected highlights.



**Fig. 6** The “mosaic of stories” created for the Nippon exhibition. Source: <http://www.nipponlugano.ch/en/at-a-glance/web/>



**Fig. 7** Home page of the project “The Sala delle Asse restoration”. Source: [www.saladelleasse.polimi.it](http://www.saladelleasse.polimi.it)

Then, all this content was “scattered” over a sort of mosaic where the user can select what she prefers according to the visual appeal of the thumbnails (Fig. 6).

### 3.5

#### Case Study 5: The “Sala delle Asse” by Leonardo Restoration

The “Sala delle Asse restoration” is our latest development, about the restoration of a magnificent hall painted by Leonardo da Vinci located in the Sforza castle in Milan (<http://saladelleasse.polimi.it/>). In the case of this project, a complex set of eleven narratives is planned to introduce and contextualize the restoration. In addition to the narratives, similar to the ones described in the previous examples, short interviews to the main people involved are also planned. All these content elements, yet again following the building blocks approach, will be made available in an advanced exploratory portal.

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## 4

### Interactive Multimedia Stories: Design Tips and Guidelines

There are a number of different “tips” that may help a designer to develop effective interactive multimedia stories, similar to those presented in this chapter.

**Raw Content** “Raw content” is the material from which stories are derived. It may consist of documents, books, images, videos, etc. The crucial point is that sheer information does not make up story: a story must be compelling and engaging, both in terms of content and the way this content is told. Therefore, if the starting point is a large amount of raw material (a typical situation), the task is made more complex: what would be really interesting for the user? What should be picked up and presented to her? Over the years, as mentioned before, we have developed the method of interviewing an expert in order to gather the bulk of the needed material. An expert will inevitably focus on what really matters; the original material can then be used for getting details and filling gaps in.

**Fragmentation** As explained in the previous sections, fragments are the bricks the interactive stories are made of. A fragment is a mini tale (possibly lasting around 1 minute), short enough not to lose the user attention<sup>3</sup> and long enough to say something interesting. The author has to make a clear decision about what concept (or two at most) to convey and how to convey it in 120 words approximately. Also, she has to keep in mind the golden rule that each fragment must be consistent on its own, no matter how short.

**Media** Text can be displayed, but, especially when mobile devices are considered, it is used to generate audio, i.e. users “listen” to the text. There are many situations in

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<sup>3</sup> The skeptical reader may try this experiment: close her eyes and ask someone to talk for one minute. How difficult was it to keep her attention up till the end?

which users are supposed to be listening to stories: e.g. when they are looking at the environment (e.g. at a building, or an object or a painting), or they are walking or driving or (last but not least) they are visually-impaired. So, it is important to create texts suitable for oral consumption, which means short, with a simple syntax etc. Images in a sense make up a narrative on their own, but, if displayed when the audio is being played, they reinforce the message. Images are also enriched by captions that should make the narrative more understandable. Images can be derived from pictures or scanned drawings. Video is a nice medium, but expensive to develop and edit. For this reason we prefer, in general, to generate videos by playing images in a sequence, combined with audio. It is often interesting to intermix standard video with video generated via images combined with audio.

**Structure** Structuring a narrative from fragments is a difficult exercise. The simplest idea is to build linear narratives, i.e. sets of fragments that can be played either in sequence or randomly. For usability purposes, in general, playlists should not exceed 6–8 fragments. Exceptions are “guides” (e.g. for an exhibition or an itinerary) where the items are determined by the number of “stops”, i.e. the number of interesting things to see. A second possibility is to have several playlists, somehow semantically coordinated. For the “Morandi” exhibition, for example, there is a playlist for the techniques, a playlist for the subjects, and a playlist for the paintings. Fragments can be interlinked (as is the case of the Morandi work seen before), to exploit semantic references. The fragment illustrating a technique could be linked to the work of arts where that technique had been used. Another possibility is to build hierarchical structures: let us imagine a playlist of 6–8 fragments; for each of them, 4–5 additional fragments with more detailed information can be defined. The user can thus choose between the “short” version (with just the main fragments) or the “long” version where the additional fragments are also offered. Another option is to let the user free to select what she wants. An additional possibility is to put together fragments from several playlists in a de-structured way, allowing the user to directly access any fragment. This was done, for example in the “Nippon at a glance” interface seen before, where the fragments created for 4 different exhibitions were assembled.

**Adaptativity** A fragment is created having in mind a specific context (for example a museum): it is implicitly understood which museum is involved. If the fragment is placed in a different context (say, for example, assembling all the cultural fragments about a city) the original context must be made explicit. We have developed a simple technique (using prefixes or suffixes to the fragments) that can cope with the problem.

**“Live” or “Authored” Content** Authored content is created with a professional speaker creating an audio track over images. Live content is created by a video interview, a video taking of a scene, etc. Live content is difficult to edit and to organize in complex narratives; additional complexity arises if several languages need to be used.

At the same time, it provides emotions and warmth (as YouTube demonstrates). Authored content provides several technical advantages, but it can be “cold” and impersonal. A combination of the two types of content is probably the best solution, but not easy to develop.

To conclude, we think that multimedia interactive stories are a great way to “give people access” to cultural heritage, due to their light-weight nature that makes their consumption extremely pleasurable, their flexibility of use (across different channels/devices and scenarios) and their feasibility (they are quick in production and not expensive). For these reasons, digital storytelling is becoming “the” way of communicating in the cultural field.

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## **Part II**

# The Institution's Claim

# New Technologies and Technological Innovation for the City: Chance EXPO 2015

Guido Arnone

New technologies are becoming essential in the design and development of the urban space for the 21st Century. The declination of the smart city projects in modern cities is focusing towards several dimensions apparently orthogonal but in effect intimately connected. Alongside the traditional Ecological and Sustainable targets, the digital and technological dimension of spaces, services and people, is increasing in relevance and adoption.

The Digital Smart City offers a set of enabler and services enhancing the citizen experience. In the middle age, a new way to put an order in designing the city was introduced by Leonardo projecting 2 city layers: the lower and upper areas – the lower being canals for tradesmen and travellers and the upper being roads for upper class. Designing and mapping the digital services can be done by grouping and ordering those services into technological layers: Energy & Lighting, TLC/ICT, Safety & Security, and Citizen Services. These layers are interdependent constituting the digital infrastructure for the smart city and, as a reference, are being used to design the city which will host Expo 2015 in Milan.

The increasing relevance of digital services in the creation of the Smart City of the XXI century is a well-established trend driven by few aspects: (1) *Internet of Things*: IoT is nothing new, but the IoT paradigm is shifting from vertical isolated solutions towards a horizontal integrated set of digital sources, integral part of a technological urban mapping. The availability of several heterogeneous geo-referenced data sources, combined with the ability to make those data available through a real time ICT infrastructure, is enabling a broader set of service offering exploiting the “time” and “space” dimensions of the urban service; (2) *Digital Communities*: Even if community services did start on the WEB, it is with the fast adoption of Smartphone and portable devices that they become part of our day-to-day living. In developing countries Internet on Mobile is not a new trend but it is the way for people to be connected digitally connected. Digital Communities are integral Urban mapping, not only representing the users of services which are driving the demand, but they actively contribute to the creation of service offering; (3) *Citizen Experience*: New technologies are exploiting urban infrastructure and spaces, the “digital experience layer” is an integral

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part of the urban planning and living experience. Citizens are interacting with the urban space through a variety of innovative touch points offering a contextualised and personalised way to enjoy content. Living the city is like experiencing a personalised journey where the environment around is enhanced with embedded and user generated content.

The section is analysing the Digital Smart City enablers and trend and describe the Milano Expo 2015 case.

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## 1

### **Digital Technologies City Planning**

Architectural and Urban Scale planning and design is changing, alongside the architectural, infrastructure and service planning, digital technologies are offering to institutions a new way of creating and promoting their services and, at the same time, they represent for citizens a mean to have direct access and to be part of the service creation and data gathering process. The urban “digital layer” is part of the planning and living experience in the city and digital technologies have a key role in shaping the urban physical and mental experience for Citizen.

We could look on how digital technologies are impacting the urban space and interactions from three different angels: the Digital City and what are the paradigm shift they introduce in the urban environment. The Digital Communities looking into how technologies are changing user behaviours and interactions. The Digital Experience, and in particular how the combination of the two previous areas is opening new experiences for urban demanded services.

In the following sections we will look at some of the key driver and rationale behind the digital technology and we will look into a real case, Expo Milano 2015, to see how new digital technologies can be applied to design and support the visitor experience in the Universal Exposition in Milano.

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## 2

### **Digital City**

Cities have become the focal point of policies and economic strategies of the new millennium and smart and sustainable urbanization – the Smart City – is a necessary condition for this vision to become reality. Smart City have been introduced for several years to indicate a new way of thinking the urban environment be means of a “smart” organisation of services and human interactions with a target to increase, the sustainability, the efficiencies and the living experience standards.

A key role in the shaping of the Smart City services and solutions is played by the Internet of Things (IoT). In the Smart City contest the IoT is enabling the creation of a Smart Urban Infrastructure (SUI) (Osservatorio IoT MIP, 2012), increasing the

relevance of data source from the territory and allowing the creation and aggregation of services. The IoT paradigm is applied to a variety of field in the urban environment like: transportation, logistic, ICT, safety and security, entertainment, and represent a dynamic data source of information suitable to monitor, control, plan and develop new services for the citizens.

If we look at the essence of the IoT, we understand that the paradigm is nothing new, but what has changed its relevance, on top of the technology improvements in sensors that indeed have increased the granularity and precision of data sources, is the evolution of the ICT infrastructure as a way to collect and to process data.

Telecommunication networks are more capillary and evolved from traditional cable a mobile coverage service towards dedicate sensor-to-sensor mashed solution (e.g. ZigBee) or even Sensor to citizen device direct interaction (e.g. RF-ID, NFC). At the same time, the introduction of the Cloud based ICT services, is providing a data repository and computational capability at urban scale. The availability of geo-referenced data sources with the ability to combine, process and make them available through a real time ICT infrastructure is enabling a large portfolio of services.

While the development trend for the City of the XXIst century is set, the legacy of existing infrastructure and services are an obstacles for the fast adoption of digital technology in the city, in this contest a Universal Exposition represent a growth opportunity overcoming legacy constraints and allowing the creation of a digital city infrastructure from a green field.

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### **3 Digital Communities**

In parallel to the digitalisation of the urban environment, the last years have been characterised by the digitalisation of the users, driven by the internet and mobility growth. In the last 3 years the penetration and usage of smartphones have increased substantially, and in 2013 the number of new Smartphones sales is higher than traditional mobile phone sale (Gartner, IDC mobile trends reports). This is an remarkable result if we consider that the first iPhone has been introduced in most countries only 5 years ago.

There are four factors that have been driving this fast change: the first is the evolution of mobile network, in the last 10 years mobile data speed has increased from few 20–30Kb/s (GPRS) to 40–50 Mb/s (LTE/4G) per user, more than one thousand time faster. The second aspect has been the evolution of mobile phones both in terms of technology and in terms of experience with larger screens and touch devices, removing the traditional demarcation between Personal Computers and phones.

However technology is not enough to guarantee adoption and, there are two other factors that have been driving the increase of mobile internet users: the introduction of affordable tariff plan, and more important, the introduction of Operating System open to developer communities and enabling the creation of application ecosystems.

Smartphones are the preferred touch point for user to access real time data and services in mobility urban contest, but in the meantime, they are also the way users are interacting each-other in the digital world contributing in feeding social communities. Similar to the IoT paradigm, in the community context, citizens are the source of information and they contribute to the service creation process through, their social interactions often geo-tagged, enabling the definition of new value added community services (Social Community Services).

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## 4

### **Digital Experience**

The core of citizen demand is not changed: the request towards institutions for a smarter city. Digital technologies exploit the data and service infrastructure space, offering a way to design new experiences and contribute in fulfilling the demand. The Digital Experience layer is the place where City Services and Digital User are meeting.

Citizens are interacting in the day by day living with the urban space through a variety of innovative touch-points, mostly personal (smartphone, tablet, e-glasses) but also public, in the attempt of public institutions to re-qualify traditional interactions (e.g. phone booth - What When Where project, New York).

The Digital Map is the canvas where geo-referenced public and user generated data is used to enhance the core services and provide information, news, events, support economic transaction (e-coupons) and play narratives (historic, artistic, cultural and culinary), offering a stimulus to live the present, understand the past and design the future of the city.

Expo Milano 2015 and other big events offer the chance to focus new digital technology in shaping the visitor (citizen) experience.

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## 5

### **Chance Expo Milano 2015**

Starting from the first edition (London, 1851), the World Expositions represented a source of innovation and human inspiration. Until the recent years Universal Expositions have been characterised by an exceptional monumental architecture representation and many signs of past Expositions are still signature in urban landscapes like *Tour Eiffel* (Paris, 1879) or *Atomium* (Brussels, 1968). Besides monumental architecture World Expositions have been an innovation showcase and things like the *Bell's Telephone* or the *Heinz Tomato Ketchup* were first showcased and introduced at in World Expositions (Philadelphia, 1876).

In more recent years, World Exposition (now called EXPO) have changed and the cultural, scientific and educational focus has become more relevant, positioning the EXPOs as a global platform for aggregation of ideas and best practices where traditions and cutting edge innovation are coexisting. Expo Milano 2015 is also characterised by this new trend and the theme “Feeding the Planet, Energy for Life” is going to be the driver for more than 130 participant countries.

The opportunity to design and build a new city using digital technology to enhance the visitor experience is an innovation opportunity offered by Expo Milano 2015, and constitute an important heritage of the Universal Exposition. Three projects have been introduced for the event: The Digital Smart City Expo is focusing to the physical visitor entering the Exposition site, The Digital Ecosystem, focusing the physical visitor and its interaction with the environment around, and the Digital Expo focusing to the digital experience of all visitors.

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## 6

### **The Digital Smart City Expo Milano 2015**

The Organizer intends to build and operate the Exhibition Site with the objective of developing a model for the Smart City of the future, thereby enhancing the visitor experience and discovery of the Theme as well as leaving a legacy of innovative systems and solutions for future cities. The Expo Milano 2015 Smart City must therefore be sustainable, comfortable, attractive, safe, informative and efficient in order to make the visitor experience thoroughly enjoyable.

Expo Milano 2015 exhibition site is located North West of Milan, it has an area of 1,1 Msqm and is built from a green field. This is an interesting case giving the chance to design a build a new urban area even if with some peculiarities that differentiate it (e.g. site is mainly design for pedestrian usage, with limited access to vehicle for logistic).

In the Middle Age a new way to put an order in designing the city was introduced by Leonardo, projecting 2 city layers: the lower and the upper layer, with the lower being canals for tradesmen and travellers and the upper being reserved for the upper class. In designing the Digital Smart City Expo services a layer based approached has also been adopted.

**Layer 1 – Smart Building and Smart Energy** The most sophisticated and modern measures currently available have been adopted in creating the Exhibition Site with the aim of minimizing environmental impact and optimizing energy efficiency. A dedicated smart Grid energy distribution network is implemented with ability to integrate local energy source from pavilions and monitor/optimize power consumptions. The network will feed with smart lighting point in the site. Sustainability criteria will be applied to all buildings and infrastructures.

**Layer 2 – Telecommunications and IT Systems (ICT)** ICT infrastructure enables to offer personalized and exclusive experience of the Expo Milano 2015 Smart City, through the use of all the technological supports made available to them: a fibre optic network based on advanced access technology (GPON), a 4th-generation LTE (Long Term Evolution) mobile network, a Wi-Fi network providing full coverage in the site and integrated with the city of Milan. Hosting of the IT and application services on a dedicate cloud infrastructure offering, with the implementation of a dedicated Service Delivery capable of orchestrating services, of collecting all visitor data (profile, geo-location, presence, etc.) and associate them with Expo Milano 2015 content.

**Layer 3 – Safety and Security** A range of services to ensure the safety of the Event and the people, through the creation of a Main Operations Centre in constant communication with the services of the Exhibition Site and, at the same time, integrating with external security centres. A solution based on a network of sensors (video-camera, fire detection, smoke detection, etc.) spread throughout the Exhibition Site; data collected from these sensors and other systems through a dedicated IP network are useful for the evaluation of the security status of the Event will be collected in a single integrated platform.

The Main Operations Centre plays the lead role of security management of the Exhibition Site, coordinating the activities of all operators on the area, collecting and managing reports of any security event occurred within the Exhibition Site and enabling the Organizer staff to handle emergencies in a unified, direct and controlled manner.

**Layer 4 – Edutainment** One of the themes close to the heart of Expo Milano 2015 is the communication of information, culture, and fun. Services for communicating and disseminating contents on the Theme are of key importance to the Organizer. With the support of innovative technological services, visitors have direct and privileged access to the content of the Expo throughout the duration of the Event. Discussions on the Theme is supported by the most modern technologies, such as interactive walls, real-time transmission of seminars, conferences and conventions.

An information diffusion system both within the Exhibition Site (starting with visitor smartphones and tablets) and in the City of Milan (including digital signage, multimedia totems, and digital surfaces). The various visitor devices can dialogue with the recognition systems integrated into digital tickets (with Near-Field Communication systems) and activate advanced Expo Milano 2015 access functions. The integrated application of these solutions are enhancing the many contents of the visitor experience (further details, personalization, interaction with user-generated content) as well as the comfort and ease of the visit (first and foremost, optimization of waiting times for Exhibition Spaces access, with one solution being modification of the visitor itinerary in real time in response to visitors' flow data).

Furthermore, in many areas of the Exhibition Site the visit may be enriched thanks to augmented-reality systems to enable Visitors to enhance their perception of the Expo Site and its content (audio, video, graphics), interact with digital information

superimposed upon the real environment (waiting time status, events program), and also interact with offsite communities.

**Layer 5 – Services** In order to make the Expo Milano 2015 experience unique and interactive, visitors will find tools and services at their disposal that will make their visit more complete and efficient. This last layer is covering more operational services to support the visit like cashless payments infrastructure based on NFC technology and smartphone, solution for disable people and E-Health for a more efficient handling of visitor wellbeing, and electric based people mover service.

The Digital Smart City Expo is not isolated from the urban contest of the city of Milan, and a special attention is paid to integrate services and solution available within the exposition site with the similar services available in the area of Milan, thus creating a seamless and consistent visiting experience for visitors attending the Expo.

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## 7

### **Digital Ecosystem E015**

Millions of people are usually taking part to Expo. In addition to touring the Exhibition Site itself, visitors have access to services offered in the local area by the business community, public agencies, and other public and private organizations. Expo Milano 2015 represents an opportunity for local players to offer new services to complement and expand the portfolio of existing services, using the Event as a driver.

For the purpose of extending the Digital Services to the territory of the Milan area a dedicated Ecosystem has been introduced. The idea behind the E015 Digital Ecosystem project is to extend the experience of visiting the Exhibition Site by creating and integrating local services, which are made available to visitors before and during the Expo Milano 2015 period. One of the objectives of E015 Digital Ecosystem is to contribute to the legacy bequeathed to the Milan area and, more generally, to the Italian system of public and private entities.

The E015 Digital Ecosystem project is based on cooperation among different stakeholders: members of the Ecosystem agree to adopt a unified technological system for sharing information and services and for offering a rich variety of applications to end users. The Organizer provides the technological solutions to support the project, integrating the Ecosystem into the technological platform of Event services (Expo Service Delivery Platform) and making it accessible to involved parties.

Based on the need to create an open environment that supports and enables cooperation among involved stakeholders, implement a Smart City and enable a Digital Society the objectives of the E015 Digital Ecosystem are:

- to define a mutually accepted technological approach and an interoperable platform that enables and facilitates connections between stakeholders so that Expo Milano 2015 be online with an expanded selection of applications;

- to facilitate and promote the interoperability and integration of the developed services and applications while respecting the autonomy and responsibilities of each involved player;
- to enhance the user-friendliness of the Event, providing support to users of offsite services and increasing their level of satisfaction;
- to extend the services of the Expo Milano 2015 Smart City to companies and local organizations by providing access to the technological architecture and specific Event features (Service Delivery Platform);
- to propose a working approach based on cooperation among different players while respecting the diversity of the business model and commercial strategies of each.

The genesis of E015 Digital Ecosystem lies in the engagement of various parties seeking to ensure that services meet demand and expand the economic and social growth opportunities offered by Expo Milano 2015.

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## **8 Digital Expo**

The idea of the Digital Expo grew out of the opportunity to engage as many visitors as possible from both a physical and a virtual point of view and from everywhere in the world. Indeed, the main goal of the Digital Expo is to contribute to the 20 million on-Site visitors target through an line experience that can inform, attract and fascinate people before the visit, and help them organizing their physical visit to the site.

The Digital Expo is built on several touch points, the WEB portal will be the single point of contact in the internet where cyber visitors (through PC, Mobile and other connected devices) can attend webinar, play events on demand, comments on blogs and virtually visit the Universal Exposition, by means of an interactive and engaging 3D virtual tour.

Moreover the Organizer is envisioning the Digital web portal as the official web site to communicate – jointly with Participants – about the Event, the Theme and all the Exhibition Spaces. This approach will maximize visibility and will ensure a wide spreading of discussions and proposals around the Theme.

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## **Part III**

# Technologies for Communicating Architecture and Urban Spaces

# Meta City: Origins and Implications

David Grahame Shane

The Dutch group MVRDV first used the term “Metacity” in 2000 to describe a city that was formed from information, *meta* meaning about or above in Greek, as in *metadata* or *metaphor* (Shane 2011, Shane and McGrath 2012). The city thus became a statistical entity formed of masses of data, describing relationships amongst its populations, its environments, and its various systems of flows and stasis. MVRDV’s Metacity was a data cube containing information about all the inhabitants on earth, a cube based on the demolished Kowloon Walled City: a three-dimensional slum, The City of Darkness (MVRDV 1998). This heterotopic and chaotic, hyper-dense urban village, used in some action movies before demolition, was a messy and informal, a maze of corridors, stairs, wires and rooms, far from the clean, transparent cube of data envisioned by the Dutch architectural group.

The metacity of information contained three other contemporary urban models. In part the data cube reflects the metropolitan model, the idea that the complexity of the city can be controlled from a single center by a single urban actor as in the dream of earlier imperial regimes with power residing in their original, “mother” city, but at a new global, United Nations scale. In part the metacity incorporates the widely distributed, mega-scale characteristics of Gottmann’s (1961, 1990) auto-dependent megalopolis model that is in crisis as the true costs of petroleum powered growth become clearer in terms of global climate change. The metacity also includes elements of the fragmented metropolis model especially its powerfully interconnected digital realm that created the dense urban fragments and informational clusters to provide resilience and back up for the megalopolis in the crises of the 1970’s and 80’s, leading to the megamalls of the 90’s and early 2000’s (Shane 2011).

Besides supporting giant new nodes and sites, the important point of the metacity refers to the role of information in shaping the perception and use of the city, so that areas that formerly appeared as countryside or peri-urban territories now fall under the urban umbrella (Gleick 2012). Urban form thus becomes at once urban and rural, a conditioned described as “desakota” (village-city) by Terry McGee (1971, 1991, 1995, 1997, 2002, 2007).

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This paper will examine the origins of the metacity in earlier urban models and implications of the city of information for the definition of the city in the future, including the need for new hyper-dense urban nodes.

## 1 Information and Urban Models in the Megacity/Metacity

After the Second World War many governments in the modern world realized the importance both of controlling public propaganda information channels and maintaining secret communication channels for their own use. In the metropolitan model this meant that the largest number of people could assemble in one place at one time to be addressed by the great leader with obvious implications for urban space, as in Mao's remodeling of Tiananmen Square, Beijing in 1956. The new square could hold one million people, twice the number of Stalin's Red Square in Moscow (Judt 2006). East German technicians provided a special electronics dan wei work factory unit 798 (now the Beijing art complex) that could build a public address system for the lampposts in the square (Woorden 2008). The state radio system in China, like many other states including Britain's BBC, would carry the leader's speeches to every living room and kitchen in the metropolis, controlling channels of information and shaping the perception of the city and world.

This "propaganda model" of top down, metropolitan information distribution still exists in many countries of the world (Herman and Chomsky 2002), perpetuating the metropolitan model. In Gottmann's (1961) megalopolis model modern communication systems on the American East Coast from Boston to Washington played a big role in his definition of the urban territory. He detailed the volume of information exchange by counting the number of telephone calls, the flow of telegraph messages and mail volume, as well as the human flow by rail, road and plane along the corridor (Shane 2011). Television broadcasting, with its three main companies controlling three syndicated channels, also formed an important informational innovation in this territory, an innovation that proved to have a political dimension with the election of President Kennedy in 1960.

While the Federal highway programs allowed the wide distribution of the city over a vast territory of the megalopolis and federal loans financed the new single-family homes of the American dream, the Federally licensed and approved TV and radio networks held the urban system together. The big American media companies of the megalopolis, many owned by the same families as the newspapers of the metropolis, fought to get the TV installed in every megalopolitan living room (Geller 1990). Here wives and children would be exposed all day to commercials for goods and services available at nearby malls spaced at regular intervals (Gruen 1964). From the informational and broadcasting point of view the megalopolis had its own geography and morphology of gigantic broadcasting towers and domestic antennas, spaced with regard to topography and market share as on Long Island, New York around Levittown (Bertomen 1991).

Information channels multiplied in the Fragmented Metropolis as various urban actors, previously excluded from the media and made their voices heard to air their grievances (Jacobs 1961). Both the metropolis and megalopolis fell apart during the oil shocks of the 70's and 80's as oil prices rose and inflation took off in industrialized societies, destroying the consensus around social and democratic goals established after the Second World War. Simultaneously the rise of OPEC and the massive flows of petrodollars in the global system established a new network of financial control centers in London, New York and Tokyo (Sassen 1991).

These financial centers required high speed communication systems, initially in micro-wave towers and later by fiber optic cable, to trade 24 hours a day around the world (Graham and Marvin 2001). SOM's design for the Rockefeller's Chase Manhattan tower (1958) provided a key example of the architecture of this new money making machine, with its podium with a roof terrace plaza and modern tower, looking down on the New York Stock Exchange and Federal Reserve Bank (Shane 2011). Later Manhattan's World Financial Center (Cesar Pelli 1986), expanded this architecture to include a mall and tower combination, located in the middle of the Battery Park City residential new town in town urban fragment (Cooper Eckstat 1978).

In the informational metacity each of these urban models with their urban actors, sets of goals and values, even symbolic forms, retains its own consistency and logic within a larger network. Foucault (1967, 1984) described three similar systems of organizing information as separate systems of thought. One system focused on emplacement or place making, one concentrated on displacement or flow, and one system created a hybrid mixture of both of these systems with an emphasis on mixing fast-changing information in shifting sites (Shane 2005, De Caeter and Dehaene 2008).

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## 2

### **Heterotopic Informational Systems in the Metacity**

The metropolis, megalopolis and fragmented metropolis all continue as layered, informational systems in the metacity. Foucault (1967, 1984) proposed that one way to look at a system of thought or information in a society was to look at what was excluded from that system, what was placed in the "space of the other", the heterotopia of the system. Each urban model implies a system of information that for logical consistency requires the exclusion of non-conforming patterns. Foucault proposed that heterotopias in systems of thought were good places to quickly the study the logic of the dominant system that made the exclusions. He also argued that heterotopias were not abstract or invisible spaces, but real places on the ground, in the city or countryside that held non-conforming elements, reflecting the dominant values of the system operators. Urban geographers especially valued this "spatial turn" in the late 1980's (Harvey 1991, Soja 1989).

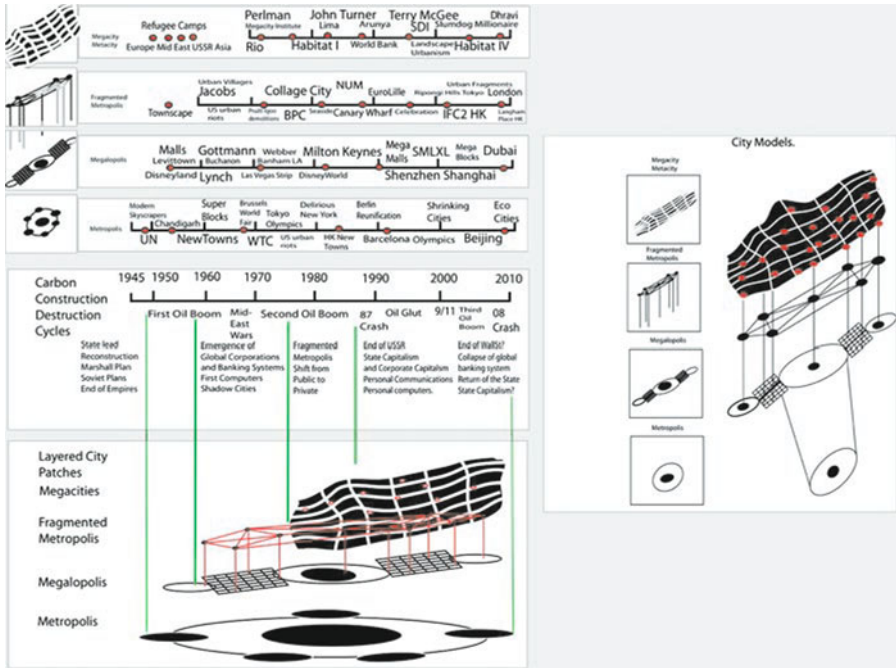


Fig. 1 4 urban models diagram; DGS

One of the advantages of Foucault’s analytical system is that it connects specific urban actors and knowledge systems with specific urban sites or institutions that hold non-conforming people and thus bring into focus key values of the system of thought. In Lynch’s model of the city of faith for instance, a feudal, hierarchical elite of warlords or priests tied many people to the land as slaves or peasants. Here McLuhan (1962, 1964) emphasized how medieval priests used the European cathedral as a heterotopic, mass communication and advertising device, saving souls while enriching the church. In this society Foucault found hidden heterotopias of “crisis”, spaces that people could enter and leave voluntarily while they passed through a temporary, personal change in private. Amongst many examples he highlighted charitable almshouses in the medieval period. Such places were known by word of mouth and hidden in plain sight, using normative urban morphologies as a disguise. The famous almshouses of Leuven, Belgium, for instance, lie trapped within a perimeter block system of row houses (Shane 2005). Foucault saw this non-repressive, voluntary, consensual, word of mouth tradition continued in modern society in the boarding school, honeymoon house and modern motel.

Foucault also closely examined a second, modern heterotopic informational system, the heterotopia of “deviance”, symbolized by Jeremy Bentham’s Panopticon prison design from the 1780’s that held those rejected by the modern system of thought. In this design people who could not conform to the new industrial norms of the modern world were taught to be modern subjects who internalized the voice

of the jailer who was hidden in the darkened tower at the center of the ring of cells. The design involved extreme measures to isolate each prisoner and restrict communication during retraining (Evans 1982). Silent prisoners, for instance wore leather facemasks in exercise yards so that they would not recognize each other outside in the city. Walls were thick to prevent communication. The jailer had a voice tube to each cell to issue instructions. Foucault emphasized how modern scientific knowledge was applied in the precise micro-codes that regulated the design and behavior of prisoners and jailers alike. For Foucault, writing from France, the state controlled and fixed the rules of discipline and punishment that defined communication in this modern city space.

Foucault's third category of heterotopias of "illusion" involved imagining a new system of thought and information at the beginning of the cybernetic age in 1967. This new system combined hybrid mixture of crisis and deviance, with an emphasis on mixing fast-changing information in shifting sites (Shane 2005). Foucault listed a strange laundry list of such new informational sites, worlds fairs, national exhibitions, department stores, museums, galleries, cinemas, theaters, carnivals, casinos, stockmarkets, markets, old style bordellos and brothels. Some of these heterotopias of illusion contained multiple, conflicting real places, like the world's fair, others contained multiple, conflicting timescapes, like the period rooms of a traditional museum.

The theater had the capacity to shift actors in time and space through performance and scenography. The cinema through jump cuts, flash backs and montage was even more effective and faster in shifting actors in time and space. Foucault like Marx saw the stock market as the ultimate fast shifting heterotopia of illusion, where information about the price of a commodity could vary by the second depending on the dealers perception of a shifting reality, while the commodity itself, gold bar or coffee in a warehouse, remained unchanged.

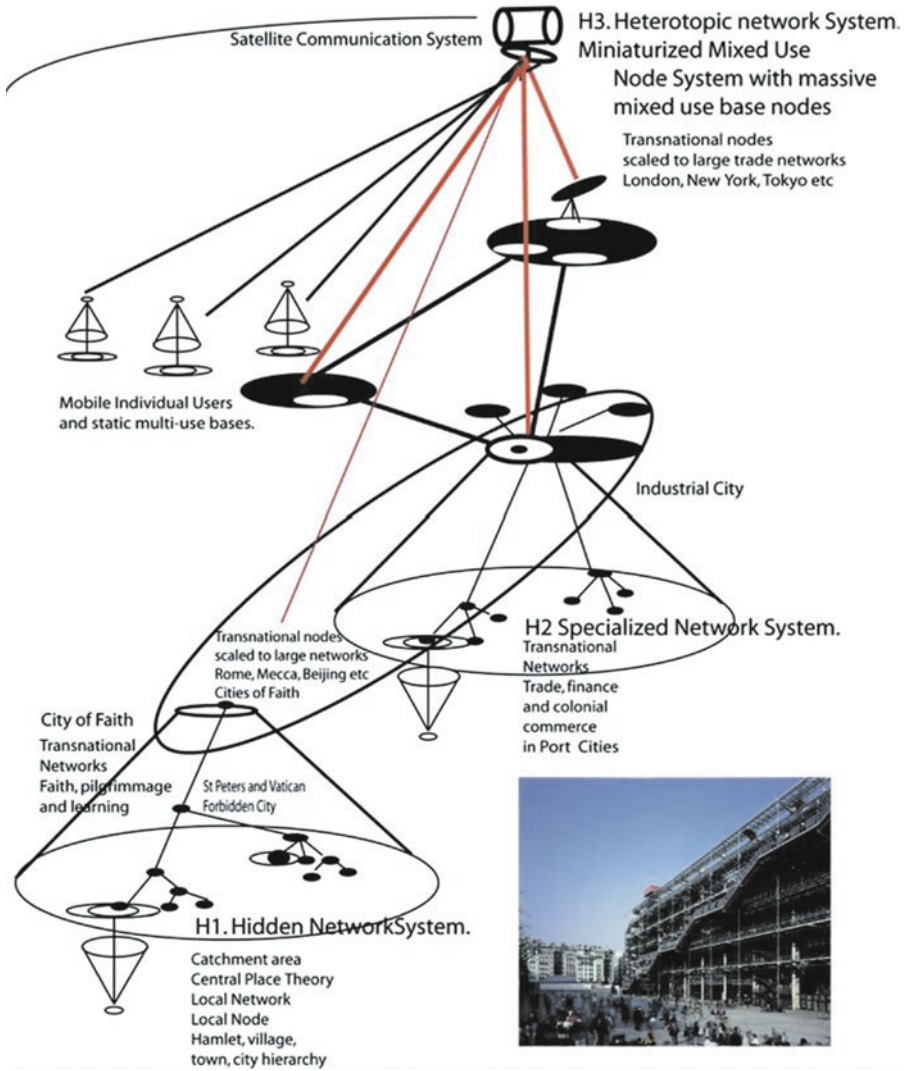
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### 3

#### **Heterotopic Structures of the Metacity: Las Vegas, Disney and Epcot 1981**

The world's fair provided an official version of such a heterotopic space, the fun fair or carnival a popular version, while the stockmarket provided the basic model for Foucault (1967). He never foresaw the growth of the global market function in the neo-liberal age, as finance, insurance and real estate (FIRE) came to dominate the design of cities and transforming social democratic norms established under the state dominated heterotopias of deviance. Trading information in fast changing and global networks replaced knowledge and knowledge creation as a source of power, status and wealth. In this system of fast changing heterotopias of illusion privately owned gambling casinos and theme parks provide a key insight into the understanding the transformation to the city as information.

### Urban Ecologies; Heterotopic Network Systems.



**Fig. 2** Heterotopic Systems; DGS

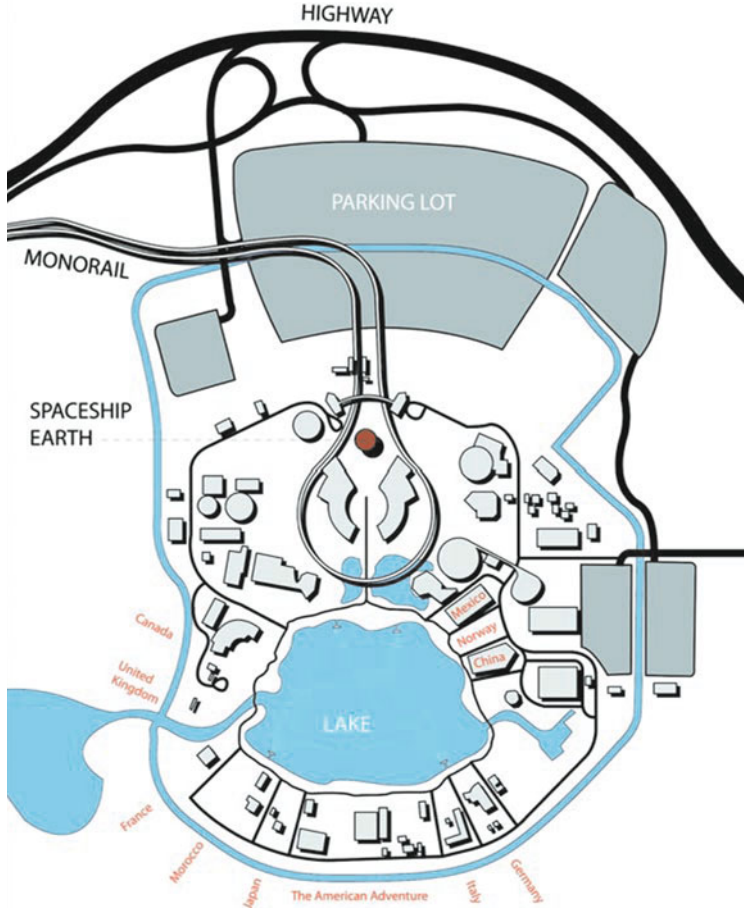
In Las Vegas normal codes are reversed, visitors spend wages earned elsewhere in architecturally themed interior fantasy environments. Gambling, prostitution and the distribution of free alcohol are profitable and legal occupations. The Venturi, Scott-Brown and Isenour team (1972) studied Las Vegas as a Pop icon outside the puritanical aesthetics of the modernist masters like Le Corbusier. Their analysis emphasized the mobility and speed of the observer in a car. They argued that designers

needed to scale signs and symbols at a megascale to be legible at speed and thus buildings became relatively unimportant sheds (unless an iconically shaped, symbolic “Duck” building). Speed and information drove signage and architectural design. At a smaller scale their analysis included the commercial strip outside every American town, the Miracle Mile of new 1950’s shops and car parks, as well as the new invention of the shopping mall (Gruen 1964)

The Venturi, Scott-Brown and Isenour team missed the key ingredient of media in Las Vegas’ success. It is easier to see the media’s influence in the early 1950’s when ABC, one of the three national TV and radio networks, partially financed the construction of Disneyworld in exchange for the exclusive rights to Disney’s cartoons (Marling 1998). The network ran the cartoons on Saturday morning to entertain children while their parents did domestic chores, resulting in massive advertising revenues. Disneyland also attracted 12 million people in its first year of operation, as people sought psychological solace in dreams of Victorian small town high streets, community and fantasy lands, while moving to the modern suburbs of single-family homes and malls (Shane 2005).

Walt Disney’s Experimental Prototype Community of Tomorrow (EPCOT 1982) in his Florida mega-theme park development demonstrated his understanding of the enclave logic of the new global urban space-making system, based on urban fragments and associated villages in global networks. Visitors to EPCOT entered past corporate pavilions that emphasized the connective power of corporate America in the global system with General Motors providing transport, AT&T providing communication systems, and Kodak storing our memories. After this entry, visitors confronted a lake, symbolizing the ocean, surrounded by a selection of old empires, like China, Britain, France, Italy, or Japan, all accessible by ferry. Each nation became a village street stage set with a vertical marker element, the Eiffel Tower for France, Big Ben for Britain, and so forth. Disney designers reversed the spatial relationship between the Saint Mark’s Campanile and the Doge’s Palace, for instance, to show that the new space was a simulacra, a transformed memory of the old city.

The redesign of Las Vegas in the 1990’s reflects the success of the Disney Company theme parks in becoming a global brand. Casino owners replaced their 1960’s parking lots with themed urban environments and redesigned the Strip as a retro-pedestrian environment, in the age of GPS, SatNav and nostalgia for past urban environments, becoming global brands. \$1.8 billion Las Vegas Venetian Casino (1999), for instance, has a Piazza San Marco forecourt with canals leading through a slot machine interior piazza up to a second floor replica of the Grand Canal, with singing gondoliers, below the housing tower with a village of villas on the rooftop (Shane 2011, 2012). The Macao Venetian casino (2007) repeated this same pattern of urban simulacra on an even grander mega-scale. Casino designers, like Disney, sought to establish their brand of heterotopias of illusion in the national informational system using urban theme park imagery as an attractor, first as part of the American suburban dream, then as part of a global network in the highly mediated metacity that extended its reach across Europe, Asia, even Russia.



**Fig. 3** Epcot Diagram; DGS and Uri Wegman

#### 4

### **Metacity: Communications and Urban Form in the Megacity**

Disney's EPCOT (1981) diagram placed the communications industry at the gateway of the new world, coupled to energy supplies from power companies and mobility from the auto industry, with a photographic company as the memory system holding images. This structural model still holds true, with modifications to adapt it to the Twenty First century.

Koolhaas's CCTV building in Beijing stands as a monumental reminder of the power of the state based metropolis in the informational city, with 5,000 employees distributing programming to one sixth of the world's population. This complex,

three dimensional, communications mega-node stands in stark contrast to the empty public spaces of the old metropolis that now serve primarily as tourist attractions, like Tiananmen Square. Meanwhile China's telecom industry serves over a billion customers with a 80% market penetration. At the Beijing Olympics in 2008 this top-down state machinery broadcast to an estimated 4.7 billion people, almost 2/3rd of the world's population (Barboza 2008).

The CCTV stands as a heterotopic monument to the city as information and as in Disney's model, implies that all previous systems can be held within this system as at EPCOT. Older cities become statistics and images to mined and manipulated as informational structures. As Disney envisioned the old imperial systems of the world and their metropolitan centers have been reduced to informational systems and images within the new global system. Tourists in their hotels, the wealthy in their condominiums and corporate offices mostly now inhabit the centers of the metropolis. All process the city as information, while global brands use the image of the city for marketing purposes. In Beijing the authorities have transformed the Qianmen approach street to Tiananmen Square into an urban simulacra of old Beijing, complete with old streetcar, as a successful, open air Festival Mall, a richly endowed metablock of information with many mobile aps and websites tied to its global and national stores (Bernstein 2009).

In the city as information such metablocks need not take the form of traditional cities as long as the network of electrical services for power and cell towers or cables for communications transmission penetrate their built fabric. The UN predicts that two thirds of the future urban growth of cities will be self-built housing like the favelas of South America, while David Satterthwaite (2005, 2007) points out that 92% of this gigantic urban expansion will be in cities of 1–2 million (not megacities), cities whose form is unrecognizable from the traditional European perspective (Perlman 1976, Neuwirth 2005). Terry McGee (1971) identified a far older Asian morphology that included rice paddies, fish farms and urban agriculture based on the communal management of water systems in ancient river valley and delta cultures, a widely distributed pattern of agriculture in the city that can be traced back beyond Angkor Watt in Asian history. This city territory has gained a new urban dimension with hand held communication devices and personal mobility, either by public transportation or by bike, scooters or motorbikes. The modern statistical definition of the Asian city often includes wide areas of agriculture belts, in Japan or China for instance, or even in Central Bangkok, where land ownership is still vested in the monarchy (Hebbert 1995, Moench and Gyawali 2008).

The kilometer square grid of central Bangkok, originally a new town area outside the sixteenth century island core, now contains ancient monastic temples and their fish ponds, with attendant workers housing along traditional Soi lanes, stretching back to an ancient canal that both irrigated the ponds and carried their produce to market. These long lanes surround the temple and have their own motor bike taxi services to carry inhabitants to the main avenue. Factories and their associated worker housing also follow the Soi format, forming another morphological patch within the kilometer square megablock. On the opposite side from the canal, Bangkok's Miracle Mile of the megalopolis formed during the Vietnam War with the busses and the

subway connecting the main Rama I boulevard with the surrounding suburbs. Here shopping malls and department stores proliferated, forming another distinctive morphological patch that turned from the interior to the exterior with the construction of the above ground Sky train. Political parties quickly learnt to make their demonstrations more effective by shifting their demonstrations from the traditional central square to disrupt shopping on Rama 1, also occupying the airport mall (McGrath 2007, 2012).

The Asian megablock with its widely distributed urbanism now overlaid with the metacity informational system can be found throughout the world, especially in river and delta locations where the management of irrigation in earlier agricultural system demanded communal cooperation and collective negotiations. The spacing of agricultural villages and communal facilities like temples varied with the carrying capacity of the land, setting up a basic territorial morphology that became overlaid in the Po Valley, for instance, by Roman colonial grid encampments, railway networks and small metropolitan centers, followed by small industries connected to the global economy by highways to the airport. The block size varied in discrete patches from the village scale, to the industrial modern block to the modern factory all within the framework of the Roman megablock overlaying the villages and irrigation system. All these systems now operate as layers of information in the metacity, with modern pumps and computers controlling irrigation systems, prices of products, both agricultural and industrial traded on line, traffic conditions and flows monitored by SatNav systems and railway companies on line, with agritourism and village images advertising the pleasures of the rural Po Valley and its Palladian villas globally. Everything appears to be open and free in this utopian territory of fun and leisure, where no one need ever get lost (Mitchell 1996, 2000).

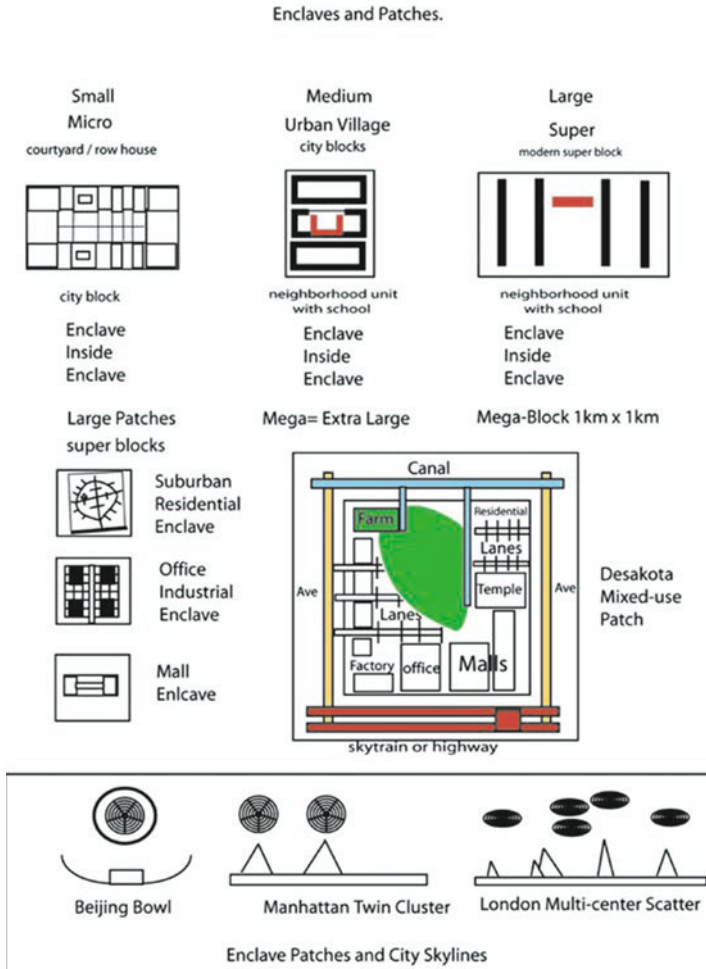
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## 5

### **Conclusion: The Limits of the Metacity Concept**

Modern global communications and hand held personal communication devices have greatly facilitated the proliferation of heterotopias of illusion in the post-modern society of the metacity. Fast changing information played a large role in Foucault's theory of the construction of sites and his theory of heterotopias of illusion. Foucault understood that the key to mobile and temporary site construction was the number and shifting sets of relationships that connected at a point inside the network, creating a temporary node from a set of relationships. Where the Panopticon had rigid disciplinary codes enforcing a set code against deviance, the codes of the heterotopia of illusion were fast changing, hybrid and flexible, giving the illusion of freedom. Multiple voices and actors controlled their spaces and were free to interact within the heterotopic space.

As Foucault stressed there are distinct limits to the freedom allowed in the post-modern heterotopias of illusion that provide only an illusion of freedom. The whistleblowers of Wikileaks, like Private Manning and Edward Snowden, amplified by



**Fig. 4** Block Scale And Metablock; DGS

newspapers like the NYTimes and London Guardian, have revealed the massive scale of US and Allied government spying on their citizens activities, including planting paid political agitators as spies inside grass root groups like Occupy Wall Street (2008) and various world wide resistance organizations. The Boston Marathon terrorist bombing (2012) demonstrated the impossibility of processing the massive data collected, and the subsequent armed manhunt of the suspects centered on cctv, TV, and tracking the location of a stolen cell phone after a shoot out in the street. The surviving, wounded suspect was ultimately located by a home owner noticing blood leaking out from under a boat cover in his back yard in the locked down working class neighborhood of Watertown (Mendick 2013).

While the metacity and its informational structures facilitates the appearance of freedom in the megacity and megablock, it too has its rules and structures that were so well delineated by Disney's EPCOT almost 50 years ago. The widely distributed city territory including agricultural belts forms the basic format of the megablock in the metacity and megacity alike. Within this larger network and framework a great diversity of fragmentary systems of exist as urban actors sponsor a dynamic ecology of urban patches within a local, regional and global economy. Here Foucault's heterotopia of illusion triumphs as the actors shift and change their priorities quickly in the shifting networks of the territory. With the collapse of the old neo-liberal financial system of public-private partnerships in the market crash of 2008, new patterns of association and finance using the internet and collective communities on the internet might now emerge from the chaos of lost home ownership and empty new towns. The metacity remains a work in process and the impact of the city as information has still to be investigated more fully.

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# Experiential Data for Urban Planning

Federico Casalegno, Amar Boghani and Catherine Winfield

Ubiquitous and context-aware mobile devices, by enabling location-based services and media platforms, are increasingly influencing the ways in which we interact with urban space. These technologies are not only functional but also expressive in nature: they mediate unique types of engagement with the urban environment through new interactive interfaces and representational forms. The adoption of such technologies in cities reflects the evolution of cities themselves, from simple forms to highly complex organisms. Cities, which that began in ancient times as were perhaps little more than skeleton and skin, providing walls, floors, and roofs for shelter and protection, have transformed over time. They went from relying primarily on the intelligence of their inhabitants to operate, to depending on highly mechanized infrastructures with the introduction of engines, pumps, mechanically powered vehicles, heating and ventilation systems, plumbing, fuel and electrical systems, and so on. Cities continued their evolution through the dawn of what might be called the city's "electronic nervous system," with the development of telegraph, telephone, and radio communications systems and eventually the "artificial nerves" that are created by electronic control systems.

Today, the city itself is a living organism, with ubiquitous digital networks supplanting the older analog networks, forming a new kind of urban infrastructure. Distributed systems of networked computers and servers, along with various types of digital sensors, have become part of the "brains of cities." The connections between place and network, between network, participation, and location, are growing increasingly stronger. These connections have already reached mass effect, even through simple services such as Foursquare and Google Maps.

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Yet, as important as ubiquitous information and communication technologies are to today's smart city are the information and communication technologies that are ubiquitous, the intelligence of the human inhabitants is no less important. In fact, it is at the intersection of human human intelligence, expressivity, and emerging technologies that and these emerging technologies that we find the most compelling opportunities for a strong urban future.

Into this mix of technological advances comes the modern mobile device. As physicist Michio Kaku has noted, "Today, your cell phone has more computer power than all of NASA back in 1969 when it sent two astronauts to the moon" (Kaku 2011). The modern mobile devices features a high-quality cameras and microphones, and are is notable not only for their it's information communication ability but also for their media production and data capabilities. As a result, they it enables complex media ecosystems, layered on top of the city, that are centered on the production and consumption of digital media content.

It is important to note that ubiquitous mobile devices promote the dissemination of narratives. Location-based media platforms ultimately serve as a conduit for people to narrate their own experiences, as well as experience the narratives of others within urban spaces. Through these platforms, people in the urban landscape can be encouraged to engage in new forms of storytelling by capturing and relaying personal experiences through digital media created on mobile devices. This behavior, in turn, builds human connections. Location-based media platforms have the potential to change the relationship between society and the built environment, making explicit the connection between story and space. Geo-tagged stories become explicitly tied to place, and new acts of narration can happen in conversation with stories that have already become embedded. The stories of people in urban spaces – whether they are residents, visitors, or people who come into the city just to work – are important to the image of the urban environment and how it is perceived, expressed, and experienced.

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## 1

### 'Small' Experiential Data

This approach also stands in contrast to Big Data, increasingly employed today in the urban environment. With massive amounts of data, a city's infrastructure can be deconstructed and reconstructed. Big Data can be key, for instance, to figuring out how best to improve traffic flow in an urban ecosystem, or even predict health conditions and prevent disease. But unlike location-based media platforms, Big Data's starting point is computation. When Big Data is used to improve traffic flow, it is about cars as computational units, not about how people interact with the city as anything more than occupants of a vehicle.

How can we understand, for example, why a given bus stop may be in a place that is dangerous for boarding and disembarking passengers, who risk being hit by automobiles whose drivers have limited visibility? Or, how can we map a broken pedestrian bridge? The best approach is to engage the city's inhabitants by collecting information from them that is personally annotated. That annotation is the key. We need a way to merge quantitative data with qualitative data in the form of personal

annotation that enriches the quantitative data, and then intelligently compute the combination.

One such approach is offered by the media platform known as Open Locast, a Web and mobile framework developed to enable the prototyping and deployment of location-based media platforms. Locast was born out of a desire by the Mobile Experience Lab at the Massachusetts Institute of Technology to understand better how evolving media technologies could be used to improve connections between people and their social, cultural, and physical spaces. Open Locast is a collection of software packages and applications developed to help achieve that goal by enabling the rapid prototyping and quick deployment of location-based media platforms. It is an open-source framework with two primary components – a Web application and an Android application – that work in unison to provide a platform that can be tailored to fit various user experiences. Through the Locast platform, users can share hyper-local and highly connected experiences. Locast superimposes layers of collectively generated information within the physical space. Within Locast, the interconnection between content, spaces and people is simultaneous and ubiquitous.

Locast links quantitative data and human expression in the form of rich media. Where Big Data may be able to provide cumulative data about a bus system, a citizen using a location-based media platform can document both the benefits of and problems with a particular bus stop within that system, and do so through a personal narrative. That citizen provides information in the form of a single qualitative data point, that is, a piece of media content created with a purpose.

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## **2 Mapping as Citizen Engagement**

To illustrate how Open Locast works and how the tool helps meet the objectives outlined above, consider some very different examples of its implementation, all serving very different specific purposes but all firmly rooted in the notion of bringing people closer together and strengthening their human connections in the context of physical spaces. The first is by the United Nations Children’s Fund (UNICEF). UNICEF’s Youth-Led Digital Mapping project in the favelas (slums) of Rio de Janeiro, Brazil, called “Visualizing Risk and Resilience.”

UNICEF’s use of the Locast technology is called the UNICEF-Geographic Information System (GIS). This technology allows UNICEF Country Offices and their partners to gather critical community data and generation location-specific reports with mobile phones. In Rio de Janeiro, UNICEF has verified “youth mappers” selected by local organizations to learn about specific community issues and then trained to produce geo-tagged reports. The reports are uploaded to a safe and secure website to detail the exact location of what UNICEF calls “community hot spots.” These may be services, social spaces, risks, and/or hazards. The geo-referenced reports are used to spur actionable community change.

Specifically, Rio youth using UNICEF-GIS map their neighborhoods, identify where governmental and non-governmental services exist or may be missing, address issues of accessibility for young people to these services, and point specifically to places where young people face particular risks or hazards about which action could be taken. The most prevalent mapped points are locations that pose some kind of physical harm to children, from buildings or roads near collapse to open sewage to downed power lines and other hazards.

The UNICEF project has engaged youth in five different Rio de Janeiro favelas with a total of some 240,000 inhabitants. In just the first few weeks after the launch of UNICEF-GIS, there had already thousands reports ranging from walking hazards and garbage accumulation to problems with sewage and power lines and risks of collapsing infrastructure. In one report, a Rio teenager participating in the project alerted UNICEF of a dangerous pedestrian bridge that had severely deteriorated with use over time and had missing and broken wooden planks. UNICEF, in turn, contacted the municipality and brokered the repair of the bridge for the community.

Another report produced a photograph of a severely strained retaining wall being used to hold an inevitable hillside collapse that would likely send rocks and debris raining down on nearby residents. Again, the teenage citizen's engagement with the project led the municipality to install a new, safe retainer, and where nothing grew before today greenery is emerging.

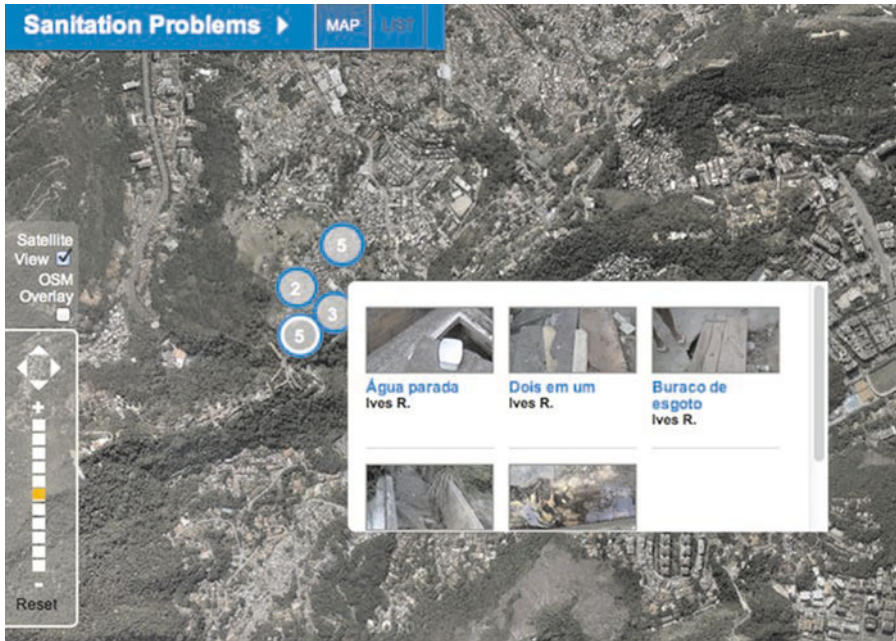
On the accessibility front, UNICEF uses its Locast tool as a way to reach citizens who may benefit but who do not have access to a computer or the Internet. As part of the mapping process, the young people using the tool help identify public social spaces where the community comes together and to which UNICEF can bring the information gathered by the mappers for face-to-face dissemination. The coming together of the community, though, is not limited to informational sessions. In one favela, the report of some unsafe conditions involving a stairway down a hill led not only to repairs but also to a citizen beautification effort, and a rebuilt wall was decorated by the community with colorful art and the slogan (in Portuguese): "Preserve what is ours." The use of the Locast tool had spurred the community to take responsibility for clean up and, in doing so, reinforced social ties among the inhabitants of the favela.

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### 3

#### **Mapping Cities Through Workplaces and Culture**

The second Locast example involves the MIT International Science and Technology Initiatives (MISTI), a program that matches more than 500 MIT students with internships and research abroad each year. Locast MISTI uses the Locast tool to enhance the student experience by capturing information, through video on a mobile device, about the internship.



**Fig. 1** Interface of UNICEF Youth-Led Digital Mapping

Locast MISTI information is mapped to specific locations where the internships take place, and is divided into three broad categories. Information in the Workplace category answers the questions: What is your workplace like? Culturally, how does it differ from places you’ve worked at in the United States? For the Research category, the questions are: What have you been working on? Any interesting discoveries? Finally, in the Community Category, the question is: What is going on in your community?

Through the Locast tool, MISTI participants support the transmission of knowledge and experience across countries and across time. A student at MIT considering a MISTI internship can view pictures and videos of students working at locations around the world, read about their experiences, learn about the cities to which they have traveled, and find out everything from good neighborhoods in which to look for housing to great places to eat to interesting cultural sites to see.

For the Boston-area Massachusetts Bay Transportation Authority (MBTA), Locast has been implemented to support a design-driven classroom project to “reinvent” the subway/bus system. The idea behind this implementation was to use the tool to understand the experience of riding MBTA buses and subways, and use the information gathered through Locast for ethnographic studies. Students fanned out in the system and took pictures of everything they could that shows how the system is used, from riders using vending machines to load their access cards to how people sit and stand in crowded and emptier trains to how people engage with the physical space of stations.



**Fig. 2** Content created by students about the MBTA

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## 4 Mapping Communal Memory

The final example is Memory Traces, an interactive collection of stories from the Boston Italian community. The project is a collaboration between the MIT Mobile Experience Lab and the Italian Consulate of Boston. Memory Traces uses Locast to gather memories going back as far as the beginning of the twentieth century from residents of Boston's North End, which has been the center of the city's Italian community ever since the first immigrants arrived. The memories are divided into numerous categories – education, family, food, language, sports, working, and several others – that are then accessible on a map of the Greater Boston area.

For example, Emilio Bizzi, a neuroscientist and Institute Professor at MIT, tells the story of his emigration from Italy to Massachusetts. His memories expressed in his story unfold in videos that link his experience to the specific community, both the physical space as well as the space that is held in common by Italians in the area and that can be shared with visitors, other residents, and anyone who visits the Memory Traces website. He talks about his earlier life in Italy and the shift to the Boston area, as well as describes his favorite places in Boston. These are linked on the Memory Traces map.

The memories are also presented chronologically on the website to enable users to trace the history through time. For example, pharmacist Giuseppe Giangregorio's memories unfold beginning in 1954 and take the viewer through the early years of his presence in Boston.

The content on the Memory Traces map can be navigated in for different way. Users can listen to the entire interviewee's history in a linear way, discover memories from immigrants in categories of content (e.g., food, travel, culture, work, etc.), select a particular historical period, or explore memories geographically, since the media are "located" on the map by where the interviewee refers in the narration. These various methods of navigation correspond to our effort to embed human memories within the realm of the city writ large, and to overlap the built environment with digital content. A mobile application allows users to access this content on the spot, so they can interact with the content in the city's specific context (location).

As the Memory Traces project shows, a smart city is more than a city powered by Big Data and computation of those data. A smart city is a city enriched by the memories of those who made it, those who use it, and those who live in it. It is a city in which communal memory is built and can be accessed and nourished in a continuous process. As the French philosopher and sociologist Maurice Halbwachs wrote in developing his concept of collective memory, "It is not enough to rebuild piece after piece the image of a fact in order to obtain a memory. It is necessary that this reconstruction is based upon data or common notions that are to be found both in our spirit and in that of the others, as these memories are continuously passed on from one to the other and vice-versa ..." (Halbwachs 1950).

Narration is key to this process. As a place becomes a city, it is impossible for all of its builders, inhabitants, visitors, over generations, to share every experience of

taking part in the creation of communal memory. The narration – both its creation and its dissemination – facilitated by Locast replaces those shared experiences and, by overlapping the narration as digital information with the physical reality of the city, the city can become an even smarter city.

\* \* \*

Some urban maps address only physical infrastructure: streets, buildings, transportation systems, and so on. But modern mobile computing allows us to expand the notion of urban mapping to encompass the connections between that physical infrastructure and the people who use it and live within it, and to go even further to take even greater advantage of the possibilities afforded by collecting data. We can create a stronger, smarter city with stronger, smarter communities built upon stronger, smarter connections between and among people because their urban maps are a reflection of the full city, not just the physical city.

Locast is a new technology that allows for new forms of storytelling to create the narration that is foundational to creating that kind of urban map. And beyond, it allows the map to exist in concert with the physical city and its people in real time and in real location. The building, the street, and its inhabitants and users, today and in the past, can all “speak” together to convey the map.

And yet more: the kind of urban mapping we have described uses an innovative technology to reinforce the flow of information from the bottom up, from the communities themselves to the institutions meant to serve those communities (as the UNICEF-GIS example shows so clearly). At the same time, it reinforces horizontal communication among community members, promoting a group conversation with positive social impact as citizens become empowered and see that their “point of view” matters and make a difference.

Big Data may capture what people in the city do, but it can never replace the power of individual memories combined through narration, and then conveyed using cutting-edge digital technologies to ensure access and participation by all.

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## **Part IV**

Modelling Tool Software,  
Processing Language and Environment  
Methodology, Urban Simulation and  
Projects Evaluation

# A New Map of the Milan Urban Region Through Mobile Phone Data

Paola Pucci, Fabio Manfredini and Paolo Tagliolato

Interpretative tools for identifying mobility practices in the contemporary cities are needed, not only for the limitations of conventional data sources<sup>1</sup>, but also because new forms of mobility are emerging, describing new city dynamics and time-variations in the use of urban spaces by temporary populations.

These mobility practices result from the combination of physical and virtual mobility, leading to new, mixed forms of daily, residential, and travel mobility (Flamm & Kaufmann 2006).

The transformations to practices of mobility question the available sources and open up toward operative challenges: the analysis of the space-time variability of mobility practices, while offering a representation of various urban rhythms<sup>2</sup> and identifying different mobile populations, remains difficult to achieve with traditional data sources. In this perspective, an interesting contribution may be provided by mobile phone network data as a tool for real-time monitoring of urban dynamics and mobile practices. In recent years, several research projects focused on the potentiality of mobile phone traffic data as promising sources for the analysis, visualization and interpretation of people's presence and movements in urban spaces. The contribution that may come from mobile phone network data for the analysis and description of urban practices, seems of great interest, due to its fine spatial and temporal resolution.

As tested in several studies (Ratti et al. 2006; Ahas & Mark 2005; Soto & Frias-Martínez 2011a,b; Reades et al. 2007; Gonzalez et al. 2008), passive monitoring of anonymous telephone traffic represents a valuable alternative to traditional methods,

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<sup>1</sup> i.e. high cost of surveys, the difficulty of data updating.

<sup>2</sup> According to Amin and Thrift (2002) the rhythms of the city are “the coordinates through which inhabitants and visitors frame and order the urban experience” (Amin & Thrift 2002, p. 17).

because it can simultaneously overcome the limitations of the detection latency time typical of traditional data sources and take advantage of the ubiquity of mobile phone networks and the pervasive diffusion of mobile devices.<sup>3</sup>

Among different survey methodologies<sup>4</sup>, the researches that focused on the analysis of aggregated mobile phone data are characterized by two different profiles and purposes: mapping mobile phone activity in urban contexts (Ratti et al. 2006; Sevtsuk & Ratti, 2010), and visualizing *urban metabolism* (Wolman, 1965; Acebillo & Martinelli, 2012; Brunner, 2007).

The first approach, named Mobile landscape approach, focuses on the relationships between mobile phone measures and people's daily activities in cities (Ratti et al., 2006; Sevtsuk & Ratti, 2010). The aim is to understand patterns of daily life in the city, using a variety of sensing systems (mobile phone traffic intensity, location-based data as GPS devices, wireless sensor network) and to illustrate and to confirm the significant differences in the distribution of urban activities at different hours, days and weeks. Graphic representations of the intensity of urban activities and their evolution through space and time, based on the geographical mapping of mobile phone usage at different times of the day (Ratti et al., 2006), are the main output of the Mobile Landscape approach.

The approach based on handsets' movements studies the relationships between location coordinates of mobile phones and the social identification of the people carrying them (as Social Positioning Method and its possible applications in the organization and planning of public life proposed by Rein Ahas and Ülar Mark, 2005).

In this framework an interesting issue regards the classification of urban spaces according to their users' practices and behaviors in the use of cell phones (Soto & Frías-Martínez, 2011a).

According to Soto and Frías-Martínez (2011a, 2011b) city areas are generally not characterized by just one specific use, and for this reason they introduce the use of c-means, a fuzzy unsupervised clustering technique for land use classification, which returns for each area a certain grade of membership to each class.

Even if, from a technical point of view, both the aforementioned approaches are based on the analysis of aggregated data and traffic volume detected on towers of the network, the loss of the traces of the origins and destinations of individual movements does not appear relevant for estimate the distribution patterns of the population in different time slots considered for the survey.

Using mobile phone data for monitoring urban practices, both approaches show that phone calls are closely related to population density in urban areas (Ratti et al. 2006; Sevtsuk & Ratti, 2010; Ahas & Mark, 2005; Reades et al., 2007), even if additional evidence is needed to specify how mobile network signals can be used to characterize and map different urban domains and their occupants and how this tool could support urban planning and policy.

According to this background, our research focused on mapping and visualizing the *changing city* by means of these new sources, characterized by a high temporal and spatial resolution.

<sup>3</sup> Three main types of survey methodology are: Individual traces detected with tracking technologies (such as GPS); Anonymized Individual trajectories collected by mobile phone carriers; Georeferenced and aggregated cell phone activity data.

<sup>4</sup> Among the methods proposed in literature, we mention the social positioning method (SPM) of Positium LBS (Ahas & Mark 2005; Ahas et al. 2010) based on active and passive positioning systems, and mobile census (MIT Senseable City Lab) which is instead a totally passive tracking system.

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## 1 Milan Urban Dynamics Through Mobile Phone Data

Starting from the results of a research carried out in the Northern Italian Region of Lombardy, using mobile phone data provided by Telecom Italia (Manfredini, Pucci & Tagliolato 2012), we intend to explore how new maps, based on unconventional data sources and better tailored to the dynamic processes in place, can represent spatialized urban practices and how they can give new insights for improving the effectiveness of urban policies.

In order to analyze the complex temporal and spatial patterns emerging from mobile phone data we used two different types of data.

The first data type concerns mobile phone traffic registered by the network over the whole Lombardy region. Data are expressed in Erlang, namely the average number of concurrent contacts in a time unit: they are spatially distributed over a grid with squared cells of 250 meters and they are recorded every 15 minutes. We performed time series analysis on this data along a period of 14 days in September 2009, in order to evaluate specific characteristics of population behaviors at an hourly and daily base. We then applied a novel geo-statistical unsupervised learning technique aimed at identifying useful information on hidden patterns of mobile phone use. These hidden patterns regard different usages of the city, in time and in space and they are related to the mobility of individuals (Manfredini et al. 2012).

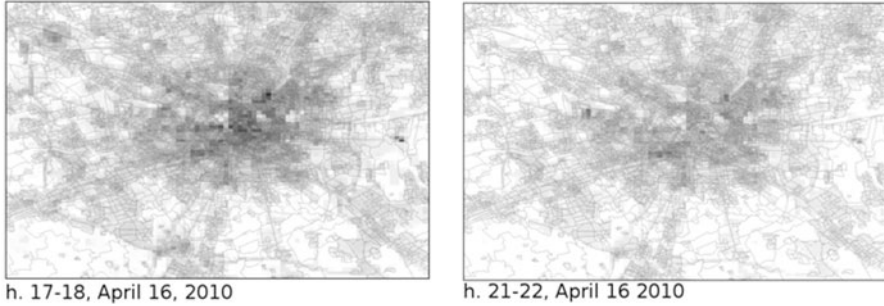
The second typology of data consists in origin-destination matrices derived from localized and aggregated tracks of anonymized mobile phone users. The data set was collected in different working days (five Wednesday in July, August, September, October and November 2012). In this case the available information was based on the geolocation of users' mobile phone activity in time and in space. With mobile phone activity we intend each interaction of the device with the mobile phone network (i.e. calls received or made, SMSs sent or received, etc.). This information was available at the level of the antenna which handled the activity. From this capillar information (which is not directly accessible for privacy policy constraints) the extracted data, consisted in hourly time series of origin-destination matrices, returning the number of users flowed at each hour of a day from an origin to a destination zone. The zones of origin and destination were determined as tiles of a tessellation, defined for this study according to the density of antennas<sup>5</sup>, consisting of 526 zones in Lombardy region.

Concerning Erlang data, even though they have some major limitations<sup>6</sup> allowed us to perform interesting elaborations on the intensity of use of the city in a time-

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<sup>5</sup> The spatial distribution of antennas depends on the amounts of mobile phone traffic that needs to be managed. In dense urban areas we therefore observe a high density of antennas while in the suburbs the density of antenna may be very low.

<sup>6</sup> It is not possible to establish a "direct" link between phone calls density (Erlang data) and the number of people. To begin with, the use of the mobile phone depends on age, sex, profession, time, activities and it is difficult to take into account the possible cross effects. This is particularly important if we want to use mobile phone data for urban investigations aimed at planning the provision of personal services, for which statistical data are needed.



**Fig. 1** Cell phone traffic during the International Design Week. Increasing intensity of grey colour corresponds to higher mobile phone activity

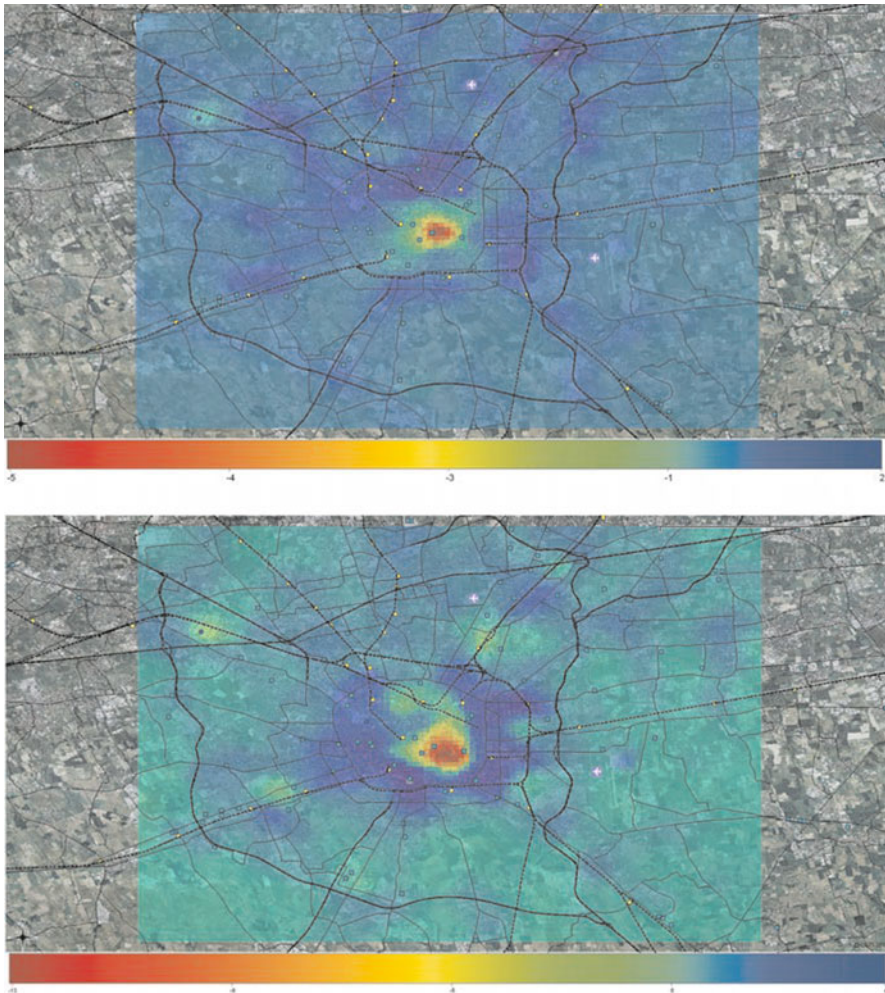
dependent perspective. This data has been exploited in order to describe the variability in the use of urban spaces, and also to quantify the effects of a temporary event (International Design Week), that modified even substantially the way and the time in which some Milan urban districts – not limited to traditional exhibition spaces – were used by tourists, city users and temporary populations. This information, not identified by traditional sources, could be useful to manage the event, to evaluate its impacts on territorial (mobility, congestion, tourism and temporary population attractiveness) and economic system (allied activities, tourism) on the whole Milan urban region.

Furthermore, a statistical processing (spatial clustering) of the Erlang data, highlighted recursive trends over the considered period (Pucci et al. 2013) concerning diurnal versus nighttime activity patterns, working day versus week end patterns. In this way, taking into account also the main equipment and the real urban structure (infrastructures, main shopping centers, railway and underground stations, trade centers) it was possible to understand how the spatial distribution of mobile phone traffic could be significant for explaining specific mobility and city usages patterns.

The city usages patterns, described by maps, highlight some urban districts characterized by specific telephonic patterns that are compatible with the real urban structure of the region, but also they return new time-varying maps of the Milan Urban Region that allow to place in space some different communities of practice (Wenger 1998) that generate particular spatial-temporal geographies<sup>7</sup>.

In particular, it is possible to observe differences in the spaces of mobility during morning and evening rush hours in the urban region of Milan. Using accurate space-time information, our findings describe a trend discussed in literature and regarding the non-coincidence between mobility practices during peak morning and afternoon hours, when the chains of displacements, generated by the same popu-

<sup>7</sup> In using the term “communities of practices” it is our intention to focus the attention on the fact that urban populations cannot be reduced to predefined and fixed categories, due to the phenomenon by which they belong to multiple categories. For this reason it is important to consider populations not as static categories (inhabitants, commuters, city users, etc.), but as “groups of subjects that, temporarily and intermittently, share practices of daily life” (Pasqui 2008, p. 148).



**Fig. 2** Daily mobility spaces: morning map (top), evening map (bottom). The color bars represent increasing mobile phone activity during working days rush hours, 8 a.m. to 10 a.m., (top) and during working days afternoon hours, 4 p.m. to 8 p.m. (bottom). Source: MOX/DiAP on Telecom Italia data

lations, are more articulate and complex (Fig. 2). Comparing these two maps on mobility patterns (Fig. 2) it is possible to deduce that the people who commute between 8:00 a.m. and 9:00 a.m. (morning rush hour) become city users between 5:00 p.m. and 7:00 p.m. The map of evening rush hour mobility patterns (5:00 p.m. to 7:00 p.m.) describes detailed places linked to social practices (shopping, going to the gym, picking up a family member or friend). The result is a dense and widespread use of the territory that traditional sources fail to capture, with consequences on infrastructural networks and demands for public transport. In our opinion, these maps

effectively represent not only the mobility patterns of people working in the city as they go back home, but also the patterns of use of the places, defined by the recurring occurrence of these practices. It is this feature (repetitiveness) that allows us to speak of “communities of practice” or “mobile communities”<sup>8</sup>.

With the second typology of data, more refined and promising, we put in evidence the main hourly distribution of origin – destination movements of a huge sample of people (more than one million per day).

Our interest lay in visualising the flows of mobility in the region of Lombardy, without available traditional data (O/D survey and census flow data), but also in describing the experiential dimensions of commuting rhythms that produce significant impacts on transport networks.

We realized a set of maps<sup>9</sup> displaying the sum vector of flows moving from each zone<sup>10</sup> at different hour of a typical working day, with the starting purpose of “validate” this new source of data, comparing it with known mobile dynamics. With new data we have built traditional representations of the flows, in order to verify their validity: for example, the morning map (Fig. 3) confirm a polarization of movements towards the main urban centers offering job and opportunities and highlights also the most commonly used infrastructures. On the other hand, the aggregated flows of mobile phone users, in the afternoon, allow to recognize significant places for shopping and leisure, that are attended after work.

These maps are heuristically valuable: they describe phenomena – the movements carried out for both work and personal reasons – with temporal continuity throughout the day, something that official sources are unable to intercept with the same space-temporal resolution.

The experiments carried out confirm how the mobile phone data permit to explore not only the spatial distribution of flows, but also the experiential dimensions of commuting rhythms. The argument is that commuting can be considered a mobile practice (Edensor 2011, p. 189) that exploits a rich variety of places of use in accordance with the temporal organization of a day, linked not only to fixed events (employment), but also with other activities.

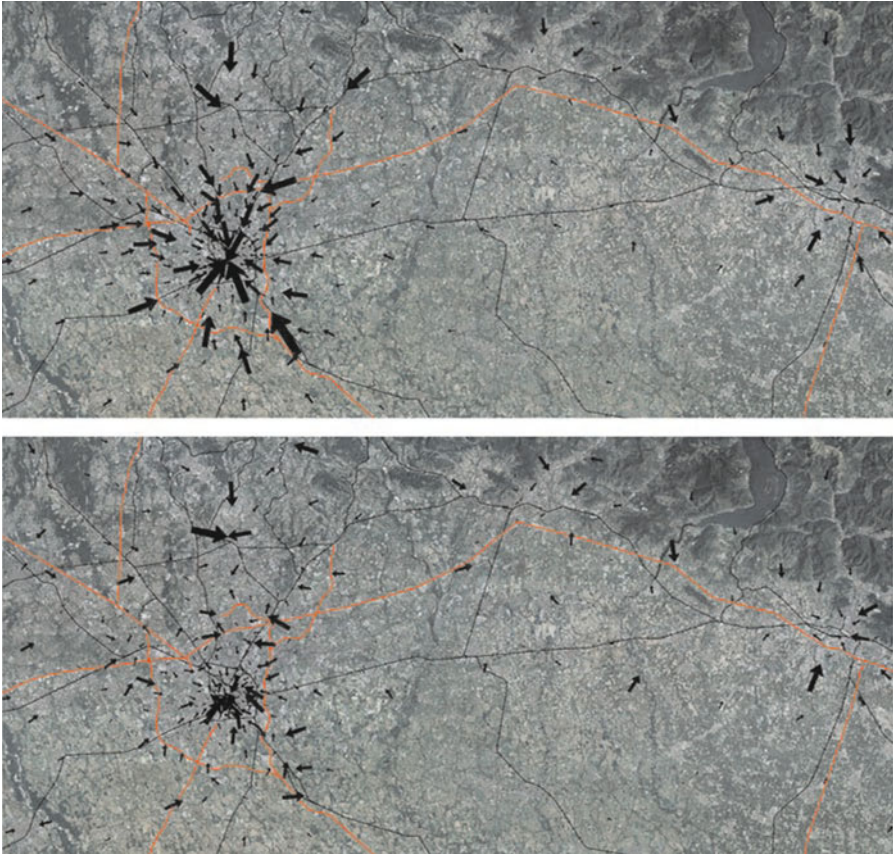
Seen from this perspective, the information derived from the continuous mapping of flows represents an important basis for reading the effective dynamics and impact of spatial mobility. It could also assist with a more efficient and fairer management of urban transport and supplies.

This simple image provides considerable indications with respect to the effective catchment area of Milan, to which regulation measures and appropriate rates of the public transport service should correspond.

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<sup>8</sup> “Groupes sociaux définis à partir de leurs inscriptions territoriales, de leurs pratiques de mobilité, des dispositifs techniques qu’ils mettent en œuvre” (Le Breton 2006: 26).

<sup>9</sup> An interactive map is available at [www.ladec.polimi.it/maps/od/fluxes.html](http://www.ladec.polimi.it/maps/od/fluxes.html).



**Fig. 3** Aggregated flows of mobile phone users: 2011-10-19 – 8 a.m. (top) and 5 p.m. (bottom)

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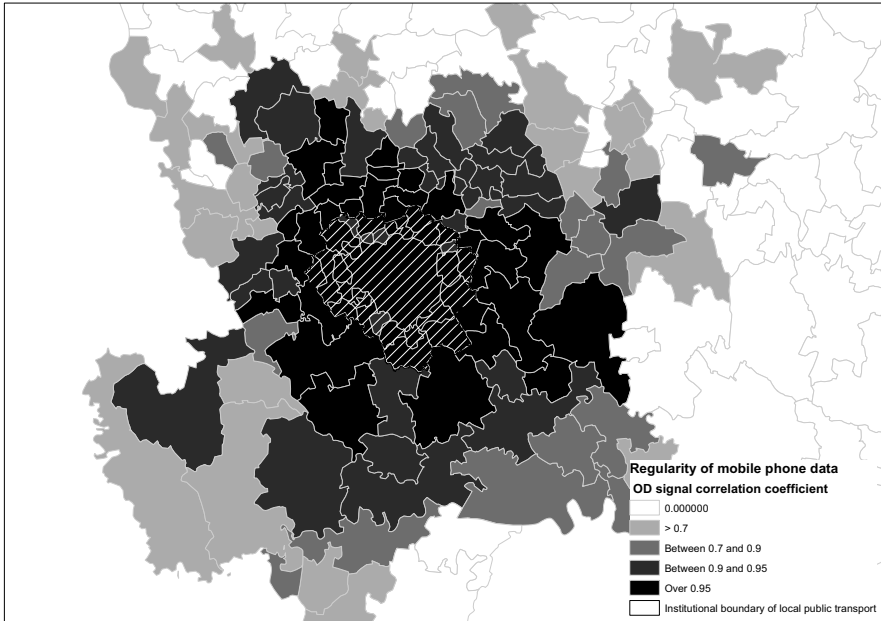
## 2

### **New Maps ... Or Too Many Maps?**

The production of maps through mobile phone data and other digital sources, in many cases exceeds the real capacity of them to provide information useful for urban policies. Often, the maps seem to have a value in itself, rather than representing a tool for reading and interpreting processes.

The ease in the production of the maps by mobile phone data, but more generally by digital sources, offers a lot of views and animations whose communicative potential is clear, much less are the uses of these maps to describe and represent urban practices.

Our research allowed us to test the potential of mobile phone data in explaining relevant urban usage and mobility patterns, as well as in recognizing temporary populations and their spatiality: these are two important topics that can be hardly intercepted through traditional data sources.



**Fig. 4** Daily mobility Milan area of influence obtained by mobile phone data and institutional boundaries of local public transport

The interest in this data is the possibility, not only to implement appropriate mobility policy in terms of skills and boundaries for a diversified management of mobility trends, but more generally to give a representation – a new map – to the various urban rhythms that translate the variability of the processes in contemporary cities. The challenge is to dispose of reliable and continuously updated information on mobility trends, that affect urban spaces and transports, in order to defining integrated and “customer-oriented” policy.

The same data helps us to question some interpretations in the literature on the erratic behaviors of metropolitan populations, on the nomadism that characterizes the contemporary practices, that surveys on mobile phone data have already undertaken (Gonzalez et al. 2008). Some research about a significant sample of mobile phone data has contested interpretations of nomadism of contemporary populations.

If they confirm the high density of commuting, they also show a strong recursion of the paths: in other words we move more during the day, but according to the known and usual paths.

Far from an analytical determinism that allows to photograph the practices in urban spaces with mobile phone sources, our preliminary reflections want to explore the potentialities of these new data source, beyond the production of suggestive maps. More specifically, we have tried to understand the possible applications of these data in explaining the spatial dimension of varying practices that have great impacts on the densities of use of the city and its services.

This implies to consider the phone traffic data as the effect of behaviors and individual habits that become an indirect information on the characteristics of the territory and, somehow, an intrinsic feature of it, that changes in time.

This study therefore suggests that mobile phone-network data have the potential to drastically change the way we view and understand the urban environment.

Secondly, it explores whether mobile network data can reveal the significant time-dependent variation, which is missing from traditional analysis and can thus describe cities dynamically over time.

A further conclusion is that urban planning competences, with specific knowledge on urban dynamics, are needed to correctly query and interpret mobile phone data and to characterize and map urban contexts and their occupants, as emerged from interviews with different stakeholders, belonging to private and public sectors, with which also future applications (event management, civil protection, mobility monitoring, urban rhythms analysis) have been discussed.

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# Sensory Aspects of Simulation and Representation in Landscape and Environmental Planning: A Soundscape Perspective

Mark Lindquist and Eckart Lange

The complexity of human spatial experience is often taken for granted. According to Gibson, we perceive the world in a dynamic way (Gibson 1979), thus, due to the phenomenon of movement, perception is not static. Moreover perception itself involves a variety of senses: hearing, touch, smell, taste, sight, the kinaesthetic system (the ability to perceive and coordinate movement) and the vestibular system (the sense of balance). It is clear that pictures do not provide a multi-sensory experience (no smell, no sound, no humidity). Nevertheless, one must say that most of human perception is based on visual information processing, through sight. At the same time, the language of planners, designers and engineers is a form of abstraction, made of images and means of spatial visualization (such as maps) that must convey information and sometimes generate emotions.

This paper provides an overview and outlook of research demonstrating the potential for using multisensory experience for the design, evaluation and assessment of landscape, facilitated by environmental simulation. Conventionally depicted visually, landscape is experienced as a multisensory phenomenon. Research has demonstrated that while visually dominated, all perception is multisensory. The most promising sensory modalities to investigate in combination are sound and vision. Simulation hardware, tools and techniques have reached the point where combining 3D landscape models and acoustic stimuli is achievable and affordable, with the potential to contribute significantly to the future of the planning and design process.

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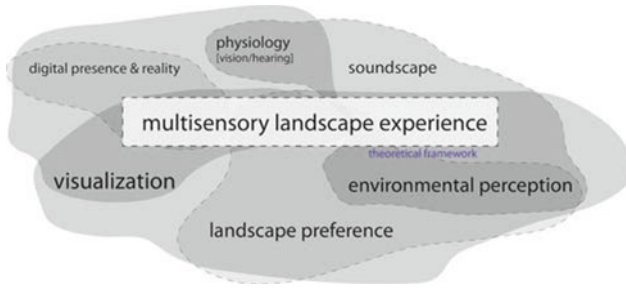
## 1 Introduction

In the real world the impact of sound on the perception of public space is increasingly under scrutiny. Interest by government and policymakers is increasing in this area, particularly in the regulation and abatement of sound in the form of environmental noise from road traffic, aircraft, railway and machinery and that impact on health and safety (Directive 2002/49/EC). “Soundscape”, defined by the ISO/TC43/SC1/WG54 working group as “the perceived sound environment in context by an individual, a group, or a society” (Kang 2010), has emerged as a research area concerned with studying the impact of sound on an environment and its perception. Soundscape research seeks a more objective starting point than noise abatement programs, and a growing body of knowledge is emerging through empirical study of soundscape in the urban environment, particularly urban plazas (Yang and Kang 2005b) and green spaces (Irvine et al. 2009).

To be able to evaluate future landscape change it is crucial to understand responses to future scenarios presented (Lange et al. 2008). Visualizations are frequently used to assess landscape change, though the perception of their realism lags behind real-world experience (Lange 2001). Immersive visualization environments can offer a “closer to reality experience” of visualizations, particularly regarding scale and space (Fig. 1), however, visuals alone do not always provide adequate information for landscape evaluation. For example, railway and motorway proposals may result in more of a change to the acoustic environment than the visual environment. The importance of multisensory experience when evaluating certain aspects of the landscape such as this has been discussed (Lange and Legwaila 2012). The validity of computer based landscape visualizations for collecting perceptual responses that would be equivalent to those based on direct experience with the real world has been called into question (Daniel and Meitner 2001). Expert-led approaches to evaluating landscape perception have been criticized, including the primarily visual approaches used to date (Scott et al. 2009). Environmental psychology findings 30 years ago reported that the dominance of visual cues can vary widely by the individual (Gifford and Ng 1982). Further studies have presented that when vision provides inadequate information the other senses increase, with the authors concluding that landscape experience is a personal and complex relationship complicated by both sensory and socioeconomic issues (Posner et al. 1976).



**Fig. 1** Panoramic immersive visualization of Fort York, Toronto, Canada (Mark Lindquist, Centre for Landscape Research, University of Toronto)



**Fig. 2** Multisensory design and planning framework

The ideas reported here draw on distinct but overlapping areas of research that contribute to a multisensory design and planning framework (Fig. 2). A multisensory framework is informed by an experiential paradigm for landscape design, planning and assessment. Such a framework offers one way to enhance or alter perception of visualizations by incorporating other sense modalities, e.g. sound, and to increase involvement in public participation for those members of the public who may not be completely visually oriented. This paper will outline the current state of the art as well as future directions for research.

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## 2

### 3D-Visualization for Landscape Planning and Design

#### 2.1

##### Landscape Perception and Preference

Landscape has been described as a visual resource (Kaplan 1985) which acknowledges human vision and hence perception in the definition. Perceptual aspects of landscape necessitate a human component and thus are not only a measure of physical attributes but also reactions to, and cognition of, physical attributes by people. Various frameworks to evaluate visual quality and character have been developed (Zube et al. 1982; Daniel and Vining 1983; Lothian 1999). Approaches focusing on landscape character have attempted to address the complications of human perception in categorizing landscape preference (Landscape Institute & Institute of Environmental Management and Assessment 2002; U.S. Forest Service 1974). Lothian (1999) proposes that studying visual properties of landscape could be defined either as an object oriented and expert led approach, or a subjective and experiential approach. Zube et al. define four paradigms for landscape perception including the expert paradigm, the psychophysical paradigm, the cognitive paradigm and the experiential paradigm (Zube et al. 1982). The fourth paradigm, also referred to as phenomenological (Daniel and Vining 1983) was reported to be by far the least covered in academic literature, with a view that its contribution was more to theoretical

understanding than application. This could be due to the complications of engaging in a more experiential way with landscape both technically and conceptually. However we argue here that it is critical to engage experientially with landscape owing to the multisensory way that humans perceive the world. The multimodal nature of perception was identified by Gibson (1979) in his theory of ecological perception, stating that humans normally perceive the environment dynamically and that human perception is not static.

## 2.2

### Landscape Visualization

Visualizations, 3D digital simulations of real or proposed environments, have been used by planners and landscape architects for a generation and are becoming technologically robust. Visualizations can range from non-immersive and static to dynamic and immersive (Danahy 2001; Lange 2001). Visualizations have steadily increased in both their realism and efficiency of creation since their first use. A thorough overview of the evolution of 3D digital perspectival-based visualization has been presented by Lange & Bishop (2005). Some of the major developments in landscape visualization are summarized in Table 1.

The construction methods outlined in Table 1 are indications of modelling evolution and not necessarily mutually exclusive, as there are examples (e.g. in the context of city modelling and architectural façade modelling) where parametric procedural modelling, a method of generating digital models from numeric input, has been updated to allow interactive modelling (e.g. Lipp et al. 2011).

**Table 1** Digital landscape visualization historical development

Year	Construction	Vis Type	Hardware	Interaction	Output	Reference
1977	Manual	Wireframe	Mainframe	Static	Plot	(Myklestad and Wagar 1977)
1977–80	Manual	Shaded relief Draped imagery Shaded building volume	Mainframe	Static	Screen/ Plot	(Faintich 1980)
1986	Manual	Wireframe	Workstation	Dynamic	Screen	(Molnar 1986)
1990	Manual	Photorealistic	Desktop	Rendered	Screen	(Peltz and Kleinman 1990)
1994	Manual	Photorealistic	Workstation	Dynamic	Screen	(Lange 1994)
1995	Automated	GIS data	Workstation	Dynamic	Screen	(Hoinkes and Lange 1995)
2005	“Pre- made”	Virtual Globe	Consumer	Dynamic	Screen	(Sheppard and Cizek 2009)

## 2.3

### Landscape Visualization Evaluation and Realism

Sheppard (1989) has identified three dimensions to evaluate visualizations: understanding, credibility and fairness in representing current or imagined conditions. These criteria identified by Sheppard focus primarily on the *visualizations*, while factors primarily concerning the *visualization environment* have been identified by Bishop and Lange (2005) with the three most important factors being immersion, interaction, and intensity/realism. Almost two decades ago realism was argued to be of critical importance in communicating landscape change (Bishop 1994; Lange 1994). Bishop & Lange (2005) offer that when the subject matter to be visualized can be represented with high levels of realism (e.g. aesthetic issues, flood risk, traffic volumes) that realism is appropriate. Lange (2001) conducted a study to assess the importance of detail in visualization at a planning scale, finding that very detailed 3D-object-data and texture information would be necessary to achieve a very high degree of realism. Bishop and Rohrmann (2003) conducted a questionnaire to compare responses to simulated and real environments, finding that simulated environments still lag far behind the real experience.

## 2.4

### Augmenting Visualization: Multi-modal Perception

Our other senses beyond vision play an important role in our perception of the world around us, but also in even wider well-being. Studies have demonstrated that smell alone, e.g., cypress resins, can reduce amounts of stress hormones and boost immune cell activity (Li et al. 2009). Beyond individual senses the interaction of the senses, and the subsequent impact of this interaction on behaviour and perception, has received attention in a few studies. In a recent study investigating olfactory stimuli researchers introduced different scents into a dance club, which were shown to enhance dancing activity (physical response) and improve the overall evaluation by participants of the evening, music and mood (perceptual response) (Schifferstein et al. 2011). The ability to determine that our own body parts 'belong' to us is known to be impacted by at least the interaction of vision, touch and receptors in the muscles that signal to the brain (Walsh et al. 2011). Tactile sensations generated by sensors have been developed that provide the perception of movement coined Surround Haptics (Israr and Poupyrev 2010), and systems have been developed that combine tactile, acoustic and visual stimuli to support relaxation (Dijk and Weffers-Albu 2010). In a classic psychological study on the interaction of sound and vision, the McGurk effect can be observed where participants watch a face on a screen and see the lips say 'ga' while hearing 'ba', yet they report that they hear 'da' (McGurk and Macdonald 1976). This not only demonstrates the difficulty in isolating sense modalities but also the potential to alter perception with multimodal information.

In their study of environmental sounds, Abe et al. (2006) demonstrated a significant difference between factor ratings for sounds listened to alone, sounds accom-

panied by verbal information and sounds accompanied by visual information. The study by Abe et al. points to one of the more promising areas for environmental simulation research: the added modality of sound to visualizations. The next section will provide an overview of soundscape concepts, the relation to landscape and visualization, and the current state of the art.

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### 3

## **Soundscape for Landscape Planning and Design**

### 3.1

#### **Soundscape**

The most promising sensory modalities to investigate in combination for environmental simulation are sound and vision. Soundscape was initially proposed as a concept in order to consider the total acoustic environment over time, space and across cultures (Schafer 1977). Soundscape, “an environment of sound with emphasis on the way it is perceived and understood by the individual or by a society” (Truax 1999), has emerged as a field of study that promises important and timely connections to landscape and visualization research. Interest by government and policymakers is increasing in this area, though to date mostly in a more narrow view of the regulation and abatement of sound in the form of environmental noise from road traffic, aircraft, railway and machinery and that impact on health and safety (e.g. Directive 2002/49/EC14). Differing from environmental noise studies, soundscape research aims to examine the “acoustic environment primarily where the sounds present produce outcomes that enhance, enable, or facilitate, human enjoyment, health, well-being or activity” (Brown et al. 2011).

### 3.2

#### **Soundscape Perception and Preference**

Empirical studies have demonstrated a correlation of the intensity of sound pressure level (SPL) as measured in decibels (dB) to subjective evaluation (Yang and Kan 2005a). However, an increase in acoustic comfort can not necessarily be achieved by simply reducing the sound level in urban spaces (Yang and Kang 2005b). Soundscape preference is related to the meaning of the sound, with research demonstrating a preference for natural over mechanical sounds (Porteous and Mastin 1985). In addition, studies suggest that cultural background and long term environmental experience play important roles in people’s sound preference (Yang and Kang 2003), as well as, age based preferences of mechanical sounds by younger people (Yang and Kang 2005b). This is in line with previous studies on noise sensitivity that show considerable individual variation and ability to adapt to noise (e.g. Weinstein 1978) and provide important direction for using sound to enhance environmental simulations.

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## 4

### **Landscape: Sound and Vision**

#### 4.1

##### **Landscape-Soundscape Interaction**

The interaction of the physical landscape and soundscape, both in qualitative and quantitative aspects, has recently become an area of research focus. The impact of the physical landscape on soundscape has been identified in recent research. Temporal sound variability can be attributed to anthropogenic activities and biological processes, while spatial sound variability primarily is shaped by landscape attributes (Matsinos et al. 2008). Another study demonstrated that foreground and background sounds have different relationships to the landscape, with spatial patterns of background sounds correlating somewhat with visually perceived landscape features, while foreground sounds did not correlate with landscape features or background sounds (Mazaris et al. 2009). Further, background or ambient sounds have shown to be more common in soundscape description than foreground or event sounds (Raimbault and Dubois 2005).

#### 4.2

##### **Landscape-Soundscape Perception**

The interaction of audio and visual stimuli in landscape perception and preference studies has received some focus over the past three decades. More than 25 years ago research indicated that the interaction of visual and acoustic characteristics had a significant impact on responses to a real and photographed setting (Anderson et al. 1983). Sound has also shown to influence environmental evaluation both negatively and positively (Carles et al. 1992; Carles et al. 1999), while the combination of motion and sound are important for reliable judgment of dynamic landscapes (Hetherington et al. 1993). In a natural park setting aircraft noise has shown to have a negative impact on responses to scenic beauty, preference, naturalness and solitude (Mace et al. 2003). A related study indicated that the presence of any anthropogenic sound negatively impacted participants preference ratings while the inclusion of natural sounds had no impact (Benfield et al. 2010). The main landscape characteristics affecting the perception of environmental sounds are: 1. Topography; 2. Vegetation; and 3. Sound proximity (Matsinos et al. 2008). One empirical study correlates sound quality with the ecological quality of green space; Irvine et al. (2009) indicate that increasing the ecological quality of urban green spaces can enhance access to quiet natural places through specific design and planning. Targeted design and planning of this sort requires tools and methods that can provide evaluation and assessment beyond the visually oriented approaches more common used.

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## 5

### **Sound and Landscape: Current Application and Research**

#### 5.1

##### **Sound and GIS**

The potential for the use of sound with Geographic Information Systems (GIS) has been presented, with important potential contributions identified as providing narration for maps, redundant information, decreasing visual distraction, alternatives to visual information, among others (Krygier 1994). One of the first uses of sound with geographic information was done by Fisher (1994), where sound was used to represent uncertainty in satellite imagery, a concept referred to as sonification. More recently a sonification tool has been developed for commercial GIS software allowing sound to represent uncertainty in data visualization (Bearman and Fisher 2011). Early studies of the tool indicate that sonification provides greater understanding of the data for the user when compared to visually representing data alone (Bearman and Lovett 2010).

#### 5.2

##### **Sound and Virtual Globes**

Using the Google Maps API developers have created “mashup” websites that overlay Google Map imagery with sound recordings of places and events (e.g. <http://aporee.org/maps/>). Sound can already be incorporated into Google Earth, in the form of a pre-recorded narrated tour through 3D space (e.g. [http://earth.google.com/outreach/tutorial\\_kmltours.html](http://earth.google.com/outreach/tutorial_kmltours.html)). A 3D sound plugin has also been developed that will allow geolocating sound in Google Earth (<http://www.planetinaction.com/earthsound/>) which has been integrated within the Google Earth Diorama project (<http://www.planetinaction.com/diorama/>). The Google Earth Diorama project facilitates communication and storytelling within Google Earth using 3D sound and vision.

#### 5.3

##### **Technological Innovations**

The advancement of consumer technology, largely driven by the video game industry, has provided opportunities for landscape and environmental simulation researchers to create immersive visualization environments at a fraction of the historical cost (Lindquist 2010). At the University of Sheffield facilities have been developed that merge stereoscopic 3D with fully immersive 9.2 surround sound, resulting in an affordable environmental simulation laboratory for multisensory landscape research and practice (Fig. 3). Software developed in association with the University of Sheffield (Simmetry3d, <http://www.simmetry3d.com/>), allows for real-time ex-



**Fig. 3** Environmental simulation laboratory, Department of Landscape, University of Sheffield

ploration and evaluation of 3D landscapes, complete with directional and spatially accurate sound reproduction.

#### **5.4 Empirical Research**

The empirical strand of the multisensory research by the author involves a series of experiments designed to evaluate the impact of the interaction of sound and vision on environmental perception in order to quantify the effects of multisensory stimuli. Preliminary results indicate that the interaction of sounds with digital visualizations significantly alter both preference for, and the perceived realism of, the environments being simulated. One of the main findings emerging from the research is the importance of the congruence of visual and acoustic stimuli on the perception of realism of visualizations, i.e. perceived realism ratings go up with congruent stimuli and go down with incongruent stimuli. Further research is currently being conducted, informed by these preliminary findings, with an aim to develop a multisensory public participation framework in the near future.

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## 6 Conclusions and Outlook

Research in landscape perception has primarily relied on visual stimuli. While historically the reasons for this are justified e.g. hardware limitations, lack of understanding or empirical evidence of multisensory perceptual and cognitive processes, advances are being made in scientific areas that can influence landscape visualization. In addition, as reported here, there is a growing body of exploratory research from within the discipline of landscape architecture that is directly investigating the interaction of sound with landscape visualizations. One of the aims of this research is to contribute to the development of tools, techniques and processes for landscape design, evaluation and assessment using multisensory environmental simulations.

The application of the research discussed here offers to contribute to landscape assessment in at least two strands: projects and people. To date there are few projects that, prior to being implemented, are assessed on their full social, cultural, environmental and spatial impacts. Environmental simulation has the potential to provide the necessary tools and information to convey impacts beyond those that can only be represented visually. Projects such as motorways, railways, and planning for sustainable energy have a visual impact to be sure. However, evaluating projects such as these solely on their visual impact is only one dimension of a complex problem. Advances in acoustics research in relation to virtual environment research has led to perceptually based audio rendering available (Tsingos et al. 2004), as well as, to the emergence of more physically accurate techniques (Richmond et al. 2010), both of which have the potential to contribute to environmental simulation research.

One specific and timely project type that would benefit from the application of multisensory environmental simulation techniques is the assessment of wind turbines. The inclusion of directional sound in the context of wind turbines would enable evaluation of not only their potential visual impact, but also their contribution to an altered soundscape. Multisensory assessment, and sound in particular, would provide a much-needed layer of information to the evaluation process.

Beyond specific project application environmental simulation has the potential to benefit specific users. People with unique needs can often be excluded from participatory decision-making processes due to environmental and spatial planning relying primarily on visual communication. The research presented here has the potential to include unique groups and users e.g. the visually impaired and those with low vision, in democratic participatory processes using multisensory environmental simulation.

Currently there is no substitute for direct real-world experience for evaluating and assessing landscape. Yet trying to convey unrealized future landscape change is a fact of life for designers and planners who do not have the ability to create full-scale models of proposals. Multisensory techniques offer one method of enhancing the perception and reality of landscape visualizations, facilitating a transition from visualization to environmental simulation. In addition to expanding the types of projects that can be evaluated, and the validity of those evaluations, environmental simula-

tion can engage a segment of the public in the decision making process who may be excluded through conventional decision-making processes.

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## **Part V**

# Advanced Digital Design and Manufacturing Technologies and Architectonic and Urban Design Project

# iPlanning: Urban Maps and Curatorship in the Age of Data Deluge

Roberto Bottazzi and Raffaele Pè

Big Data – defined as “...collection of data sets so large and complex that it becomes difficult to process using on-hand database management tools or traditional data processing applications” – is one of the key cultural phenomena redesigning the relation between physical and digital domains. The sophisticated techniques to mine large data sets promise to redefine our relation with the built environment and how we will intervene in it.

One key facts often overlooked by architects is that 75% of the current processing power is no longer contained in desktop computers but it is distributed within our environment. Through mobile phones, sensors, and RFID tags we already inhabit a landscape in which the dominant technological paradigm is characterised by diffuse and ubiquitous computation in which previously separated domains – real and virtual – can now dialogue.

In 2011 Calit University in San Diego manufactured the smallest IP address to date: 10 micrometres in width, its size is roughly the same as that of a red blood cell. This innovation coincided with the simultaneous implementation of IPv6 protocol for Internet addresses which will expand the current IPv4 protocol by allowing creating an impressive number of uniquely identifiable virtual addresses. As Benjamin Bratton pointed out through a theoretical calculation, if these IPv6 addresses were evenly distributed over the entire surface of the planet, we will have an impressive  $6.67 \times 10^{27}$  uniquely tagged objects per square metre; this will allow an unprecedented fusion between virtual and physical realms; one in which not just objects but even atoms and cells could have a presence both in reality as well as on the Internet.

This would constitute yet another paradigm shift in the relatively brief history of the relation between real and digital domains: the image that we had to conjure up would be radically different from the those of prosthetic gloves and goggles developed in the 90's, but it would also mark a significant departure from the much more integrated and seamless paradigms of the web 2.0 – term coined in 1999 – dominated by the

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development of social media and media convergence. However, what the experiments at Calit suggest is something far more radical: a scenario in which it is possible to conceive of such thing as digital matter. As Benjamin Bratton also argues the actual challenge brought up by these developments is not primarily technological; rather it will be a design challenge as what will be at stake will the relation between subjects and objects, their levels of interaction/integration, finality, and agency. This is all the more urgent if we consider that fields as diverse as music or the military have already capitalised on such radical advancements, whereas architecture and urbanism are still largely unaffected by this transformation.

A point in case in this argument is the current research carried out on the so-called Smart City. In this field – which obviously should involve architects and urbanists – IT companies and car manufacturers are making most of the progresses. Ciscos, IBM, Living PlanIT, Audi, and Siemens – to mention but a few – are actually developing projects for new towns as well as defining the discourse accompanying these initiatives. Every company in this business has its own definition of what a Smart City is, but as Adam Greenfield pointed out, it was Living PlanIT's which provided the most concise, perhaps earnest account what they stated that "...[the Smart City] is the missing link between real estate and technology sectors". Perhaps unsurprisingly, it is here framed rather bluntly that the domain of Smart Cities largely overlaps with that of corporations and market-driven agendas.

Again, what is missing in this discussion is a broader and more cultural take on these issues in order to expand this conversation beyond the claustrophobic constrains of profitability and economic value. Design issues are imbued with and draw inspiration from larger societal and cultural transformations; the kind of concerns that this debate is in need of.

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## 1 Global Governance

For instance, the pervasive diffusion of computation in cities will offer the opportunity to reassess how cities are managed locally and how they will network globally. What is at stake here are the now-unstable notions of territory and sovereignty further questioned by the *global data deluge coming simultaneously from near and remote locations*. Digital devices do not inherently have the capacity to acknowledge geographical and even political boundaries, a condition which is even more complex if we consider their ability to be networked to each other. The dynamic, fluid nature of portable digital devices is eventually deployed onto physical territories which do possess both *specific geographical and political form and organisation*. If on the one hand, excessive emphasis on the static quality of physical space dangerously drifts the conversation towards issues of control; on the other hand, a more integrated, non-linear relationship between the digital and physical domains could give rise to more complex forms of global, networked accountability and, potentially, governance. The issue of global governance could be rethought in the light of the possibilities to foster exchange between organic and inorganic life made available by digital technologies [an issue that the environmental question is making all the

more pressing]. Global governance here does not refer to control or monistic models of management; to the contrary, it should be understood as an attempt to establish a *common protocol* to monitor and allow diversity and local specificity.

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## 2

### Scale

These considerations eventually affect our notions of scale; the linear sequence of concatenated spaces going from large to small or – less frequently – in the opposite direction will no longer hold. The work presented by Calit researchers collapses the different spatial domains into correlations between digital and physical as well as between the extra-small – atomic – and the extra-large – planetary – scales. It also follows that we may witness a transformation of traditional ways of conceiving and communicating spatial information towards new ones exploiting the capacities of digital technologies. Spatial information may not simply be recorded in printed maps or zoning diagrams, but could actually be geo-located, accessible directly at the location in which it was generated in the first place or needs to be experienced. This repository of data would then no longer be a piece of paper or even a computer screen but the city itself, in all its three-dimensional, dynamic reality.

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## 3

### Embedded Data

Embedding data within the fabric of the city poses then questions to the contemporary practices of sharing and managing digital data in urban environments. The current and most popular model relies on the construction of so-called control rooms. Data are ‘withdrawn’ from physical reality, aggregated and mined in a single location – the control room – before useful services are fed back to citizens. By withdrawing data we do not just refer to moving data to a specific location where they are stored but we also extend it to its ownership which unavoidably moves from the individual citizens to the corporation managing the infrastructure. This prevalent management model seems strangely out of date in regards to the actual potential that the latest technologies provide. As also suggested by sociologist Saskia Sassen, embedding data means shifting to a model in which data extracted from a specific, physical reality are no longer transmitted to a control room, but rather remain local; not only allowing citizens to appropriate them with the minimum amount of mediation but also demanding a greater level of interaction between local residents and the actual infrastructures gathering and manipulating data [perhaps by switching from a privatised to an open-source model].

Some of these concerns also informed two recent projects speculating how digital technologies could alter how we understand and design in cities.

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**4****Xiamen Interactive Model**

Carried out in collaboration with Chora – an architecture and urbanism office based in London – the Xiamen Interactive Model focused on energy consumption and production to test how some of the more general and abstract concerns could actually affect the planning and management of the specific urban environment. A large 4x4m model printed as 122 1-mm thick rapid prototype SLS tiles of the entire metropolitan area of Xiamen, China, at 1:10,000 scale. Underneath this thin layer a carpet of LED lights interacted with users and the city itself to visualise patterns of energy consumption. Local patterns of energy consumption – both present and predicted – are linked to one another and, in turn, to larger datasets about China. The document managing the city is therefore no longer a traditional masterplan but rather a dynamic, interactive model based on the consumption of finite resources; a key criterion orchestrating the relation between nature, artefacts, and people. By digitally augmenting what a masterplan can include, this project begins to reveal how established notions of scale need to give way to more complex, networked ones, in which the city operates as an interrelated ecosystem.

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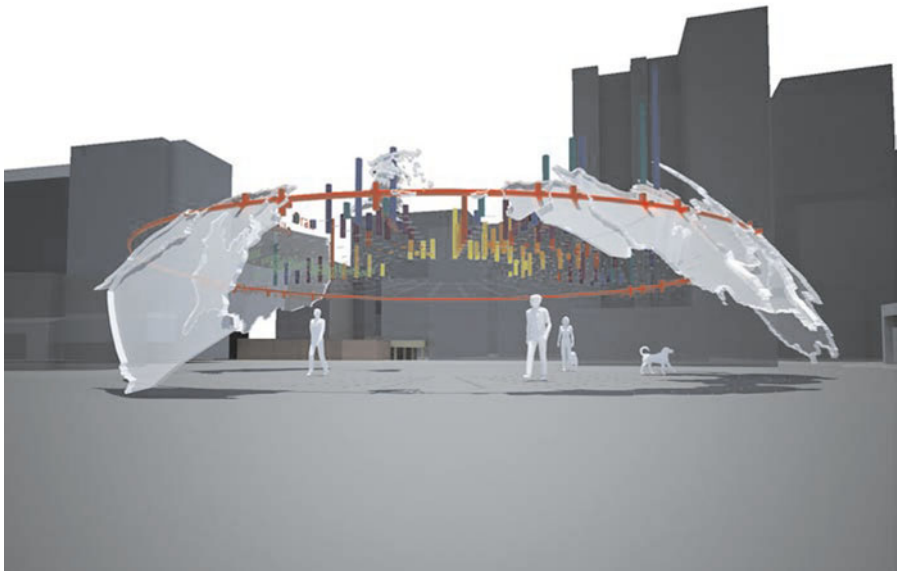
**5****35 Degrees**

Exhibited at the ‘Site Unseen’ Festival in Chattanooga, USA – the first Augmented Reality [AR] outdoor art festival – 35 Degrees further explores how the possibilities opened up by Big Data can change how we consider and plan cities. User-friendly, geo-located, and connected to a potentially infinite archive, AR is somehow the opposite of what urbanism has currently come to represent; a discipline whose internal mechanisms have alienated it from public debate and involvement.

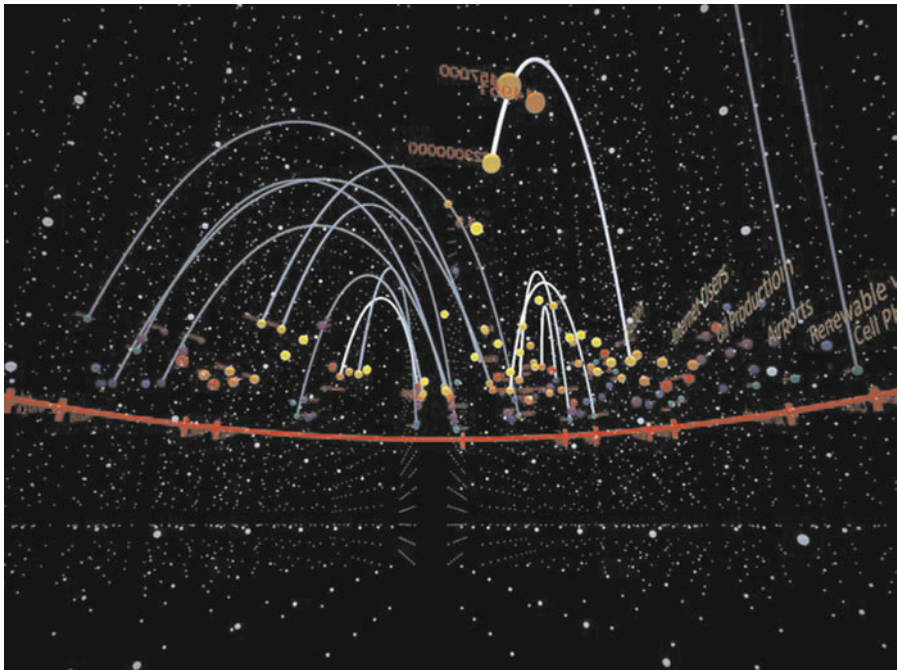
What kind of urbanism can AR engender then? 35 Degrees utilises AR to connect all the cities sharing with Chattanooga the same latitude: 35 degrees. In doing so, it envisions a different notion of urbanism; one in which local and global issues, cultures, and locations are dialoguing by comparing ten different lifestyle indexes to each other.

35 Degrees imagines cutting a section through the earth exactly on the 35th parallel. This straightforward geometrical operation forms a 35-metre diameter ring (Fig. 1), only visible on one’s mobile screen through the phone app Layar, on which all the cities sharing the same latitude than Chattanooga are marked.

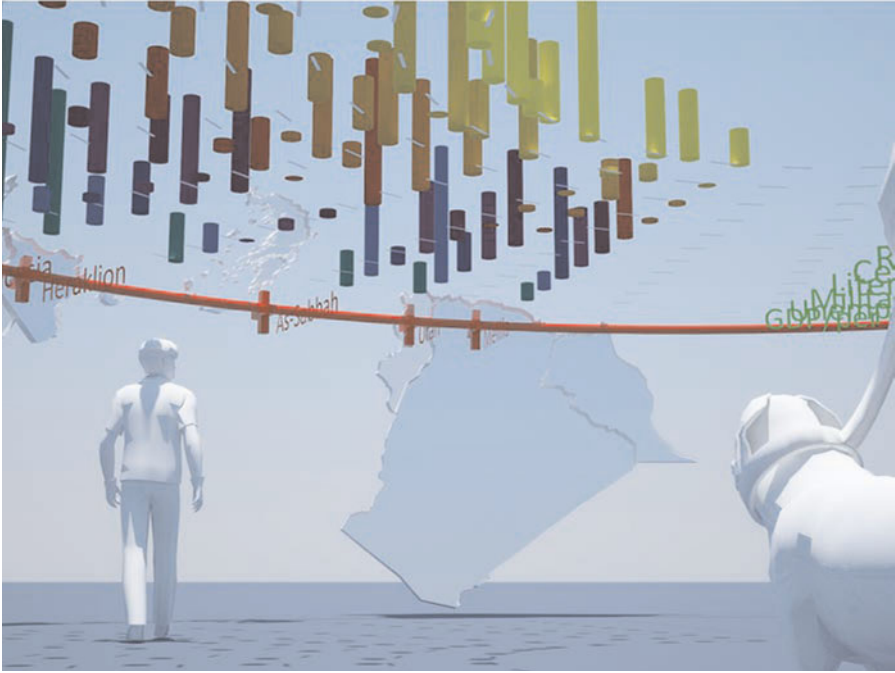
This simple gesture creates an iconic space – a ring (Fig. 2); a close, continuous curving shape connecting 21 cities around the world only by virtue of their geographical location and bringing them together regardless of their cultural, political, and economic differences.



**Fig. 1** v\_08\_colour – 35 Degrees: rendering of Augment Reality view



**Fig. 2** 02n\_colour – 35 Degrees: abstract representation of data mapped



**Fig. 3** v\_13\_darker – 35 Degrees: rendering showing the actual visitor experience of the installation

Within the space formed by the ring, each of the countries represented is mapped against ten categories which span from material needs [such as accessibility to water resources] to the immaterial world of digital technologies (Fig. 3) [number of cell phones per habitant].

These categories are taken from the authoritative CIA World Fact book and mapped against each other: Inflation rate, number of Internet users, oil production, number of airports, renewable water resources, number of cell phones, level of literacy, military expenditures, unemployment rate, and GDP/per capita. Pakistan's connection to mobile communication dialogues with South Korea's extraordinary technological infrastructure, Afghanistan's poor literacy is echoed by China's proportionally minimal access to aviation transport, and finally we can appreciate at a single glance the global distribution of renewable water across the 35th parallel.

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## 6

### A Real Urbanism of Data

Like an iconic image, the ring of the 35th parallel displays geography and data both as experiential and interconnected constructs. Every single location on the planet

could have its own ring; endlessly repeated, yet every time unique because of its coordinates. In the information age unity does not mean uniformity as the area enclosed by the ring become a space for dialogue and interdependency?

The ring merges the micro scale of human economies to macro interactions of global geography through a continuum gradient reconciling previously fragmented scales; from the material to the intangible. The systemic performative nature of digital data meets the humanist, symbolic, and almost primitive figures of the ring; the digital world of data is in conversation with the domains of geography, politics, environment; the matter our environment is made of.

Data are part of the physical environment we daily inhabit; as such they are subjected to the same, cultural, economic, and political webs which manage and affect our own existence. Though the challenges to overcome are multiple [privacy, open data, etc.], architects will particularly be presented with an even more profound and troubling prospect. Digital culture promises to be ‘messy’: open, dynamic, user-generated, diverse, it relinquishes central control to give voice to a plurality of expressions and needs. Authorship too moves away from a single individual to open up towards a multiplicity of actors. Will architects be able to embrace these transformations?

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## 7

### **Architecture in a Performance-Driven Perspective**

#### 7.1

##### **Art Digital Memory**

Our current living environment is shaped by informational systems and multi-cultural overlaps of digital data and electronic impulses which define new priorities for contemporary art-maker such as architects and designers. The epistemological construction of our knowledge through artistic rendition should emerge from the focus on the effects of performance-driven-experiments on our built environment. Marshall McLuhan used to define such condition as “acoustic”: a social context in which knowledge can be gathered through oral and transient exchanges (1969). The development of such interaction can happen through digital tools, performing art objects within designed ambiances of inclusive and polyphonic events (Tschumi 1996). Each form of artistic expression in the “acoustic” environment delineates a semantic character of mobility and mixité which only the spatial absorption of its realization can fix in a resilient identity for our knowledge. The implementation of digital art objects as “musical” performances and “epistemologic objects” allow them to resound in our minds with renewed expressivity and pathos through their entrenchments in the value of their physical allocation. This process defines new emerging aesthetic categories which requires art-makers to conceive aesthetic and comprehensive learning frameworks, for which users (or the interpreters) provides meaning and recognition as if art could excite individual and collective memory across the in-puts

given by the composer (see the work of composer Salvatore Sciarrino as described by Carratelli 2006).

New technologies measure the pace with which the anthropological images of our living trajectories and habitat overlap and interact in our mental space. They condition our biological cognitive inner rhythm, configuring knowledge through an unprecedented physic-digital pattern. Proportions, geometric correlations, and rhythm in the configuration of such pattern determine frequencies of complex compression and decompression in the disclosure of the agogic of our spatial behaviors and the morphology of the space we inhabit. Digital art objects enact dynamic interpolations across different disciplines and knowledge fields on the basis of a recognizable anthropological tale: art-objects mirrors our cultural and social context offsetting it into a poetic and transfigured dimension through which we can detect aspects of ourselves and our societies which otherwise would remain hidden or unexpressed (Casati 1994). The objective of a digital enquiry within the field of architecture and urban design should then embrace the necessity to express such innovative mode of self-representation, regulating the intensity of the techno-ecologic expressivity of its anthropologic image.

Revisiting the study undertaken by Lévi-Strauss in the text *Anthropologie Structurale* (1958) about the perceptive and ritual origin of consolidated human settlements, the anthropological image describes an intuitive mechanism of organization of the inhabited spaces and its relationship with its environmental social context of civic aggregation. Anthropological images are similar to the visual narrative recreated by Eduardo Paolozzi in collaboration with Peter and Alison Smithson for the exhibition *Parallel of Life and Art* (ICA London 1953). The exhibition invited visitors to recombine the images presented according to their own biographical path, but using common elements in cognitive composition.

The anthropological image is influenced by shared spatial behaviors and local traditions of appropriation and transformation of the territory. In architectural terms, the anthropological image redevelops the meaning of urban type towards an ampler and more inclusive notion. In the morphology of the type we detect geometric relationships that refer to the ways with which the body feel and perceive the space through conceptual rendition. The anthropologic image includes these relationships within a more complex individual imaginary that searches within the fields of artistic production (architecture, painting, sculpture, music, etc.) the premises to understand and to embody such mathematical construct. Anthropological images absorb architectural types within the boundaries of an anthropometric study of the modalities with which the self meets the space. The contribution of digital interfaces orients architectural design toward a trans-disciplinary combination of mental and physical in-puts that refer to our anthropological imaginary to rethink in depth the very nature of its tools.

## 7.2 Curatorship (Database and Data-Processing)

A digital-art-object is an orientation map for the disclosure of the configuration of complex relationships between mental and physical space. A map is an artistic operator that retains reciprocity between multiple sequences of mobile elements within the landscape, controllable design variables, and places, in order to recreate ambiences of minimum harmonic meaning in a state of multidimensional compression. Entropy is not perceived as the domain of the unfathomed chaos but it is the field of possibility for architecture to tune morphological ambitions and corporeal dynamics with greater efficacy and precision. The orientation map learning framework invites to master digital design processes with a new “musical” awareness (McLuhan 1967). Recurrent frequencies in space and in time generates natural interfaces (Alexander 1967) that can be employed as active forms of sense making assisting the immersion of people in uncharacterized places. The livability of a building or a settlement can be implemented insisting on the relevant reversible and irreversible processes that allow the existence of their physical structure.

Maps organize our knowledge with a relational and stochastic intention exploiting a database which is always geo-referenced. The database contains all the spurious elements of the composition. The map aims to define the character of these elements through key-words and semantic aggregation, recreating a cognitive system that synthesizes the database in a global mental image. The metrics employed for the re-distribution of the database regulate the inner expressivity of the conceptualized elements, defining identity as an agogic interpolation between tonal expressivity and rhythm of recurrence.

The composition strategies activated by digital-art-processes interpret designed objects as protocols for aided immersions within a place. The protocol recreates an orientation map through a rhythmic proliferation of the biological and energetic values of its generators. The curatorship through the equalization of such values shape a spatial repercussion of impulses which is eco-sympathetic in the sense that it is tuned with its context and its environment, transforming the territory in synergy with it. The employment of locative media allows in fact to trace and mark the environmental dynamics from which the landscape emerges. A continuous exchange between users and spaces enables designers to provide information about a place as well as to learn from it and about its ecological format. The recent involvement of digital tools in spatial design engages with an idea of landscape that differs from the romantic conception of picturesque epiphany of interior feelings and abstract emotions<sup>1</sup>. The landscape does exist, not only through the eyes of those who intend to observe it, but it is embedded within its environment, and from the premises of its material essence, it appears to us as an extension of our physical and perceptive status.

Architects as creative producers of knowledge and experienced interpreters of urban phenomena, are involved in the redefinition of the boundaries of the discipline becoming selectors of contents and operators. They discern themes and strategies

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<sup>1</sup> “Votre âme est un paysage choisi” (Verlaine, *Fêtes Galantes, Clair de lune*, p. 89).

to disclose the resources hidden within the territory of our cities exploiting digital techniques of communication. According to Raoul Bunschoten, the figure of the curator introduces a different perspective on the mission of the architect, redirecting his skills of spatial manipulator toward the design of complex urban processes (2011, p. 603). The architect presents in fact two types of expertise, an ability in reading the morphology of urban conglomerations and buildings and a capacity to envisage their image over time. Curatorship means a disciplinary encounter between different way of communicating a space in the light of the care for our habitat, expressing our interest for the environment, fostering spatial awareness and knowledge. Cedric Price anticipates this condition in the text *The Invisible Sandwich*, arguing that “making the potential of this invisible dictionary of possibilities work for one involves the rejection of the role of architecture as a mere improver, a formal enricher of the environment as it at present exists” (2006, p. 12). The attempt of the architect-curator is transversal and inclusive, searching for resources (intellectual as well as material) building spatial strategies of supply and distribution according to a collaborative approach.

### 7.3

#### **Rendering: A Performance-Based Practice**

Database construction and data-processing, in the perspective offered by architecture and spatial design, require the promotion of sensorial tactics for cultural inclusion in order to render the cognitive and physical qualities of the art-object through digital interactions. Rendering is a word taken from the experience of composer Luciano Berio who used to describe it as a way to reproduce the “original matter” of a composition through media processing. The designed product of data-processing is oriented towards a practical experimentation in which performance is conceived as the place where urban transformation is engrained and validated. Performances pervade a space with potential harmonic meaning, using sounds, words, images, as a stochastic tool to outline identity and character in our knowledge. Performances trigger spatial transfiguration and social reactivation through artistic and recognizable gestures. Carlo Sini qualifies art-making as the activator of our ontological rhythm, specifying the inner quality of the human being in relation to what one does or make – no one can be addressed as “absolute”, we always refer to ourselves as characterized by an action or by the intention of making or doing something (1992).

Digital-art-objects express recurring relationships between the spatial establishment of the self and his cultural behavior through practices of agogic inter-play. The expressivity of this movement is coordinated by tonalities and metrics. Space design as a set of agogic instructions for the cultural characterization of environmental appropriations sees the role of architecture as a performing instrument to regulate such motions. We refer to the research of Richard Taruskin in *Text and Act* (1995), and the one of Carolyn Abbate (*Music – Drastic or Gnostic?*, 2004) to explain in depth the change of paradigm in the construction of knowledge caused in recent years by digital tools. Digital-art-objects interpret the experience of performance as an act more

than a text, provoking an historical shift from a textual culture toward a “mediatized” image and sound culture. For Carolyn Abbate performance is “a polysemic text to be analyzed in its many conflicting domains” (ibidem, p. 507), it traces a change in the formation of cognitive patterns in culture through the emergence of new communication media (see also musicexperiment21.com). Trans-disciplinarity through media can only be achieved with experimentation in practice requiring an abductive motion of thinking in the way things are perceived and understood. During a performance, abduction (Bateson 1972) and anamorphic movements effectively become the most prominent tools for our knowledge to create invention and awareness of new unexpected categories in the perspective given by an aesthetic approach to art-making. Users freely activate the collective imaginary of the composition along multiple individual trajectories.

Space design as art-performance coordinated by digital media reconstructs a kinetic map for anthropometric recognition across the topographic encoding of its spatial happening, delineating elements of resilience and transformation in the way our mind retains such pattern. The rendition of our contemporary art-digital-memory through epistemological objects searches for new complicity between physical and virtual features in the form of Franco Donatoni’s *Tableau Vivant* (1980). In Donatoni’s paradigm<sup>2</sup>, the architecture of the composition (tableau) embodies the corporeal qualities of spatial behaviors (vivant) engendering movements which are synchronized and geometrically appropriate in relation to the topographic emergencies of the geography on which they insist. Trans-mediatic rendering should consolidate such identity using composition as a semantic structure for the realization of performance in relation to varied geographic situations. Tuning and Synchronization for the construction of architectural strategies of urban reform are located along physical lines of informational percolation according to a dynamic interpretation of eco-tonal spaces within the city. The recursive proliferation of these artistic actions will provide a sentient translation of the meaning of hyper-localism.

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<sup>2</sup> See Donatoni’s representation of *Babai* (1967), for harpsichord solo, included in John Cage *Notations* (1969).

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## **Part VI**

# Critical Reactions: A Bridge Between Academic Core Concepts and New PhD Researches

# From Power to Empowerment? The Social Role of Cartographic Knowledge

Alice Buoli

The paper aims to draft a critical reading of the role of maps in the construction/representation of power in Western societies, according to some main recent and historical literature references and research experiences. In this context the notion of power is considered in a broader (spatial) sense: as a mean of control, surveillance and production of space and, at the same time, in relation to the notion of “knowledge” (namely cartographical knowledge) in Foucaultian terms.

Thus, the essay will explore and draw the attention on two main issues. From one side, the double role of maps as tool, language and means of communication of political power at the service of political elites and, therefore, their ability to translate political projects and decisions into space (as, for instance, in the “construction” of political boundaries).

From the other side, the paper will suggest and explore the idea of a “paradigm-shift” in the use and access to cartographic information, due to the introduction of new open-source and open-contents technologies and platforms. Since the last decades, in fact, ICT has been opening new spaces for social practices and interactions. These processes have deeply affected the relationship between map makers and map users, leading to innovative forms and practices of participatory and community-based mapping and commons-based peer production cartographic tools, which allow to question maps as “socially constructed forms of knowledge” (Harley 1988, p. 277).

At the same time, a series of critical issues regarding the accessibility and the ownership of the cartographic information will be taken into account.

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## 1

**Introduction: The Social Role of Maps / Maps as Social Products**

*The social history of maps, unlike that of literature, art, or music, appears to have few genuinely popular, alternative, or subversive modes of expression. Maps are pre-eminently a language of power, not of protest. Indeed, computer technology has increased this concentration of media power. Cartography remains a teleological discourse, reifying power, reinforcing the status quo, and freezing social interaction within charted lines.*

(J.B. Harley, 1988, p. 301)

A contemporary reading of the quotation from the seminal Harley's essay *Maps, knowledge, and power* (1988) raises some critical questions on the role of cartography in contemporary societies.

Is still cartography an "exclusive" and technical form of knowledge? Or can one theorize a deep change in the relationship between map-makers and map-users and in the access/production of the cartographic information? Can spatial/territorial knowledge deriving from most recent open-content mapping platforms and soft-wares be a new form of "counter-power knowledge" (Castells 2011), a "form of protest"?

*Participatory-GIS, community-based mapping, peer-production mapping*<sup>1</sup> and many other recent forms of shared spatial knowledge production, based on user-friendly and open content mapping platforms, seem to have open a new field of opportunity for the emergence and enhancement of what Foucault, in a 1976 lecture, called "subjugated knowledges": "a whole set of knowledges that have been disqualified as inadequate to their task or insufficiently elaborated: naive knowledges, located low down on the hierarchy, beneath the required level of cognition or scientificity. (...) which involve what I could call popular knowledge" (Foucault 1980, p. 82).

Thus, a kind of "paradigm shift" seems to be at stake in the cartographic field, not only in technical and technological terms, but also from a social and symbolical perspective. The shift regards from one side the *accessibility* to the cartographic information, from the other the *possibility* and *capacity to produce, own and share* it.

In fact, according to Foucault's theorization of power/knowledge nexus, power is a "productive force", the result of social interactions, exercised and re-produced at different levels of the social body.

The later work of scholars and thinkers such as, among others, John B. Harley and Franco Farinelli, has further explored and stressed the power-knowledge nexus from a cartographical perspective, particularly in the recognition of maps as "socially constructed products" (Harley 1988) and in the identification of cartography's (and cartographers') role in the construction of the modern and colonial geographies of power (Farinelli 2009; De Diego 2008).

<sup>1</sup> *Commons-based peer production* is a term coined by Harvard Law School professor Yochai Benkler to describe a new model of socio-economic production in which the creative energy of large numbers of people is coordinated into large, meaningful projects mostly without traditional hierarchical organization (Source: Wikipedia).

This field of thought conceives maps as “images” which are never neutral, but always partial and value-oriented (Harley 1988, pp. 278–279; 1989, p. 8): “mobile containers” (Farinelli 2009, p. 138) of particular approaches and visions of the world due to the uses and reasons why they have been drawn.

To this respect, the debate on the ethics of ICT and (participatory) GIS opens a series of questions about the data-selection processes and the (im)possibility to be “faithful” to other’s perceptions and conceptions. As the Italian geographer A. Turco (2010) has stressed, the spreading of cartographic knowledge deeply involves some issues about ethics and language: “How to map the ‘others’ ” views and reasons? (...) How to take charge of the elsewhere, with its topical, environmental configurations without turning this into a territorial etero-centred disguised?”<sup>2</sup>

In the following paragraphs, some possible trails of interpretation about and across these issues will be traced, first by looking at the role of cartographers during the colonial and early modern nation-state rise, and then by stressing the most recent “shift” in the relation between map-makers and map-users.

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## 2

### The Role of Cartography in the Construction of the Geographical Space

*The scene described is held in Lisbon in 1502. The historian Gérard Vindt reports to the king the theft, from the maps room, of the only specimen of a real world map depicting the Indies and Brazil, designed for the first time on the basis of the information provided by Pedro Alvares Cabral and Vasco de Gama. The disappearance of this state secret is experienced by the king as an economic disaster: it deprives him of the access to his property. Owning the geographic information meant not only to assert its authority, but also watching and jealously protect his wealth. Five centuries after the most powerful states in the world still exert a control on the paranoid mapping and satellite imagery, not hesitating to classify all the top secret documents of strategic, economic or military<sup>3</sup>.*

The anecdote, reported by Philippe Rekacewicz, portrays one of the most interesting issues related to the history of power/knowledge nexus. Indeed, since the ancient time, maps have been seen as a powerful tool allowing its owners to control, give shape and use the geographical information to its own interest.

This idea is particularly meaningful if we start looking at the age of the geographical explorations and modern colonialism: the maps produced during this crucial bundle of centuries had shaped the main political divisions of the world and its territorial and political configurations, most of which are still critical today.

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<sup>2</sup> Text translated from the article appeared at <http://www.monde-diplomatique.it/LeMonde-archivio/Febraio-2006/pagina.php?cosa=0602lm12.01.html&titolo=La%20cartografia%20tra%20scienza,%20arte%20e%20manipolazione>. (accessed on 30 September 2013).

<sup>3</sup> Text translated from the article appeared at <http://www.monde-diplomatique.it/LeMonde-archivio/Febraio-2006/pagina.php?cosa=0602lm12.01.html&titolo=La%20cartografia%20tra%20scienza,%20arte%20e%20manipolazione> (accessed on 30 September 2013).

The role of cartography, as a scientific discipline but also a form of art, is strongly related to the raise and predominance of the modern nation-state<sup>4</sup>, in the European context. This specific form of political power represents and recognizes itself through the use of maps and, by the means of cartography, produces its territory, defines its borders and activates mechanism of spatial control and surveillance. The state has been – and has remained for a long time – the principal patron of the cartographic activity in many countries.

Maps acted at different scales, as perfect instruments in the hand of the political elites, not only at the symbolical level or at the geographical scale, but also as powerful tools for defining from an economic perspective the territory and as means by which define the value of land property, through the use of the geometric measurement (Farinelli 2009, p. 26).

The history of art, and of painting in particular, gives us some clear examples of the strong linkage between political power and cartography. This is quite evident if we look at some famous historical portraits, such as (among a vast repertoire) the picture of Queen Isabel the first of England, portrayed by Marcus Gheeraerts standing on top of a map of the British possessions, and the business card of British explorer Sir Joseph Banks, representing Iceland (his latest geographical discovery). Has Harley has stressed, “these paintings proclaimed the divine right of political control, the emblem of the globe indicating the world-wide scale on which it could be exercised and for which it was desired” (Harley 1988, p. 295).

## 2.1

### **Geographical Discoveries and Arbitrary Lines Drawn on Maps**

According to Farinelli, the shift from the static model of the “globe” to the mobile device of the map / table can be seen as the main explanation of the 15<sup>th</sup> century geographical discoveries (Fig. 1) (Farinelli 2009, p. 61).

Indeed, due to its finiteness, the image of “the globe” wouldn’t have allowed thinking of an “otherness” outside the finished perfect sphere, while the reduction/projection of the globe onto the “table” suggested that something else should have existed outside the limits of the map.

This crucial paradigm-shift in the history of cartography and spatial representation had relevant consequences on the conception of the world, at that time, and triggered the age of geographical explorations and modern colonialism.

In this context the map is seen no longer just as a representation or “narration” of geographical explorations, but the means by which European political powers legitimized their control over the explored and colonized territories. In this sense, as the Renaissance perspective was not only a method of representation of reality, but a real visual system of control and production of space (Farinelli 2009, p. 38), maps of the 15–16<sup>th</sup> centuries were vehicles for producing and re-producing power. Indeed,

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<sup>4</sup> Intended in its classical meaning of a political entity in which political power, people, culture and territory coincide within specific borders. The process of nation-state building in Europe is usually located from the end of the XIV century till the XIX century.

*European colonial expansion  
15th-16th century*



**Fig. 1** European colonial expansion – 15th–16th century – Tordesillas and Zaragoza Treaties (redrawing of the map “Les grandes decouvertes et le premier partage du monde” by Gimeno R, Mitrano P (2005) in: Questions internationales: Mers et océans 14, p. 7)

due to the development of the expansionist ambitions of the major European powers outside the continent, the gradual colonization of territories occurred far from the motherland. The colonies, as extensions / territorial appendix of the state and part of the national territory itself, were under the sovereignty of the colonizing countries from the administrative, political and military point of view. At the same time they were “other territories” because of the geographical distance separating them from the political and administrative centres. Cartography, as other forms of representation, helped the colonial powers to bridge this distance.

This observation seems to be particularly pertinent if one takes into account the process of border-construction operated by the European powers during the colonial period. Considering the British partition of India after 1947 or the construction of African national borders, it is possible to see how the (arbitrary and one-directed) use of cartography had affected the history of entire continents.

In this sense one could argue that most of today borders, are the result of arbitrary operations on cartographic representations and hardly the result of social or cultural processes.

No arbitrary delimitation and immaterial border was maybe more significant than the one traced throughout the Atlantic Ocean from north to south at the end of the 15<sup>th</sup> century to define the spheres of influence and domination of Portugal and Spain in the world: the *Raya de Tordesillas* (Fig. 1). The line drawn according to the *Treaty of Tordesillas* (1494), starting from an incomplete map, where the undiscovered territories were part of the geography of the contending empires, ran along the north-south meridian, 1,770 km west of the Cape Verde Islands (off the coast of Senegal, West Africa), corresponding approximately to a latitude of 46° 37' W. The lands to the east of this line would have belonged to Portugal, while all the territories west to the *Raya* would have been part of the Spanish Empire<sup>5</sup>.

The *Raya de Tordesillas* represents a milestone in the process of territorial control and power outsourcing carried out by European countries over other territories starting from an arbitrary delimitation on maps (Cella 2008, pp. 43–45). Again, as Farinelli has noticed, the “*political project is the result of the cartographic prophecy, of its achievement*” (2009, p. 72).

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### 3

#### **A Paradigm-Shift in the Role of Map-Makers and Map-Users?**

The discourse about maps’ ability to transfer a political project from the table into space, become even more problematic if one moves fast forward to our globalized and “liquid” contemporaneity (Bauman 2003).

According to Farinelli’s reading of Saskia Sassen’s thinking (ibidem 2009, pp. 176–177), the origin of the globalized / global world lies in the end of the nation-

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<sup>5</sup> After the voyages of Magellan, the line was moved in 1529 with the Treaty of Zaragoza (allowing Portugal to extend its control over a larger area).

state, which is no longer the container of the social process: the raise of the electronic networks, of the Internet, had substantially reset the link between the socio-economical processes and the territorial control operated by the nation-state and political power.

Moreover, the “power of fluxes” within the “network society” (Castells 1996–2000<sup>6</sup>) seems to have taken control over the “traditional” flux of power linked to its territorial and national base (Farinelli 2009, p. 169). According to this perspective, this is the end of the state as the main traditional site of power, due to the effects of globalisation (Castells 2007, p. 239) and due to the changing cultural and socio-political processes that emerged with the raise of the ICT, which allowed the diffusion of networks within the entire social structure.

As the state used to be the main holder of the cartographic information, its dismantling seems to imply deep consequences on the use and ownership of the geographical knowledge. In the “network society” cartographical information becomes something “liquid”, as the borders of the “table” become more and more uncertain.

At the same time, the accessibility and ownership of geographical knowledge seem to have experienced a rapid diffusion along with the spreading of networks.

As a consequence, this process is leading from an *exclusive* and *elitist* model of knowledge keeping and control, to an *inclusive* and *diffusive* system of knowledge production and sharing, deeply affecting the complex relationship between map-makers and map-users. As previously reminded, in the nation-state system the cartographic information and its production and management were in the hand of the cartographers: loyal servants of the political power.

As de Diego (2008, p. 20) has clearly stressed: “It was the geographers who gathered information and ended up being agents of the state, collecting and representing the data. Information that was directly exploitable by the colonial authorities, strategists, traders or industrialists”<sup>7</sup>.

Starting from the age of the great geographical exploration, geographers played a central role in relation to political and colonial power of the European nation-states: not only as “story-tellers” of other’s exploration and stories, but as “translators” at the service of political power, appointed with “the power to be able to design the map” (*ibidem*).

Thus the cartographic activity also implied first a work of visual re-invention, and then of re-interpretation of reality, and often of “falsification”.

Not only “distortions” (conscious or unconscious) were part of map-makers’ work, but also what Harley calls “silences”: arbitrary and aware omissions of “troublesome” data and information<sup>8</sup>.

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<sup>6</sup> Castells M (2000) *The rise of the network society* (2nd ed). Blackwell Publishers, Oxford, Malden, MA.

<sup>7</sup> Translation from Spanish to English edited by the author.

<sup>8</sup> These “silences” appear to be particularly meaningful if one takes into consideration, for instance, the cancelation from maps of ethnical minorities and/or native communities, completely neglected during the colonial partition of the “conquered” territories and in border disputes.

### 3.1

#### Community-Based and Collective Mapping: From Power to Empowerment?

Indeed, according to Farinelli's reading of Benkler's thinking<sup>9</sup>, technology has produced and enhanced new spaces for social practices and interactions, restructuring the public discourse in a way that allows individuals to interact with power in a completely different and unprecedented way, thanks to ICT communication means. This could happen because Internet, as the first modern form of mass-communication, has expanded its own radius of action, decentralizing its structure of information and culture production and sharing.

In this sense, the accessibility to the cartographic information, due to opening of new social spaces operated by technology and networks, leads to the possibility to produce and share cartographic images which are no longer an exclusive and "private" property of political entities and powers, but which are open and free to public and collective use. Thus, it is possible to notice that maps are becoming no more tools of power, but means of social and political "empowerment" for those who participate to this process of knowledge-sharing.

In this light, some interesting experiences of *community-based mapping* and *participatory-GIS* have been recently explored: the role of "non-expert" map-makers in the construction of data-bases and drawings is assuming more and more relevance, above all in relation to the theme of territorial development and environment and landscape protection. Platforms like *Locast*<sup>10</sup> and *Open-street-map*<sup>11</sup> and many more are being designed with a user-based approach, in order to allow a variety of different editing and drawing possibilities.

Despite some criticism and scepticism (Turco 2010, p. 255) towards participatory practices and experiences of map-making and planning, it is worth noticing how some expediencies of common-based peer-production mapping are gaining importance, not only in the western and developed countries, but even more broadly in some former colonial territories.

From this perspective what seems to be more remarkable is "... the role of survey and mapping as active practices in the overseas expansion of early-modern Europe, re-examining the way that maps acted as a medium through which knowledge of unknown places was constructed in a dialogue between (often fantastic) European expectations and imaginings on the one hand, and autochthonous experience on the other" (Cosgrove 2008).

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<sup>9</sup> Benkler Y (2006) *The Wealth of Networks How Social Production Transforms Markets and Freedom*. Yale University Press, New Haven and London, p 271, 30, 31.

<sup>10</sup> <http://locast.mit.edu/>

<sup>11</sup> <http://www.openstreetmap.org/>

### 3.2

#### **MULTIMAP. Regional W Park**

In this light one relevant experience, combining both the technical and technological perspective and the hands-on and participate dimension in a non-European context, is the project “MULTIMAP. Regional W Park”<sup>12</sup>, a multimedia platform designed and promoted by an international network including SIGAP Onlus, The World Conservation Union (IUCN), Italian Cooperation and European Union Program PRPW/ECOPAS (Ecosystèmes Protégés en Afrique Sahélienne).

The main purpose of the project is creating an information system for data collection on the socio-territorial aspects of the Trans-boundary Biosphere Reserve of W, at the border between Bénin, Burkina Faso and Niger. The platform, in fact, is drawn on an apparatus of images that includes participatory maps (at local level) and GIS thematic and operational maps (at national and regional level).

The research project and the participatory survey was conducted between 2001 and 2004 by a research team of geographers of the Università degli Studi di Bergamo in collaboration with the researchers of the University of Abomey/Calavi (Cotonou, Benin), the University of Ouagadougou (Ouagadougou, Burkina Faso) and the University of Abdou Moumouni (Niamey, Niger) (Ghisalberti 2006).

The project involved a two-phases on-site research, involving local populations in a process of data-collection and map production. It consisted in a survey among the local and migrant population living in villages round the reserve, in order to enhance new aspects of the territorial organization and of the exploitation of natural resource.

The participatory mapping allowed to add supplementary information and in-depth arguments not only the territorial organization, but also the set of values and knowledge of local communities (Ghisalberti 2006, p. 997). The final product of the research was a series of maps produced on GIS, on the base of the information collected during the fieldwork and the participatory mapping phase and published on MULTIMAP platforms, together with other media.

The above-mentioned issues raised by Turco (2010, p. 251) appear to be particularly relevant in this context: “how to map the others’ views and reasons? How to remain faithful to the plots of negotiations, deliberative ideals, without transforming power relations in drawings of domination?”

The MULTIMAP project seems to suggest a possible “direction” to overcome these arguments, by rather assuming and placing a variety of different perspectives (local communities visions) into a larger institutional frame. Nevertheless, some questions and critical points remain open, such how to properly “translate” participatory maps, drawn on paper by local communities, into a GIS-based platform.

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<sup>12</sup> <http://www.multimap-parcw.org/> (accessed on 30 September 2013).

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## 4 Some Conclusive Remarks

The paper seeks to synthetically draft a possible reading of the role of maps in the construction/representation of power in Western societies, according to Foucaultian power/knowledge nexus, further stressed by other authors in the cartographic field. In particular what emerges is a complex intertwining of different issues related to social, symbolical and political connotations of cartography both as a tool at the service of political power and, at the same time, as a mean of empowerment for people within our networked society.

Starting from the first quotation by Harley, at the beginning of the introductory paragraph, the paper tries to concentrate on some crucial questions: is it still true that the power of maps is concentrated in the hands of political entities? Or can we observe a paradigm shift in the use of “cartographic knowledge”? And if so, can we look at maps no longer (or not only) as tools of control and surveillance, but also as means of empowerment for a broader community of “non-experts cartographers” in a networked society?

The reflections proposed in the paper aims to discuss these broad questions and following a precise theoretical path that, starting from the de-constructivist and post-colonialist theories, propose a socially-oriented reading of the past and present role of cartography inside society and in relation to political power.

Within a broader context the progressive spreading of new cartographic forms, tools and practices performed by “non-experts” map-makers, is producing a change in the way we look at power and (cartographic) knowledge. Contemporary (peer-based) cartography, as a powerful iconic language and as a flexible interpretative tool, seems to open a search for new languages more comprehensible for a larger “community” of map-maker”.

A conclusive remark follows the direction traced by Turco (2010) in his clear critique of the general label “participatory cartography”, beyond which often lies a series of superficial interpretations and readings of the territory, without a specific and profound knowledge of local contexts.

On the other hand, the risks of ideological manipulations, misunderstandings and bias of the geographical information are unavoidable outcomes the value and socially oriented nature of cartography.

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# E-Planning: The Digital Toolbox in Participatory Urban Planning

Annalisa Lodigiani

The introduction of digital and mobile technologies has profoundly changed everyday life transforming the way people communicate and interact with one another, but also the way of consuming/producing services and experiencing places.

Consequently, architecture, urban design and planning approaches have been changing too: from the integrations of *media* in architecture and in product design (*urban screen* and *media facades* to offer new services and information to the public), to the planning and management of the Sentient and Smart City, thanks to *remote sensing*, *crowd sourcing* or, generically, user-generated content. However, although the concern of the inhabitants in their environment has becoming one of the favored topics for discussion on the web (Luehrs 2008), the most sophisticated applications have been made for leisure purposes, then for spatial decision-making. Therefore, the paper will discuss opportunities as well as disadvantages of the use of innovative technologies as tools for enhancing levels of social collaboration in urban planning.

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## 1

### Web 2.0 from Entertainment to Urban Planning

In front of the increasing growth and complexity of our cities, a challenge is to understand how we can use digital media technologies and principles from online culture to design livable cities and to engage citizen with issues at stake in their cities (de Lange 2011).

Several different disciplines, such as geography, computing sciences, social sciences, architecture, environmental psychology, have seen digital tools and urban informatics as a playground for research, developing software programs and applications in own specific field of interest.

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However, extensive understanding of the digital tools and methodology in urban planning has not yet emerged and the field of participatory urban planning has remained quite stable for the past twenty years (Wallin et al., 2010): “Among numerous existing map mashups, we did not find any that are included formally in a planning process, let alone any that relate to the deliberative element in planning” (Rotondo and Selicato, 2011).

As the current methods have insufficiently supported the democratic participation, researchers has started to explore the *opportunities disclosed by new technologies*: “the web-based methods can make participation more democratic than the traditional approach, because they free participation from the limits of time and place, and they can potentially reach large numbers of inhabitants anonymously” (Kahila and Kytä 2010).

Thanks to applications of *urban and community informatics* and the appropriation of *ubiquitous computing*, communities have recently made *intriguing use of various technologies to drive participatory planning* (www.wearefuturegov.com 2011) and the stakeholders have shown to be eager to act locally on an ad hoc basis and to channel their activism through the Internet (Wallin et al. 2010), which is become the most important knowledge building environment in today’s world (Staffans et al., 2010).

In this way, from the beginning of the 21st century a “*digital citizenship*” has started to emerge as the ability of citizens to effectively participate in social activities in real time via data networks; it could be defined as “the ability to participate in society online . . . It represents the capacity, belonging and potential for political and economic engagement in society in the information age” (Mossberger et al. 2008).

This idea has emerged in a context of a relevant revolution in government-to-citizen relationships. Under the recommendations of the European Union and the United Nations, the so called e-government/governance, Open Government or Gov 2.0 has grown roots and borne fruit in communities worldwide calling agencies to focus on transparency, collaboration, and engagement, i.e. involving citizens by making use of technologies and web platforms (www.wearefuturegov.com 2011).

Inside the *e-family* other concepts have arisen tided to e-governance, such as e-democracy, e-participation and e-planning, even if it is not usually included, as a field still in construction (Saad-Sulonen and Horelli 2010).

“Instead of simply planning on behalf of the public, there is an increasing effort to involve the public from the beginning of the planning process. This “engaging” approach to planning has been referred to as “Planning 2.0” and makes extensive use of collaborative technologies like participatory Geographic Information System (GIS) and crowdsourcing platforms” (www.wearefuturegov.com 2011).

So, authors have tried to keep order in the fuzziness of digital terminology (Medaglia, 2007), distinguishing *participatory urban planning* from proper *e-planning*:

- *Participatory urban planning* means in general a planning approach that advocates and facilitates the inclusion of stakeholders in the planning process.
- *Participatory planning* becomes *e-planning* when participatory activities are expanded beyond face-to-face interaction to include ICT-mediated interaction that

is independent of spatial and temporal constraints. Participatory e-planning can be defined as a socio-cultural, ethical, and political practice in which women and men, young and older people take part online and offline in the overlapping phases of the planning and decision-making cycle. It can take place via the internet or other digital and non-digital means (Horelli & Wallin 2010).

Technical possibilities for this already exist. Recent experiences of *collaborative web-based efforts* have enabled amateur to create and share theme-oriented geospatial information and suggestions (Rotondo and Selicato 2011), allowing citizens to act as urban planner (Horelli and Wallin 2010). The basic challenge is to genuinely link planning-related local forums or mapping platforms to the actual decision-making process as part of the openness and transparency of governance.

Planners should eventually get familiar with online interaction with *digital citizens*, and mainly with the “born digital” generation, that expect the same kind of high-quality usability, flexibility and reliability from electronic services provided by public administration as they do from commercial services; they are not satisfied simply by reading articles, but they want to comment on and add to the knowledge itself (Staffans et al. 2010).

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## 2

### **Suggestion Box Takes a New Dimension: from Website Forum to Social GeoWeb**

*E-Planning* is a field where the strengths of *e-Participation* can be displayed to best advantage:

- a more heterogeneous group can be engaged, made of young, middle-aged and busy inhabitants, while older people dominate in public hearings (Kahila and Kittä, 2010; Chow, 2011);
- relevant information, including geographical data, can be provided and displayed visually through real-time and intuitive platforms;
- contextual local knowledge can be collect in the forms of pictures, voice stories, text;
- feedbacks and suggestion can be gathered on a scale that that is never possible in a town hall meeting or neighborhood.

But, when we speak about ICTs in participatory urban planning, we refers to a very wide range of tools.

Starting from *web sites* – which can have an *informative*, *archivist* or, better, a *discursive* role, providing an arena for discussions concerning the neighborhood and urban projects (*Lillhent Forum* in Finland; the website of the development plan *LivingBridge* in Hamburg; the US crowd sourcing website *GiveeAMinute!* on transportation issue) – e-planning is evolving, developing platforms which allow people to report problems, urban experiences, memories, ideas, etc.. Citizens can enter them into a map, visualize and share it via social media. Nowadays, thanks to mobile de-

vices (smart phones and tablets) they can add they comments and suggestions on planning issues at any time, with a more spontaneous and active participation (Höfken 2012).

Official portals of *digital mapping*, combined with user-generated contents – such as SoftGis used in some municipalities in Finland (Kahila and Kittä 2010) – seem to be the desiderated evolution in institutional activities of what Turner called “neogeography”: “geographical techniques and tools used for personal activities or for utilization by a non-expert group of users; not formal or analytical” (Turner 2006). In other words, the term “*neogeography*” has been adopted to describe people activities when using and creating their own maps, geo-tagging pictures, movies, websites, etc; a bottom-up approach to geography initiated by users (Rotondo and Selicato 2011).

Exept few experiences, the *Social GeoWeb* (Höfken 2012) has been mainly reduced to a worldwide proliferation of “*potholes reporting*” portals, since the platform *fixmystreet.com* to the dutch version *verbeterdebuurt.nl*.

However, there are case studies that have taken a relevant step forward.

The better Social GeoWeb platforms, as SoftGis, provide complete web site and social media presence, where inhabitants can go to read updates, get in touch with policy makers and, to ensure that planners receive targeted, they can place-specific comments and suggestions utilizing online maps; otherwise suggestions can also “float” if they are not location-specific, as when they deal with a whole neighborhood. Planners will benefit from this tool that allows a geographic perspective, as well as spatial collecting and analyzing of input (*www.wearefuturegov.com* 2011).

But what about platforms for interactive co-design of urban environment and effective visualization of development proposals for evaluation?

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### 3 The Challenges of Effective Visualization and Co-Design

In participatory planning effective communication and universal accessibility are underpinning principles of the process (Lange 2000; Chow 2011). The tools showed previously, achieve the essential tasks that are demanded to the use of new media: providing a communication platform which suppresses a barrier of non-professionalism and allowing distant contacts and enabling participatory process management (Hanzl 2007).

Nevertheless, they are based on 2-D maps, with the addition of texts, pictures, renders, etc.

However, representing a city on a map to communicate variations to its citizens may not be the most appropriate form of language (De Filippi and Balbo 2011) even because 2D plan remains mainly recognized as way of presentation of planning regulation (Hanzl 2007). Three-dimensional models, photorealistic rendering, virtual reality and augmented reality certainly encourage individuals to pay more attention, to feel engaged and perhaps to take an active role (De Filippi and Balbo 2011).

As Lange stated “We are living in an *era of visual communication*. If the planning disciplines want to be better understood by the public, they have to work with and in the three-dimension – the real world is three-dimensional as well” (Lange, 2000). Consequently, in the planning and design disciplines, such as landscape and urban planning, digital 3D-visualizations have gained increased recognition, even if loosely integrated in the planning process and thought of as *a sometimes expensive supplement to sell the final planning product* (Lange 2000). The research work of *Laboratorio di Simulazione Urbana “Fausto Curti”* has again and again shown that there was a risk of using three-dimensional visualization: potential manipulation, which could be misleading (An, 2005).

The techniques for the visual representation of *3D models* are static pictures, animations and Virtual Reality.

Static pictures, as elevations and 3D presentations of a project show a site as seen by a static observer and are the most conventional form of presentation (Hanzl 2007). Dynamic simulations as animated 3D graphics show it as seen by a moving observer. This is the most effective form of presentation of planning solutions because it has the great advantage, that the observer is not limited to certain predetermined viewpoints. Instead the observer can move around freely, choosing what to see and from which direction; thus such presentation remains interactive and it can be accessible via web (Lange 2000; Hanzl 2007). Examples of the use of multimedia 3D models are the project of Park Noerrebro in Copenhagen Woodberry and Down project by CASA\_University College London (Hazel 2007).

Still Lange has pointed out that even the best simulation is only a representation of the real world “A virtual walk-through is not the same and will never be the same as a real walk in nature”.

If, on one hand, researchers are developing ubiquitous platforms where inhabitants can receive information, add their knowledge and opinion, and interact with projects at any time and everywhere, on the other hand they are trying to fulfill another requirement: “Participants are fascinated with the possibility of exploring an urban project on site, being able to simultaneously see the visual and the real scene” (Maquil et al. 2007).

*Urban Sketcher*, a Mixed Reality application, has been designed to enhance collaborative interaction on urban design among stakeholders in real-time, while visual feedback is given to all participants on a projected live video augmentation. Transposing the basic idea of video-based painting in a collaborative outdoor situation, this tool allows users to directly alter the perceived reality by sketching on canvases in a video see-through augmented representation of the urban scene (Sareika and Schmalstieg 2007).

This doesn't happen in a lab but on the site of the urban reconstruction, under a tent that incorporates MR as well as conventional planning activities and that allow to see and feel the real urban context. However, while we have previously affirmed that 3D realistic representations and explorations of projects are the most effective way to communicate and engage citizens, *Urban Sketcher* has made a different choice. According to Lange, it can be argued that even simulation with a lower degree of realism can still contain the most important information needed for a specific pur-

pose (Lange 2000). “In the conceptual phase of design, architects often make quick sketches rather than accurate scale drawings. Sketching has interactive qualities because it can be performed during a discussion, and informative sketches can also be created by lay people to a certain degree. Therefore, we decided that a sketch-based interface would be most appropriate for the intended use” (Sareika and Schmalstieg 2007).

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## 4

### Is Augmented Reality the Future?

If Urban Sketcher prefers the easy real-time interaction and the modification of the urban project, at the expense of realism, the emerging technology of mobile phone *augmented reality* is expanding the currently available planning and design toolkit, allowing to provide an view of proposed changes, with a *good realism degree* and *inside the real context* of a fuller ambient array of sensory experiences (Lange 2011). Considering the ubiquitous access that people have to mobile phones with 3D capabilities, and given increasing access to high-capacity mobile phone networks, it is likely that augmented reality could be the tool adapt to fulfill the desire of the digital born generation. In fact, in a paper that examines *Landscape and Urban Planning's* articles on landscape visualization published over its 99 volume history, Lange asks to the community of landscape and urban planners and designers, how to cope with the expectations of a *new cohort of visual sophisticates* who play with 3D computer, watch the weather forecast together in 3D on a new 3D TV screen and enjoy a multi-sensory 4D cinema (Lange 2011).

Recent researches seem to confirm the potentiality of the use of augmented reality in participatory planning, even if this tool is in very initial stage of experimentation and very little scientific works have addressed AR visualization of building models in planning process (Olsson et al. 2012; Allen et al. 2011; Graham 2011; Jeffries 2012).

On the other hand, AR applications on mobile phones have become almost a commodity, with consumer applications such as Layar, Wikitude, Junaio etc. displaying information of nearby services and events.

Consequently, first case studies have chosen mobile phone as the appropriate device not only because they are hand-held and have efficient enough processing power, but they also have integrated camera and GPS functionality. Additionally, mobile phones – being personal devices – could be used for urban planning visualization purposes as stand-alone applications by any stakeholders or end user groups (Olsson 2012), obviating the need of specialist hardware, as in Urban Sketcher (Jeffries 2012).

By overlaying the real world with digital information, augmented reality software creates a geometrically accurate composite of the physical and the virtual. Instead of decrypting the complex technical language of a proposal document or base opinions on deceptive artist's sketches and render, anyone can visit a development site, whips

out a handheld device and gets an instant impression of how the building will look in that space when completed (Jeffries 2012).

Compared with other augmented reality tools, mobile AR applications will eventually encourage greater public engagement giving anybody (with access to a smart phone) the ability to participate in urban planning events, in their own time, and without the need to attend formal or prearranged meetings or presentations. And, to increase much more the willingness to participate, researchers are working toward a version of software that could be angled at the public and that should include a voting function.

Allen, in New Zealand, has already experimented a feedback function, so relevant for users (Allen et al. 2011; Jeffries 2012; Olsson et al. 2012), while the case study of the former factory area of Billnäs in Finland (Olsson et al. 2012) and the report of Prof. Lange with his lecture, have given back interesting evaluation results.

The main strengths underlined by users are: a natural and easier device; an ‘in situ’ approach that allow *awareness of one’s surroundings and viewing the real background*; a more comprehensive understanding of the plan in general, the interrelations of the planned buildings (e.g. relative locations and proportions, also including the volume and height), and how they appear in the environment from a citizen’s perspective on the ground level. Looking at the several weaknesses mentioned by the citizens, the main claims relate to the low detail of the architecture, the locations chosen to view the model – too far –, the impossibility to use the AR actually anywhere (Olsson et al. 2012) and as Lange said during his lecture even if mobile phones have the great advantages to be handy and widespread, their screen has appeared too much small. So, researchers see in the future new possibilities from the use of tablets.

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## 5

### Conclusions

To briefly conclude this report on the use of the *digital toolbox in participatory planning* it can be useful stressing again a question pointed out in the first part of the paper. Nevertheless participation is a widely accepted principle and the opportunities offered by digital technologies take up newspapers and scientific journals, case studies of e-planning are few and scarcely embedded in real planning process.

In fact, against the strengths of this approach, it has to be said that the possibility offered by web 2.0 to every citizen to become a producer of geographical information could take planning action and debate in to a *information overload* (Rotondo and Selicato 2011; Kahila and Kytä 2010). This “data deluge” is hard to manage even with an efficient tag system because summaries of posted information are usually difficult or impossible to generate (Rotondo and Selicato 2011). Inhabitants substantially add qualitative information in descriptive forms (stories, anecdotes, examples, memories of the past, and so on), which are difficult to be “processed” and to be used as operative indications for the planning actions. Moreover, the manage-

ment of this kind of processes is generally a highly time-consuming operation for the participants and facilitators.

Therefore planning professionals appreciate local knowledge – even if it is challenging the monopoly position of expert knowledge – but they are so far unable to use the information in the planning process and surprisingly, little consideration has so far been given in planning theory to the impact of the social media on urban planning expertise and on the future of the planning institutions (Staffans et al. 2010).

Other critical aspects concern the difficulties encountered by participant. The concept of digital divide is no longer a problem of connectivity, but it can be redefined in relation to discrepancies in cognitive parameters among community. People are more or less capable of using ICTs and related applications depending on the cognitive they dispose; that is normally related to age, social milieu, cultural factors and education.

These differences raise democratic problems: “the prospect of ‘smart city’ in a digital divide context suggests that democracy in the interactive space could be heavily undermined” (www.paritechreview.com). Nevertheless the geographer Jacques Levy has put into question the capability of technological devices to enable “a representative picture of the population since, like in other classic consulting processes, it was always the same people who spoke”, others researches shown that these tools are used and are designed to be used by *unheard voices*. The access to planning process can be limited by many factors such as lack of time, money, characters (shyness, etc.) while the use of digital platforms and tools opens the process to an heterogeneous public and, more and more, is specifically targeted to young people: “Youth involvement can be an opportunity to develop civic skills and virtue in the adults of tomorrow” (Chow 2011).

However a significative problem is the fact that the computer or smart phone mediated environment is certainly colder and less stimulating than a traditional face-to-face meeting. And even if the use of the chat function could alleviate the monotony of a computer mediated session, the lower level of interaction occurring among participants, is aggravated by the lack of feedback among participants, which could only be provided at the end of the round of answers (Rotondo and Selicato 2011).

In conclusion, participation remains a great challenge even with the aid of digital technologies – which has opened a new *Pandora's box* – and participation in urban planning remains a not so developed chapter in the most part of Smart City programs all around Europe<sup>1</sup>.

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<sup>1</sup> With the exception of few case, such as the interesting case of *Malmö with its Living Lab the Neighborhood* (see Unsworn Industries (2009), Imagine potential futures with Malmö's New Parasopes, <http://www.unsworn.org/>).

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# Crowd Sourced Maps: Cognitive Instruments for Urban Planning and Tools to Enhance Citizens' Participation

Cristiana Mattioli

For centuries, mapping activity has been carried out by experts, in particular for military purposes or land administration, infrastructure planning, and environmental monitoring. It was only within the last decade that technological innovations in computer science, positioning, and navigation devices have facilitated citizens direct involvement in urban mapping. In particular, crowdsourced mapping shows potentials for urban and participatory planning. It allows people to create and share geographical information with few costs and expertise. Real-time data collection can have different aims: thematic map creation, collective story-telling, or social empowerment and counter-geography. Some critical points still exist. However, virtual maps can be considered alternative tools to enhance civic participation and to identify spatial and social opportunities for urban transformation.

## 1

### Introduction

For centuries, mapping has been carried out by experts who followed mapping and quality assurance procedures. They were mostly trained professionals working for military interests or cadastre and civilian authorities responsible for land administration, infrastructure planning and environmental monitoring. It was only within the last decade – from the launch of Google Map in 2005 – that citizens themselves have started to become involved in mapping activity. Technological innovations in positioning and navigation devices and in computer science have set the conditions

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for this shift: the emergence of portable and cheap GPS receivers, web 2.0 technologies<sup>1</sup>, and communication networks (Internet).

Various terms have been coined for these collaborative mapping-activities, such as *neogeography* (Turner 2006), *GeoWeb* (Batty et al. 2010), *volunteered geographic information* (Goodchild 2007), *crowdsourcing geospatial data*.

The field is constantly growing and has lots of potential for mapping. In fact, these kinds of map are relatively *cheap and real-time updated*, two important characteristics that traditional systems lack.

The paper focuses on collaborative and participatory mapping. After a short introduction to crowdsourcing approach in geography, the paper considers some international and Italian *experiences of collaborative geographical data collection*<sup>2</sup>. They show how people's involvement can have *different aims*: open maps creation, counter-geography and empowerment building, design proposals collection, urban monitoring, community identity narration, etc. The main purpose of the present study is to evaluate the *potential* of these tools for urban planning and social participation. Nonetheless, the paper identifies also some *critical points* that need to be faced by the discipline.

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## 2

### User-Generated Geographical Data and Crowdsourcing

Following Turner, “essentially neogeography is about people using and creating their own maps, on their own terms and by combining elements of an existing toolset. Neogeography is about sharing location information with friends and visitors, helping shape context, and conveying understanding through knowledge of place” (Turner 2006, p. 3).

Also, Goodchild says that “volunteered geographic information (VGI) [is] a special case of the more general Web phenomenon of user-generated content [...]” (Goodchild 2007, p. 212) that allows non-experts' engagement in mapping.

Crowdsourcing<sup>3</sup> is a term derived from outsourcing, used to describe a form of collective and shared work. In front of a difficult and expensive task, the collaboration of big groups of users can allow the detection of creative solutions.

At least, two major definitions of the term “crowdsourcing” can be identified.

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<sup>1</sup> “The term ‘Web 2.0’ (2004–present) is commonly associated with web applications that facilitate interactive information sharing, interoperability, user-centered design, and collaboration on the World Wide Web.” (Batty et al. 2010).

<sup>2</sup> The experiences presented in the paper are maps that use existing accessible geographic representations, like Google Map or OpenStreetMap, and customize them adding new contents via GPS or mobile phones connected to Internet.

<sup>3</sup> The term, coined in 2006 on Wired magazine, refers to a form of user's engagement and interaction that exploits what Surowiecki calls *The Wisdom of Crowds* in his book of the same name (2004). “Crowdsourcing operationalizes crowd wisdom, and it is a mechanism for leveraging the collective intelligence of online users toward productive ends” (Bradham 2009, p. 10).

1. Crowdsourcing “is an appropriated model for enabling the citizen participation process in public planning projects” because it “can mobilize citizens, foster creative inputs in combining everyday and local-based knowledge and expert one, and produce plans through democratic processes which more accurately address our lived experience within organized networks” (Brabham 2009, p. 7). In fact, the author imagines an open and transparent relationship between authorities and citizens. Once the firsts have clarified and crowdsourced urban problems, giving all the instruments and documents for their study and comprehension, inhabitants might be able to find *creative solutions* thanks to local knowledge and collaboration. *Bottom-up proposals* will be then shared online and voted by other users; the winning ones will be implemented by the city, also combining two or more of them. The collective contribution can also be extended to fund raising, promoting projects’ sustainability and feasibility.
2. The term “crowdsourcing” “describes also data acquisition by large and diverse groups of people, who in many cases are not trained surveyors and who do not have special computer knowledge, using web technology.” (Heipke 2010). This definition interests the collection, organization and distribution of user-generated data that are mostly individual. These information can inform planners and authorities of urban practices, identities, perceptions and desires. At a basic level, individual reports can contribute to services’ and spaces’ implementation. Moreover, they can reveal existing resources and people’s expectations – important materials for the urban project.

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## 3 Crowdsourced Maps: An Overview

### 3.1 Crowdmap as a Platform for Local Urban Governance

Starting from the idea of Kickstarter.com, a platform where people can propose ideas and projects and collect money to realize them, Dan Hill and the finnish Sitra group conceived a website that allows inhabitants to make urban design proposal for their neighbourhood or city.

If traditional consultation can generate negative engagements, stigmatized in the NIMBY positions, *Brickstarter.org* tries to reverse this approach promoting YIMBY (Yes In My BackYard) movements around bottom-up suggestions and projects’ implementation (Boyer and Hill 2013). The aim of the website is to enhance citizens’ *empowerment* and participation in decision-making process, together with *institutional responsiveness*; finally it practices *participative governance*.

As the website explanation says, Brickstarter is a forum for citizens, a public story-telling platform, a community fundraising tool, and a *real-time dashboard* where institutions can map collective desires and proposals. It makes easier and

faster the *connection between citizens and institutions* and encourages their cooperation.

The website uses *social networks and mobile apps* for collecting possibilities and transforming them into proposals, sustained by activism; then, it manages and gives visibility to urban projects that can be financially sustained by people<sup>4</sup>.

Organizer team offers *professional skills* related to design process (time program and permits information). In doing so, planners concretely set the conditions for bottom-up activism and facilitate people encounter. Interested citizens can decide the degree of their involvement: they can support the project with their vote; they can organize meetings and working groups; they can even finance the realization with money or offer personal work.

As correctly Lange says (2012), Brickstarter goes beyond virtual dimension because it seeks to increase community *aggregation and socialization* and has an impact on physical world. Indeed, collective interactive maps and participatory platforms can be seen as a kind of “public space”, or more correctly an “anteroom” of real public spaces, where citizens/users can express their feelings and ideas about the city and transform it through virtual representation (Di Siena 2011).

### 3.2

#### Crowdsourced Thematic Maps

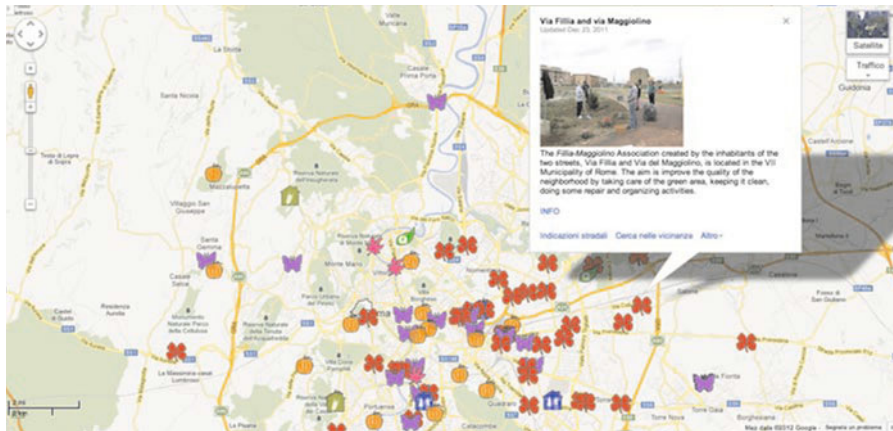
Crowd-mapping are based on people’s involvement. People’s participation can be strengthen acting on personal interests and preferences. This aspect is evident in thematic crowdmaps, such as maps concerning *urban agriculture* and *urban abandonment*. These two topics are particularly relevant in contemporary cities but sometimes not appropriately treated by local authorities – mostly because they are first raised by bottom-up interventions.

*Urban agriculture* has to face constantly the topic of optimization and exploitation of (non-used) areas in the city. It means that urban or territorial programmes (set by municipalities or NGOs) need aerial maps where fields and associations can be geo-localized and shared online in order to develop the *network* (Lotus International 2012).

Two Italian NGOs have launched mapping activities on urban agriculture.

*Zappataromana.net*, a research project of Studio UAP in Rome, identifies and maps 66 community gardens, 57 orchards, 30 “spot-gardens” made by local associations and citizens. These information are combined with the localization of urban farms, community centres and collective projects for the maintenance of green spaces (Fig. 1). Finally, the map gives a *wide representation* of urban agriculture phenomenon in the city of Rome – which is the first agricultural municipality in Italy.

<sup>4</sup> Crowdfunding is a collaborative process in which people can support organizations and projects with their own money. The main principles of crowdfunding can be found in Falossi’s *Kapipalist Manifesto* (from the name of the website Kapipal). Crowdfunding web platforms facilitate the encounter of demand and offer around projects’ fund raising. They can treat several domains or focus on a specific thematic. “Equity-based” crowdfunding has recently been regulated in the United States (Wikipedia source).



**Fig. 1** The map about urban agriculture in Rome collects and shows 153 collective green spaces (accessible at [www.zappataromana.net](http://www.zappataromana.net))

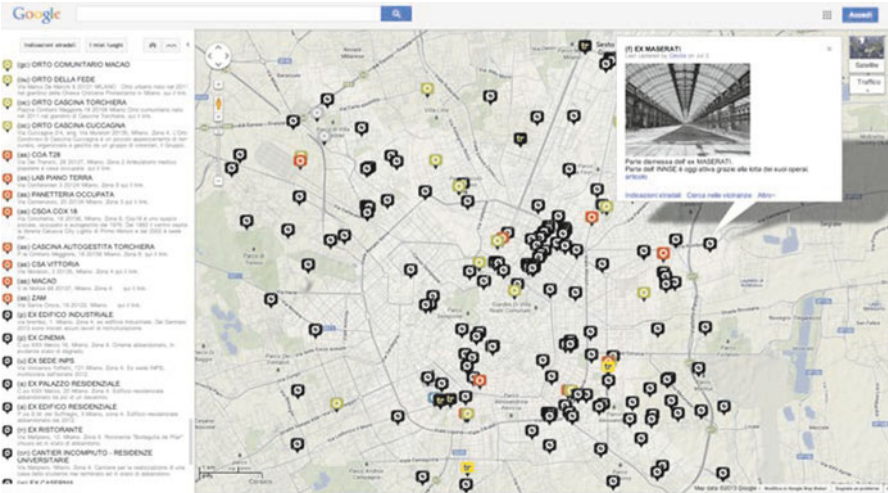
The website, together with its Facebook version, is now a focus of the activities and the projects led by different associations in the different places.

The map of *Ortodiffuso.noblogs.org*, the project led in Milan, follows the same criteria, giving *written and iconographic information* about the projects of the census. The aim here is *to reveal and quantify* the projects of urban agriculture, even the private and small ones conducted on individual bases (on the balconies).

Developed by an activist, several groups and associations then concentrated around the bottom-up mapping process. Finally, this experience played an important role in the formal recognition of community gardens done by the municipality, which now uses this cartography as a database.

The two maps on urban agriculture presented here are *constantly updated by their curators*. In fact, users are not allowed to edit the map directly; they can report local activities sending an e-mail to coordinators or they can ask to be inserted in the curators' list. Allowing a complete control on data, these procedures obviously have the advantage of increasing the accuracy. At the same time, they may discourage spontaneous and discontinuous participation.

On the contrary, other maps are thought to be *interactive* and can be directly edited and updated by users. It's the case of the map done by *Temporioso.org*, an association and research group based in Milan that works on *urban abandonment*. The aim of quantify and localize neglected buildings is combined here with the need to create a platform where *offer and demand* of empty spaces can meet (Fig. 2). People looking for a working or recreational place can contact Temporioso and ask for their *intermediation* with private and public owners. The long activity of the group has already brought to a project of temporary reuse of a former industrial area, conducted together with the municipality of Sesto San Giovanni, nearby Milan. Working spaces have been rented to young designers and the industry has become a creative place, open to the city. Recently, the association has signed a partnership



**Fig. 2** The map of *temporiuso.org*: localization of abandoned building and reuse projects in Milan

with the municipality of Milan with the purpose of analysing the existing situation and detecting opportunities for cultural and social reuse of public empty properties.

The role of the association is not limited to mapping activity; they also build public calls and manage the entire process of reuse. Aware of the limits of virtual involvement, team architects and mediators directly stimulate people's engagement promoting *meetings and events*. During the last year, *Temporiuso* has organized several bike tours in the city districts with the aim of discover new abandoned spaces, gather stories and memories of local people and enrich the crowdmap.

The association is becoming an institution and “infrastructure” within the city. It stimulates the dialogue between authorities and bottom-up experiences. For this reason, the map collects now different dimensions and degrees of urban abandonment and reuse, including squats and open spaces' re-appropriation.

The three experiences presented here are more than thematic crowdmap creation. Collaborative mapping has attracted and catalysed interests and energies, stimulating broader projects related to urban dimension. In particular, the associations promoting mapping have rapidly become local, and even national, references for the peculiar thematic they treat. This common element seems to be significant: it shows how crowdsourcing can effectively gather people and create “communities of interest” around concrete urban issues.

### 3.3

#### Counter-Geography

Through web 2.0 tools, people share more and more information about *local urban places*, frequently in a fragmented and disorganized way. Hence, planners started

to understand the important role of new means of communication, like Facebook, Twitter and geoblogs. These softwares are more and more used now to stimulate the *evaluation of everyday life spaces and urban projects*, in particular focusing on specific themes, like environment and facilities.

A specific application of crowdmapping concerns *counter-geography*.

Counter-mapping deals with the possibility to create cartographies alternative to formal and official ones. Especially in contests of informality, this means revealing the complexity of stories and practices taking place in the “blanks” of the map. It is a *political discourse* because spatial omission of informal settlements is still an instrument to avoid debates on public policies and resources’ distribution (and to confirm slums’ illegality), a powerful signal of the non-integration and *recognition* of some inhabitants (De Carli 2012).

Projects of crowdmapping that take place in informal settlements request a *necessary cooperation* with local associations and inhabitants. Also, experts are needed to teach people how to use technologies and organize their contribution.

The experiences presented involved mostly young people and children, asking them to make some reports on environmental conditions, local services and community spaces.

*Locast* is an open platform created by MIT Mobile Experience Laboratory.

It is a *location-based media platform* that can be used for different purposes. In this paper, it’s interesting to deepen its application to *social empowerment* and *urban quality improvement* analysing the Rio de Janeiro project. Together with UNICEF, Locast team worked for some months with *young inhabitants* of five *favelas* in the Brazilian city. Using mobile and web technologies, the project helped youth build impactful and communicative digital maps, which represent *environmental risks*.

UNICEF had the aim to detect problems related to urban life quality and safety and solve them with *physical and specific interventions*.

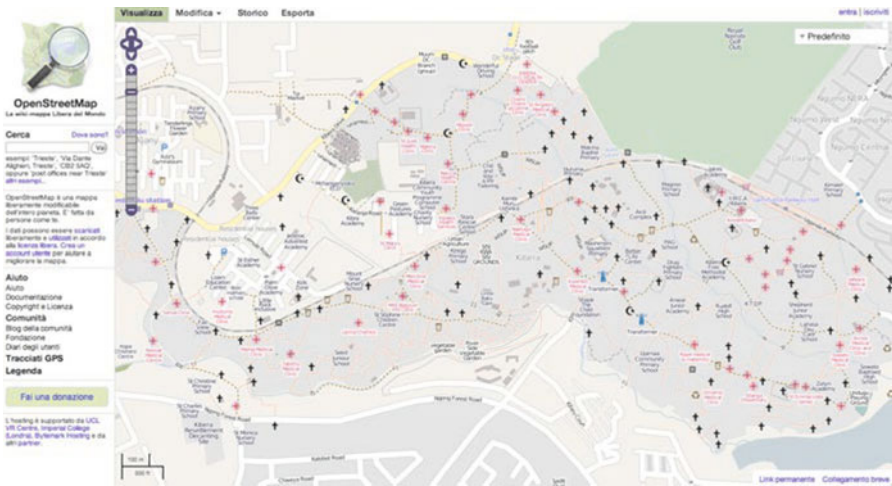
Finally, the mapping project created the conditions for a true empowerment of the population and made the people more *responsible* of their neighbourhood. Also, the project produce a *real-time portrait of the community* through geo-located images and videos, made by participants and inhabitants.

*MapKibera.org* is a project made in Nairobi, Kenya, with the aim not only to reconstruct a map of the biggest slum of the city – and of Africa –, but also to *make visible* a big group of unrepresented citizens. The map shows the context of their everyday life and their non-official *re-appropriation practices*.

The collective map creates a *new territory* where material and immaterial spatial dimensions stay together and can be evaluated as *opportunities for future transformations* of the urban area (De Carli 2012). In this sense, the map can be a *research tool* for the identification of urban issues (Fig. 3).

However, the map can be also considered a *political instrument*, a product that can be used by inhabitants and NGOs to ask for urban quality improvement.

If we consider the *process*, the map was a *medium* for the construction of *social relations* inside the slum community. More, the relational work with local community creates a sustainable group of *map maintainers*, encourages the cooperation of people and the sharing of information.



**Fig. 3** Mapkibera project worked on the OpenStreetMap geographic database and updated it defining streets, services and community spaces located inside the slum

Finally, the bottom-up map created a *new collective imaginary* of the slum inside and outside it (*Ibidem*, 2012).

### 3.4 Crowdsourcing and Collective Story-Telling

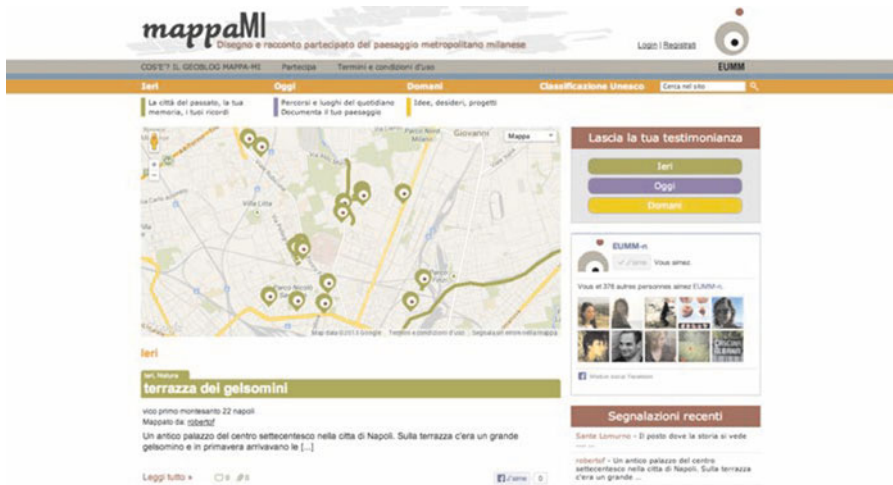
As we saw, crowdsourcing activity can allow the collection of urban information about *alternative and unconsolidated identities and imaginaries*. In this sense, it can become an import *cognitive instrument* for planners and politicians: a way to synthesize collective feelings, perceptions, aspirations and problems and to recognize significant and attractive places inside the city (Di Siena 2011).

Interactive maps seem to be a way *to reinterpret the spaces of everyday life*, especially combining objects, people, spaces and relations (Villa 2011).

Crowdsourced maps can indeed be used as a tool to collect geo-referenced memories and stories inside *cultural and local valorization projects*.

An interesting and innovative example in this sense is the experience of the *Eco-museo Urbano Metropolitano Milano Nord (EUMM)*. Together with the creation of the urban eco-museum in the northern part of Milan agglomeration, the cultural project is made of a participatory geo-blog called *MappaMI* (realized in collaboration with the Politecnico di Milano). It gives citizens the possibility to upload (digital) *traces and narratives* about their neighbourhood. The community map gathers *past, present and future* stories, perceptions, suggestions and impressions in the form of “pins” related to images, videos and written descriptions (Fig. 4).

Through this *dynamic and temporal* map the EUMM represents what the UNESCO has defined as “immaterial cultural heritage”: the combination of building and



**Fig. 4** MappaMI website: the creation of a collective story-telling around the crowdmap (mappa-mi.eumm-nord.it)

monuments with oral languages and stories, local art craft traditions, public events and collective representations and knowledge.

#### 4 Critical Points and Limits

Nowadays non-experts can create their own high-quality and no costs map with any particular expertise. What is sufficient is to obtained coordinates using GPS or by finding them on free database such as Google Maps or OpenStreetMap.

User-generated maps usually do not conform to the protocols of professional practice. However, crowdsourcing also fosters the “ability of a group to validate and correct individual errors” (Goodchild and Li 2012).

Besides critical points related to security, confidentiality and privacy (Batty et al. 2010), what seems to be relevant for the discourse of collective participation in decision-making processes is the “digital divide” issue (accessibility). Even if the spatial diffusion of Internet has enormously increased, remote areas may not be reached or may still have slow connection. Also, some populations, like elderly people or lower incomes, may not have the possibility or the capacity to use these devices. For these reasons, web technologies must be seen as an *integration* of traditional participative approaches and some investments have to be put in the *enlargement* of the users’ arena (Brabham 2009). In some cases, it is possible to create Internet access-points in public spaces, such as libraries and public offices, and provide staff helping users. Related to this, it’s essential to underline that the use of

*English language* in many crowdsourcing platforms can be an additional limit to global participation.

If we consider these technologies as complementary tools for traditional participation, however, we have to face the problem of *people's involvement*.

According to some studies reported by Heipke (2010), for open contribution systems, 90% of the users only consume the information, while 9% contribute occasionally and only 1% is constantly active in adding contents. Some measures for increasing participation are then suggested: to make it easy to contribute; to edit, don't create (to provide templates); to reward contributors and to promote quality contributions by reputation ranking (trust building). Moreover, large amount of data seem to depend on population density, interest and income.

As the experiences presented in the paper show, at a local level *direct relations and public events* still count and can increase virtual involvement. Even if we speak about crowdsourcing, it's important to remember that the role of *mediators and curators* can be quite important and significant in driving collective contributions and set the aims of the projects.

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## 5

### Potentials for Urban Planning

Despite the lack of quality assurance and the incompleteness of volunteered geographic information, crowdsourced maps seems to have potentials in relation to urban planning and public participation improvement.

Collaborative maps have *few costs* and can be *constantly updated* by participants on numbers of topics. They can be *temporal* and *dynamic* and they can provide *new type of data* (also related to feelings, emotions, practices, etc.), as the experiences related to collective narratives show. Moreover, being informal, they don't need to cover global or national scale; they can be *more accurate* at a local level than authoritative representations.

Urban planning can benefit from crowdsourcing activities in several ways.

First of all, collective data can be used to enlarge and deepen the awareness on spatial phenomena. Often, public authorities do not have up-date representations of spatial transformations or do not make them accessible. For example, if we consider the case of urban abandonment, it is clear that collaborative mapping can fill a void that is almost insurmountable for public research (especially in the present condition of resources' scarcity). In this sense, collective maps represent an important *cognitive instrument* for urban planning.

Considering the complexity and plurality of contemporary societies and territories and their rapid transformations, dynamic collaborative cartography seems to be one of the most appropriate ways to represent the reality.

Subsequently, the paper shows that maps can participate to a *political discourse* around the future of the city. In fact, maps not only represent the reality, they are also able to transform people's behaviors and perceptions of urban places. They can

offer an instrument with which setting up a shared spatial and social protest (De Carli 2012), starting from the existing resources and problems. In this sense, cartography is a tool to *collect opportunities* (such as vacant lots, abandoned buildings, bottom-up activism, etc.) for urban projects' improvement. More, it fosters civic responsibility around common issues and contributes to the definition of *new identities*. Synthetically, it increases social and spatial *awareness*. Indeed, collective mapping activity reveals to be an important *tool to enhance civic participation* in decision-making processes concerning spatial transformations.

Urban planning has to face these issues, not only designing connected public spaces (with wireless infrastructures), but also creating open virtual platforms for citizens' *information, participation and expression*.

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<http://www.unicef-gis.org>  
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# Post-Optimal Cities or: How Architects Learned to Stop Worrying and Love the Network and Vice Versa

Paolo Patelli

With this article, I would like to sketch out a few of the relations we can currently see emerging across a number of metropolises: looking from within the broad socio-cultural condition here referenced as “network culture”, across the new geographies of the networked public sphere, and in the use of urban social spaces, a new culture of participation, which is performed through often mediated acts of augmentation, collaboration, confrontation and appropriation, is challenging the traditional role of public space, the disciplinary methods of urban design, and forces us to face larger issues about decision-making, governance, and, ultimately, democracy. In other words, what follows is a tentative exploration of the interlocked, equivocal relations between both fleeting and structural socio-cultural aspects of the network society, inertial practices in public spaces, contemporary models of governance and – again – their spatial presence.

Firstly, I will outline the framework of my propositions, referencing the paradigmatic socio-cultural shift associated with mobility and with the pervasive concept of the “network”. Then, I will briefly describe some of the implications of such transformations on the ways public spheres, urban publics and networked publics are produced. Afterwards, I will address the shifting role of public spaces in the experience of everyday urban life and in the constitution and upkeep of urban communities. I will conclude with a brief description of the protests in Taksim-Gezi Park, Istanbul, which started on 28 May 2013.

Throughout the article, I will hint to the possibility of alternatives to the prevalent rhetoric of the “smart city”, tentatively sketching what could be called “post-optimal cities”: while the emphasis in public debate is still on making cities more functional through the deployment of ever new technologies, what can we envision beyond plain efficiency?

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**1****From Mobility to Networking**

We are in a moment where we all witness a massive convergence of society, culture, politics, places and things – via the medium of the Internet. Beside the rather technical maturing of web and mobile technologies, in fact, we are observing the slow development of a new and broader societal condition, a paradigmatic cultural shift affecting our economy, public sphere, culture, even our subjectivity. In order to escape from the usual “eternal present” of unmindful spectacle and consumption, which deprive us of any history (Virilio 1997), as well as from timeless categories, which have never really been (Jameson 1990), it should be important to look at such socio-cultural change in context, not focusing on specific new technologies – which can only be always relatively so – and focusing on longstanding social, cultural, technical and material domains. Kazys Varnelis named such historical phenomenon “network culture”, making it different from the more familiar definitions of “digital culture” and “network society” (2008). Employing Charlie Gere’s discussion of Digital Culture, in fact, Varnelis argues that whereas “the digital” is fundamentally based on a process of abstraction that reduces complex wholes into more elementary units, in today’s culture, connection is more important than division: information is less the product of discrete individual units, than the outcome of networked relations and links between people, machines and places (2008). Moreover, whereas in Castells’ and Sassen’s interpretations of the network society, the production and the transmission of information on networks are the dominant organizational paradigm of the world economy (Castells, 2000; Sassen, 2001), the network today goes even further, extending deeply into the domain of culture. In contrast with the – now *passé* and archaic – idea of Cyberspace, which gave way to the imagination of a global mind, hyperconnected and infinitely powerful (Berardi 2011), digital media and network technologies are now part of the performativity of our everyday life. In fact, and even though networks are not at all new or unprecedented, they are colonizing our life to such degree that it is impossible to separate out technology from our *self* anymore. The phenomenon of Web 2.0 in particular, marked by the rapidly evolving domains of e-commerce, social media, and social networking, have affected and reshaped how we form communities and cultures, forge social structures, utilize resources, and engage in politics (O’Reilly 2005). As the Internet has become the backbone of communication, commerce and labor, the public transformed as well, now inhabiting multiple, overlapping and global networks such as user forums, Facebook, Twitter, Foursquare, Flickr, blogs, and wikis.

There is a parallelism here with the idea that (im)mobilities produce and organize social life across distance, forming (and re-forming) its contours through a subtly choreographed (re)configuration of people, objects, and places (Sheller and Urry 2006). I see such phenomenon as part of dwelling and place-making, but of course it has been noted that it contributed to converting open public spaces into interstitial crossing points, emptied of any social meaning (Augé 1992; Secchi 1993; Secchi 2000). While urban life and urban experience were always synonymous with a partial dissociation from the constraints of locality (Picon 2005) – today, the corpo-

real travel of people for work, leisure, family life, pleasure, migration and escape is not just coupled to imaginative travel, through talk and images of places and peoples appearing on and moving across multiple media, but also to communicative travel, through person-to-network contact, mediated through the Internet and the social web.

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## 2

### **Cities, Beyond Efficiency**

The rapid urbanization across the globe creates multiple challenges in planning, development, and operation of cities; a key idea is currently to find ways that data and information from the city is systematically monitored and used to manage the city more effectively economically and environmentally (Ratti et al. 2006). This explains why IBM, Cisco, General Electric, Siemens and many other global companies have become all at once interested in cities and their destiny: they like to portraiture any urban future as “smarter” – being the ones in the position to supply the necessary hardware, software or related services: sensors, actuators, processing power or analytics, for example. The urbanized portion of the world is indeed increasingly covered and wired up by networks of several kinds (optical fiber, 4G, WiFi, sensors) and is finally becoming something resembling the open-air computer envisioned by many radical architects of the 60s. Environments can be programmed and services made more efficient, from many points of view. This is a great commercial opportunity and, as big companies entered the stage, a formerly radical discourse on the (often uncanny) relationships between people, technology and environment, is actually moving to the mainstream, driven by technology and market interests only.

Whereas determinist assumptions and language saturate the writings of many technology advocates and the business pages of many popular magazines, throughout this article I assume that a society’s technology alone does not drive the development of its social structure and cultural values. It is, rather, an “intertwining”, whereby technology does not determine but operates, and is operated upon in a complex social field (Murphie and Potts 2003). Moreover, following the theory of social construction of technology, the ways a technology is used cannot be understood without understanding how that technology is embedded in its social context (Bijker et al. 1987).

From this perspective, it becomes evident how a social construction, adoption and adaptation of new communication technologies cannot point solely to developments in the direction of what has become to be known as “smart cities”, a technocratic dream of a fully manageable and controllable urban system: the ubiquitous deployment of information technologies not only afford new levels of efficiency, pushing us towards “optimality”, but offer new platforms for social engagement and action, whose spatial and architectural implications are still matters of speculation. The possibility of imagining and prototyping what I call post-optimal cities steams from the affordances of a network culture and moves beyond functionalism, entailing and

resulting from augmentation, collaboration, confrontation and appropriation. New techno-social practices are showing the potential to generate new hybrid spaces and forms of public participation that reconnect the material dimensions of urban public space with the affordances of the networked public sphere.

To move away from the focus on technological systems and seamless design, an ethical shift, in considering “what a city is” is implied: as Dan Hill puts it: “We don’t make cities in order to make buildings and infrastructure” (Hill, 2013); with an exponentially increase of the world population – soon to reach 8 billions – the most important environmental qualities are people (Branzi 2010). Pervasive Computing and the Internet of Things, instead, rather than putting the humane at the centre of their vision, appear today to engage citizens as consumers. People could instead be seen as active and productive nodes in the vast network that comprises the city. The situated interactions of individuals and groups of citizens, across the geographies of public spaces, shape experiences, imaginaries and identities which are not only dependent on construction and transformation; they are built phenomenologically and performatively, and are increasingly affected by memory, perception and attention – the domains of information. The challenge, for both citizens and designers, cannot be limited to crafting individual experiences, nor to building a sense of community at a local level in the city, and should extend to reawakening meaningful public space and public life in the city as a whole.

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### 3

#### Typologies of Situated Interactions

Public life – and in particular political life – as Hannah Arendt has described it, pretends careful attention to geographical considerations and to the virtues of particularity (1958). Following Arendt, Kenneth Frampton criticizes contemporary architects who emphasize the envelope, leaving the tectonic form and the spatial aspects of the built form aside. What is missing in these cases is the ‘space of appearance’, a term derived from the philosopher’s “The Human Condition” (Arendt 1958; Frampton 1979). For Arendt, the space of appearance corresponds to the *polis*, to that space “where I appear to others as others appear to me.” Such public space of appearance can be always recreated anew wherever individuals gather together politically, that is, “wherever men are together in the manner of speech and action” (1958, pp. 198–199). However, since it is a creation of action, this space of appearance is highly fragile and exists only when actualized through the performance of deeds or the utterance of words. Its peculiarity, as Arendt says, is that “unlike the spaces which are the work of our hands, it does not survive the actuality of the movement which brought it into being, but disappears [...] with the disappearance or arrest of the activities themselves. Wherever people gather together, it is potentially there, but only potentially, not necessarily and not forever” (1958, p. 199). The space of appearance must be continually recreated by action; its existence is secured whenever actors gather together for the purpose of discussing and deliberating about matters

of public concern, and it disappears the moment these activities cease. It is always a potential space that finds its actualization in the actions and speeches of individuals who have come together to undertake some common project. It may arise suddenly, as in the case of revolutions, or it may develop slowly out of prolonged change. Historically, it has been recreated whenever public spaces of action and deliberation have been set up, from town hall meetings to workers' councils, from demonstrations and sit-ins to struggles for justice and equal rights (d'Entreves 2008).

The questions, for architects and urbanists, are many: what are the characteristics of these spaces of appearance? What affordances should be put in place? How to triangulate with contextual conditions and especially with the other proper instruments of the public sphere – media? Frampton writes that the stress on place may be construed as affording the political space of public appearance as formulated by Hannah Arendt (1979); examples from the architectural history could range from the intercolumniation in the temple at Thebes, where the hypostyle is announcing the sacral space, to the Greek theatre, where the body politic could gather and transcend everyday life – the life of necessity or labour, as Arendt calls it. In fact, not only provides the Greek theatre a place to make this possible, it also expresses it in its tectonic form, as its form is a representation of the absent collective body. Frampton argues that such a conjunction between the cultural and the political is difficult to achieve in late capitalist society, and among the occasions on which it has appeared on more general terms, he gives recognition to the development of Bologna in the Seventies, when an appraisal was made of the fundamental morphology and typology of the city fabric, and socialist legislation was introduced to maintain this fabric in both old and new development (1979).

Probably not by chance – it cannot pass unnoticed today that Bologna in the 70s was the city where the Italian post-workerist and autonomist movement merged with counter-cultural students' movements, giving rise, in the streets, to a moment of bright and violent burst of collective political imagination (Lotringer and Marazzi 2007). Autonomists in Bologna formulated the concept of immaterial labor, carried out in Mario Tronti's social factory – this analysis lies at the root of the critique of MySpace, Facebook and other social networking sites as exploitation of the free labor of users to frame ads.

Frampton adds as a counterpart that “the universal Megalopolis is patently antipathetic to a dense differentiation of culture”, as it intends the “reduction of the environment to nothing but commodity”, consisting of “little more than a hallucinatory landscape in which nature fuses into instrument and vice versa” (1983). The sole possibility of resisting the rapacity of this tendency lies in the cultural precept of ‘place’ creation; the general model that he proposes is the enclave – “the bounded fragment against which the ceaseless inundation of a placeless, alienating consumerism will find itself momentarily checked”.

Frampton, in his analysis and critical manifesto, remains attached to the materiality of architecture or, more generally, to that of the built environment.

The new urban society – on the contrary – is often represented as one where the physical basis of sociability is declining, in favour of less material, delocalized, far-ranging systems and social networks (Picon 2005). Considering the spatial di-

mension of the public sphere, nevertheless, does not imply that we should conceive the architectural object exactly in the same light as we used to: Antoine Picon suggests that a whole set of problems that were usually considered as minor should be integrated: “we need to blur the frontier of the architectural object, a little like what contemporary philosophy and cultural theory have done with the subject, from Deleuze to Latour and Sloterdijk”, “to explore the multiple ways that it extends beyond his or her body. The architectural object is no longer to be conceived as closed upon itself. It is as much a network, a series of concentric circles. Such a reading will provide a new take on architectural complexity, as well as performativity. It is through the multiple channels that relate it to its context that architecture truly performs” (Picon 2010).

Lewis Mumford, on his part, noted already in the 1960s that because of faster transportation systems and transforming time geographies of work and leisure, public spaces were undergoing in North America important transformations in their social functions, fostering ever more articulated reflections on their design. The characters of urban settlements were changing, responding to transformations in many social practices, which were already waning or shattering in myriads of paths, following mutual relations and dependences on specific places and objects at considerable reciprocal distances (Mumford 1961). From the background of a society traditionally represented as organically unified, innumerable and irreducible subjects emerged; they brought their heterogeneous instances and requests to the foreground. Also in Europe, collections of paratactically juxtaposed objects simultaneously implied the shattering of inhabited space, and a new expanded use of urban and suburban space; between objects and places, everyone was following their own itinerary, from personal origins to equally specific destinations (Secchi 1993). The automobile transformed social interactions and their physical basis – the urban settlement – right after the Second World War, the Internet did it the Nineties and again with its subsequent: across a network of networks, communications, multimedia production and playback capabilities associated with digital media are changing the way we experience the city. Nevertheless, among discontinuous traces, fragments that are hard to reassemble, something shows a different inertia: the ground, its textures paths, the system of open spaces and collective spaces. Next to the hypertrophic substitution of images and texts, open space tends to be more stable: in such spaces society recognize their past, in open spaces long-lasting practices unfold: rites in which society recognize its identity and stability (Secchi 1993; Secchi 2000). For Richard Sennett, “one of the key issues in urban life, and in urban studies, is how to make the complexities a city contains actually interact” (Sennett 2011), and it could be argued that indeed the contemporary development of electronic networks has privileged the interpretation of public space as a sphere of interaction; as much as I agree I also think that a second key issue is how to maintain a clear direction, while running the risk of Brownian-like agitation, in a world that shows a fundamental lack of inertia, sensitive to micro-change (Picon 2010). The traditional city was already full of events, but they were counterbalanced by a lot of inertia, beginning with the built objects and spaces. What Antoine Picon calls the city of event perspective, is fostered by the pervasive presence of fleeting digital media. What opacity – rather

than transparency – can we adopt as stabilizer of urban life and urban experience? Is it possible to reinvent media not as a tool for ever-closer-to-immediate interactions, but to act as frontiers, as thresholds, as obstacles, within the unfolding geographies of flow? A challenge to thinking of the relation of architecture and events is that of public space: as an enduring framework that is used habitually, architecture provides an obvious basis for a contextual approach to design such interactions. Architecture serves the body and not just the gaze; it is not just perceived, but inhabited, and it surpasses most other technological productions at institutionalizing spatial arrangements to the extent that they shape cognition (McCullough 2004). A culture's inertial spatial forms perpetuate a particular cognitive background – architecture has to be appreciated when is memorable – what about media?

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#### 4

#### **Conclusion: Taksim and Gezi Park**

On the morning of 28 May 2013, around 50 environmentalists are camping out in Gezi Park, Istanbul, in order to prevent its demolition. The protesters initially halt attempts to bulldoze the park by refusing to leave. Police use tear gas to disperse the peaceful protesters and burn down their tents in order to allow the bulldozing to continue. The day after, the size of the protest grows exponentially, with online activists calling for support against the severe police crackdown (2013 Protests in Turkey).

On June 4, a solidarity group associated with the Occupy Gezi movement, Taksim Solidarity, issued on the Web several demands: the preservation of the park; an end to police violence; the right to freedom of assembly; the end of the sale of public spaces, beaches, waters, forests, streams, parks and urban symbols to private companies large holdings and investors; the right of people to express their needs and complaints; a discussion about the third airport in Istanbul, the third bridge over the Bosphorus, the construction on Ataturk Forest Farm, and the hydro-electric power plants (Taksim Solidarity Press Release 2013).

These two maps – partial, as every maps – are both global perception maps and maps of individual experiences in Istanbul, during the 2013 protests. They are produced by digital technologies and represent occurrences, events and situations, rather than objects, arrangements and organizations: something that happens rather than something that is following traditional ontological categories (Picon 2010). They are between the scale of the city and that of the individual. They visualize the spatial distribution of geolocated content shared on social media by common people in Istanbul during a huge political protest, sparked by shared affection for public space and for the publics, then scaled enormously to challenge the current political regime. How can traditional planning and design react when confronted with urban publics that are both plotted and somewhat unpredictable? The affection of urban space and the affordances of the networked public sphere certainly do have a role, beyond both functionality and spectacularisation. Now it's time to test design.



**Fig. 1** Map of Istanbul consisting of 48 hours of geolocated tweets (June, 2013). Taksim Square is indicated with the white circle. Although there is a clear density around Taksim, it is also very evident that people tweet most from the bars and clubs along the Bosphorus. Tweets are color-coded for the time they have been sent



**Fig. 2** The larger Istanbul area consisting of 48 hours of geolocated tweets (June, 2013)

**Acknowledgements** Data visualizations of digital geo-located content generated by users and shared on Twitter during the 2013 protests in Istanbul have been kindly provided by LUST (lust.nl). The experiment in data gathering and visualization is an early result of \*UrbanSensing, a larger research co-funded by the European Union's Seventh Framework Programme.

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# The Innovation of Technologic Tools in Images Production: An Answer to a New Sensibility Towards Complex Visualizations

Matteo Giuseppe Romanato

The progress of innovation in land mapping and in space representation is not a process without ties with the request advanced by the social sensibility towards technology. It is a course of development in fact which, besides the last amazing outcomes, has always walked side by side with the history of representation and the concept of space as well.

Two among the main features demanded from the digital resource are nowadays the temporal structure for a predictive perspective and the ability to reproduce an immersive context. But, contrary of common opinion, they were already displayed during the XIX century. In the romantic English garden design it was essential to show the proposed changes in the landscape before and after the work. The immersive environment was already present in the “Panorama” where a continuous circular landscape was painted inside a round-shaped building. These experiences must not be intended as merely business class entertainments but more as feedbacks to a precise landscape sensibility which could not be satisfied anymore by the usual static and enframed pictures. And this continuous evolution of people’s expectations is nowadays testified by the experiences of some contemporary museums installations as well. We can so build a parallel with present day and the emerging of the landscape ecology in the last decades. This, with its complexity of natural and anthropical references, started to breed ways of landscape representation more and more advanced and technologically sophisticated. The birth of the “International Association for Landscape Ecology” (IALE) in 1982, with the purpose to study the ecology of spatial configuration at the human scale, can therefore be considered as symptom of a new sensibility toward the protection and the recovering of natural environment, prelude to new forms of representing, evaluating and monitoring the landscape also through more refined digital equipments. But these new technologies, even if in pursuit of likelihood and communicativeness, are quite far from eliminating ambiguity. On the contrary they

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raised again complex issues. Among these topics we can find some important epistemological questions that can be enlarged also to traditional representation. Concerning this Stephen R.J. Sheppard tried to focus the question and resumed the debate about the three principles of validity, reliability and ethics in visualization. These issues are growing in importance with the increase of productions of renderings and digital images in a bottom-up process that drove the web to be a depository for environmental representations sometimes of excellent quality. All this sides of the evolving situation are so evidence of the pregnancy and the fluidity of present (but also timeless) topics on which researchers and scholars are still focused and working.

One of the most widespread phenomena of the last years is definitely the increasing interest for environmental quality and for the ecological sides of the urban and land space. Events such as the “N.I.M.B.Y.” syndrome (Dear 1992) or the protests and mass arrests due to demonstration against the cutting for forest industry (Magill 1992) are the evidences that a new sensibility is nowadays a well shared common element which public opinion takes into account considering the transformation of its space.

So the monitoring and the preservation of landscape is a key point for an acquainted body of citizens since the first nineties. But this issue cannot be reduced only to a form of selfishness or to personal interests. Separating this phenomenon from the rise of a new look toward space and environment could lead to misunderstand the complexity of the relationship between the symbolic values of the perceived space and reality. The way we perceive and consider the space is so worth investigating.

Our perception of the space outside our body is one of the most debated issue of all the times but recent studies about human perception focused on the multidimensional aspect of sensorial experience (Lewkowicz, Ghazanfar 2009) and of course the importance of the five senses are present in a lot of cultures. So this complex stratified frame of our world perception is starting to be studied also by designers in developing their works (Signorelli 2013).

Many recent examples can be quoted about it. More and more numerous exhibitions, organized presentations and displays of a selection of items involve different senses. In Milan recently we must report the case of the “Sensible museum of the roman theatre of Milan” where exploring the rests of the roman theatre under the stock exchange building the visitors can perceive the noises and the smells connected with it (Muscatiello, Guercio 2000).

But if we have a glance just backward to the past we must consider that the multi-sensorial experience is nor new nor limited to western civilization. The ceremonies, events and festivities, down to the last detail of the designs of the baroque era already focused on it according to the “Gesamkunstwerk”<sup>1</sup>. Moreover eastern cultures found the fascination of stimulating the different senses. Some really interesting and enjoying experiences can be reported here. We can go from the Topkapi library in which

<sup>1</sup> For this term definition see also: Wagner R (1849) *Die Kunst und die Revolution*.

every book was perfumed according to its content till the “ocular” harpsichord by father Castel discussed by Diderot in his famous letter about deaf and mute people<sup>2</sup>.

Anyway, although considering the synesthetic experience an important part of the aesthetic values than people can look for in the environment, it is matter of fact that most of our impression of surroundings comes from sight (Bruce et al. 1996) through our eyes. By the way this modern consideration finds besides a peculiar agreement with the famous definition in Aristotle’s gnoseology “The soul never thinks without a mental picture”<sup>3</sup>.

From this point of view it is evident that new technologies and digital ways of representation can allow a more precise and efficient visualization of phenomena that must be the key point for every scientific enquiry. It is a matter of fact that nowadays scientific and technical community has come to depend upon scientific visualization also in a lot of not spatial domains according to the last developments of the image semiotics (Eugeni 2013). Fields as mathematics, biochemistry and others need most of times a digital shape or a model to make visible otherwise invisible aspects of nature or logic. The visualization of atomic orbitals or the intersection of curves in the space are well known ways to perform in a comprehensible pattern very complex and specific problems.

But if we refer to space and land survey we can focus better our attention on the new perspective shown by the possibilities of new technologies to represent landscape in a new way. Augustin Berque claims that a landscape civilization can exist only when a landscape thinking is well developed but this needs some conditions among which he finds a very important one: the existence of pictorial representations of landscape (Berque 2008). This is not the place where to discuss whether or not Berque must be contested in his results but we should admit that representation of landscape is one of the main step to start considering it a topic.

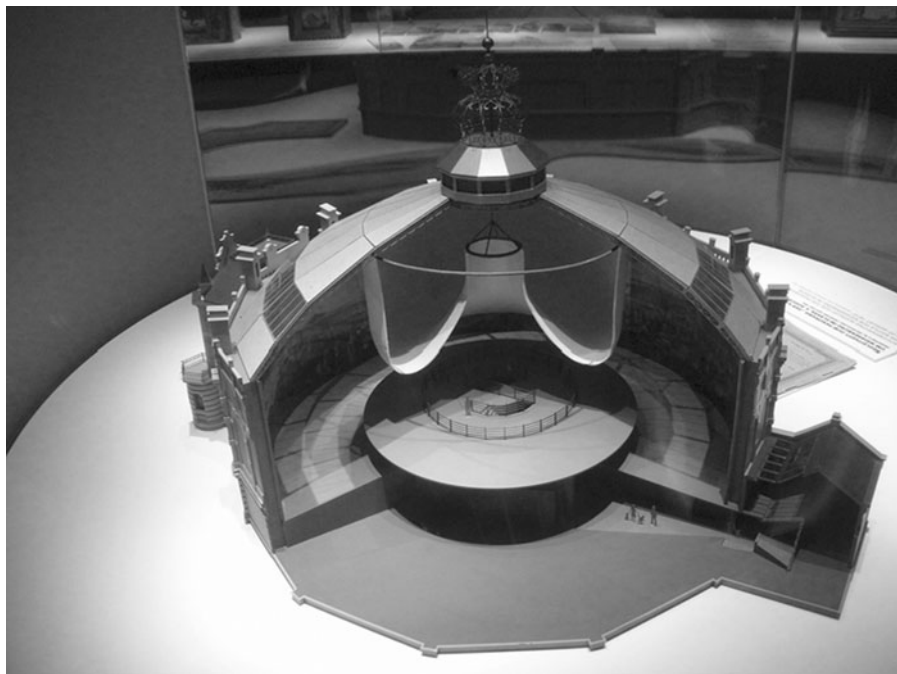
All the history of landscape painting anyway was about a static and not-immersive representation of places. Both bidimensional and tridimensional representations offer not-dynamic and circumscribed phenomena of spatial extension. So the latest technologies are the last step of an hard route to complexity whose two of the main elements are the passage to time related performing and around the observer depiction. One of the major examples of the first issue can be referred back to Frederick Olmsted and to his famous design of central park in New York<sup>4</sup>. On the footsteps of the Humphrey Repton’s Red books<sup>5</sup> he showed the existing situation in comparison with the new project through drawing both ones in contrast together. This contribution must not be misunderstood because it is a great attempt to introduce the fourth dimension into representation although limited to a first and after situation.

<sup>2</sup> Diderot D (1751) *Lettre sur les sourds et muets à l’usage de ceux qui entendent & qui parlent*, France. Modern edition available in: Hobson M, Harvey S (eds) (2000), *Lettre sur les aveugles à l’usage de ceux qui voient suivie de Lettre sur les sourds et muets à l’usage de ceux qui entendent et qui parlent*, Flammarion, Paris.

<sup>3</sup> Aristotle, IV Century B.C., *Per’i yuq=h* (On the soul), Modern edition available in: Sachs J (ed) (2001) *Aristotle’s On the Soul and On Memory and Recollection*, Green Lion Press.

<sup>4</sup> Beveridge CE, Schuyler D (eds) (1983) *The paper of Frederick Olmsted*, vol. 3, creating central park, 1857–1861. John Hopkins University Press, Baltimore, London.

<sup>5</sup> Repton H (1803), *Observations on the Theory and Practice of Landscape Gardening*.



**Fig. 1** Modern reconstruction of a XIX cent. “Panorama”

A second important step is the invention of the “Panorama”. It can be considered a good evidence of the necessity to introduce immersive vision in landscape reproduction experience<sup>6</sup>. The past techniques needed to build specific buildings devoted to this purpose but it is not probably a pure chance that nowadays panoramas have a revival in some museums where, besides the traditional exposition spaces and paths, new buildings are starting to be added to collections in order to reproduce not only the works of art or historical legacy but also to involve visitors to the atmosphere and life of past civilisations. One of these examples is the panorama recently build in Berlin Pergamon Museum where the artist Yadegar Asisi<sup>7</sup> created a re-enactment of the ancient metropolis adding more the variation of the daylight according to the running of time, sounds and effects to reproduce, as far as possible, the sensation of being in the old Hellenistic capital.

This two sides of the representation proposals (the time evaluating process and the immersive faculty for the observer) are, in a certain way, a new approach to the relationship between the reality and the public. The great difference between these two ways of painting the landscape and the previous ones is considering the viewer no more a “user” of the representation technique but an active protagonist of the viewing process.

<sup>6</sup> Comment B (2000) *Das panorama*, Nicolai, Berlin.

<sup>7</sup> Asisi Y (2004) *Architekt der Illusionen*, Faber + Faber, Leipzig.



**Fig. 2** An interactive experience in contemporary museums (German Film Museum in Frankfurt)

The evolution of sensibility and public expectations has never stopped in last times as, just in the footsteps of Pergamon Museum, every exhibition has tried to intercept new ways to engage visitors through technology. One of the most dynamic institution is, for example, the German Film Museum of Frankfurt where even a simple chroma-key system put behind visitors can offer an interactive experience to enthusiastic people through a green screen (Pantone 354) and a digital camera.

The emerging of new expectations can so lead us back to the starting question about the new sensibility toward the protection and the recovering of natural environment and the new form of representing, evaluating and monitoring the landscape.

The necessity to preserve or to recover natural landscape rose up in the early seventies just to coincide with the emerging of the environmental question. Until those days in fact ecology was still an academic issue<sup>8</sup> but since it has spread into society it has reached popularity and started driving the perception and the consideration of natural space as a resource, a complex system and a valuable heritage to save. So a branch of ecology started to be really important and it was the so-called landscape ecology.

Landscape ecology was born in Europe about historical planning on human-dominated landscapes but then it was developed in America integrating heterogene-

<sup>8</sup> Odum EP (1966) Ecology, Holt, Baltimore.



**Fig. 3** A computer generated 3D landscape. Author: Gary R. Huber. Source: <http://www.3dnworld.com/gallery.php?user=GHuber>

ity in space and time and considering the integration between human and natural stations. It soon started including human-caused landscape changes in its survey (Sanderson and Harris 2000).

By the eighties landscape ecology was an established, discipline. It was testified by the birth of the “International Association for Landscape Ecology” (IALE) in 1982 with the purpose to study the ecology of spatial configuration at the human scale. This approach is particularly important because it marks one of the steps of the changeover from a concept of landscape intended as an historic and aesthetic space to a more scientific group of relationship among living species, human beings, ecosystems and natural phenomena.

This passage consisting in the rescue of a biological and ecological value of landscape is crucial and dramatic because it points out a radical change in the mental concept of land, forest, natural sources among people.

We can now build up an interesting parallel with the XIX century. Humphrey Repton in fact had to demonstrate through representation that his design for the English-style gardens did not reduce the aesthetic potential of the previous natural landscape by showing a before and after transformation. This operation was so indispensable because his customers recognized the value of the land in its natural state (and that is the fruit of the new romantic sensibility) that could be empowered or lowered as well.

In the same way the “panoramas” could offer a new view of the cities involved in the first expansion of the bourgeois age. Cities that could not anymore be perceived only through their main monuments but enclosing all the space in transformation.

These two references are now useful to demonstrate that in the same way a new form of representation of space is needed to come to a point of contact with this kind of new way to look to the environment we referred about the emerging of landscape ecology. It is not here to questioning if the new mental approach generates the new way of visual technique or vice versa. What is important is to analyse the strict relationship that the two elements have together.

What we have defined as an innovative approach to natural landscape is pretty displayed by the perception of modern industrial harvesting techniques in the forestry industry. These ways of cutting trees, particularly the so called clear-cutting, are now considered against the principles of sustainability and both responsible for the landscape damage of woods especially in North America. The research on public’s negative reactions in America (that, as we announced, can be considered a part of the new exploit of the better known in Europe Nimby syndrome) produced some works concerning the effort to minimize the disadvantages of people’s reactions (Magill 1992).

The old way to represent proposed landscape changing due to wood harvesting and the consequent re-growth by silvicultural rotation were considered obsolete. It was in fact a normal landscape composed by simple symbols of trees put on the surface of land in order to quantify how many trees were involved in the process (Miklestead, Wagar 1977). This representation could no more satisfy people.

The key point in this kind of representation is perhaps vegetation. Plants and trees with their fractal geometry of leaves and branches offer probably the most complex and challenging space to representation techniques. In common experience, although sometimes it is very difficult to distinguish a building rendering from a photo, it is almost always easy to detect the difference between an artificial image of a tree and a real picture of it. The variety of forms, dimensions, geometries and the range of species of trees or types of wood in a park or in a forest are definitely the core of their visual fascination. This great variety is just the object of study of landscape ecology. The great value devoted to biodiversity of species is what makes the difference between the request made to representation techniques in the past and nowadays ones.

There is in fact more than one way to represent vegetation and landscape. Plants and trees are usually portrayed through texture maps on polygons (billboards). But another solution is using model based on polygons to reproduce the geometry of vegetation (Raffye et al. 1988). Of course the different techniques can be merged together as always in the past has been done. Few people know for example that many movie backgrounds were often paintings on canvas added in postproduction<sup>9</sup>. One of the last solution in fact is combining different levels of abstractions at different stages of the modelling and rendering process (Deussen 2003).

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<sup>9</sup> For example the bay landscape in Hitchcock’s “The Birds”.

From what we have said just above it is clear that the new request to technology is to find out ways to describe in complete, comprehensible and time-evolving applications the possible situations in forestry, agriculture, landscape in general and so on. So computer-aided visualizations should be used to answer questions that range from the functioning pattern (ecological point of view) to the appearance (look point of view). The effect of digital revolution on images production and on computer-generated contents can intercept the new way to think over the environment by offering an extremely sophisticated outcome in terms of richness of visualizations and complexity of models.

If this is evident we must answer what is utility of visualization for environment.

Eckart Lange and Ian Bishop (2005) tried to find out the questions that nowadays visualization needs to answer by proposing the aims visualization should be useful. For these authors such purposes are understanding environmental mutations before they occur, helping people to take decisions for the future and deepening the knowledge of the relationship between people and their environment.

Referring all these problems only to sight does not simplify the question of course. But, although we quoted some example of the plurality of senses in human experiences, it is clear that the human strong trust in the eyes is still a powerful tool in analysing world. This because our sight is not only a source of aesthetic pleasure but also an instrument to structure decisions, to take choices, to judge policies and orientations.

Herbert Simon (1976), the founder of the concept of organizational decision-making focused his attention on the structure of choice in human beings and societies. He claims that every decision should be based on three framed questions: the identification and listing of alternatives, the determination of all the consequences resulting from each of the alternatives and finally the comparison of the accuracy and efficiency of each of these sets of consequences.

Simon himself claimed that in this case a picture is sometimes worth a thousand words just in order to make the right choice. So a great value of techniques is their capability to enforce and augment the consciousness and the awareness in the process of public and personal decision through fundamental visual information. It is in fact clear that the only way it could be possible to answer to a Nimby syndrome it showing people the possible alternatives in decision making and, of course, these alternatives must not be expressed in a academic or sectorial way.

The further step in the process of definition of the ways in which new technology can help decision making within communities or stake-holders could so be the correct formulation of what Stephen R.J. Sheppard (2005) called the principles of validity, reliability and ethics in visualization. According to Sheppard it is possible to synthesize validity as the capability to describe correctly the phenomenon and to satisfy the demand of people to be acquainted. Reliability can be defined as the power of representation to give dependable outcomes in every situation just as a tool that must give a good performance not only in particular situations. Ethics is finally intended as the independence and the disinterestedness from market and business dynamics that broke out as far as new technological tools started to be offered to

professionals. It is clear that these epistemological questions are crucial in the era of the digital revolution.

According to such critical definitions in fact Sheppard (2001) proposed also new concepts that could support a correct ethical behaviour in representation. Among them we can find for example accuracy, representativeness or visual clarity. The necessity is in other words that representation should reproduce as closely as possible reality with a significant amount of views and proper details.

All these issues have actually an impact on the very recent spread out of professional and amateur renderings and digital visualizations on the web also according with the bottom up processes of contemporary society. A lot of them are in fact products of excellent quality in terms of precision, accuracy, details, definition and photo realism so that the previous statement about the clear distinction between digital outcome and photo in nature visualization is starting to fail.

It is in fact enough to have a look to one or more of the softwares available for rendering vegetation and to their quality to understand the new dimension of their performance<sup>10</sup>. Even though this process started increasing with the development of the so called game-software<sup>11</sup> it represents undoubtedly a new frontier and a challenge in representation sciences. It is so clear that the specific request to these kinds of applications to environmental application must still be explored. But the open question is which one of these models can really fulfil the necessity to keep together people expectations, designer projects, planners necessities, scientists complexity, ecologist relations and being reliable, valid and ethical as well? The answer could be a research field for tomorrow.

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# Non-Contextualized Ambits of Contemporary Urban Dynamics: Maps and Relational Dimensions

Raana Saffari Siahkali

Nowadays with the invention of the internet and informatics developments, spatial information providers are shifting from physical context to communication instruments such as smart phones, tablets and etc. In fact, it seems that both spaces – reality and virtual – with the same functional aspects and different kind of experiential dimensions are changing the present lifestyles simultaneously. Accordingly, we might realize two ranges of velocity in the urban mutation process: The cities physical contexts mute with a slower speed –measured in Seconds/minutes- compared to the non-physical layer (related to the communicative devices and the narration of information) alteration which is measured by megabytes/gigabytes. Therefore the lack of compatibility between these two speed ranges makes the contemporary urban spaces more intricate to comprehend when ‘*human sense of time*’ -as K.Lynch cited (Lynch, 1976) -is gaining a new and different ‘*biological rhythm*’; still ‘*what time is this place?*’ (Lynch 1976).

In order to find out sophisticated explanations for the defined problems, we need to have a new interpretation of contemporary urban spaces and their multi-dimensional characteristics. To achieve that, requires different instrument, capable of providing us with suitable components to re- reading of the urban spaces. These instruments will enhance our capacity of interpreting the complexity of the space in its geographical, historical, informational, communicational and spatial aspects. Such interpretative capacity in the urban scale could be provided by new maps- as evocative instrument mediating between physical forms and dimensions and immaterial qualities, through which we will be able to explore, interpret, conceive and transmit the components of the contemporary urban space. The question that rises here is: Does a new ‘reading’ of the territory, through the communication technology, lead towards the definition of new spatial characteristics for the urban spaces and consequently address the urban projects in their physical aspects? To find out the possible answers for the mentioned question, this paper – through an experimental research – aims to focus the spatial

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characteristics of the urban spaces in relation with the Wi-Fi environment- as a non-physical layer above the urban fabric- in which the main goal is to re-examine the traditional spatial indicators through a process of comparison between them and the new multi-layered characteristics of urban spaces. The first step is to categorize different groups of conceptual and practical elements that would be taken into consideration for designing spaces: such as society's different themes, spatial dynamism, user's aggregations, inhabitants/commuters, and ways of people's interaction with the space, time lapse and technological devices to define micro-terrains of functional themes in which an urban project would be addressed; in the next phase, a hypothetical framework is considered that would lead to the examination of grades of permeability and physical-Virtual porosity of urban spaces in relation to public use and frequency.

## 1

### Step 1. Conceptual Terrains of Socio-Spatial Relations: Static Condition

The first step is to categorize different groups of conceptual and practical elements that would be taken into consideration for designing the spaces: such as society's different themes, spatial dynamism, user's aggregations, inhabitants/commuters, and ways of people's interaction with the space, time lapse and the technological devices in a linear matrix.

The first group is, in fact, two main types of communicative devices which would act as catalyzer for re-reading the urban spaces which take to a new kind of relation with the information layer of the city: 'handled devices' such as smartphones and tablets and 'surfaces' such as mega digital screens which are the new generation of billboards.

Based on the mentioned two types of devices, in the next category, it has been tried to study the kinds of people's interaction with them within four different situations where 'user' can relate to the device and the information brought by it. '*active-temporary*' relates to the 'subjective' use of device with specific intentions: taking the smartphone to trace an address. '*passive-temporary*' regards to the 'user' being literally forced to use the device: in case of 'messages' exchanges within social networks. The third and the fourth situations occur when the 'mega-screens' are concerned: '*active-nonstop*' relates to the points of attraction which captures the attention of 'user' as the observer and '*passive-nonstop*' regards to the existence of mass media in urban spaces: the famous example of 'time square' in New York City.

The 'users' category regards to the 'urban population morphology' which – according to Guido Martinotti- could be categorized within four new emerging population kinds: *inhabitants*, *commuters*, *city users* and *metro businessmen*, whose different combinations, random intentions and spatial interactions within the city, – as explained also in the previous chapter- are increasing the conceptual and practical conflicts between urban 'physicality of the spaces' and their experienced 'images'; "The urban structures in which we walk – or ride – in our daily existence are already radically different from the urban images we carry in our minds, and in our

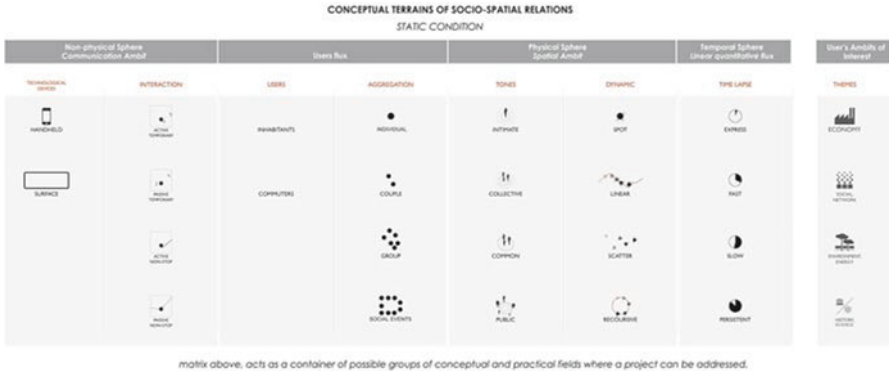
hearts. Thus, I believe that there is urgency for a very profound reconceptualization of the intellectual and empirical tools we need for the study of urban social facts and processes” (Martinotti 1993).

Since the mentioned categorization regards strictly to the urban sociological structures and the matrix aims to study the elements that should be taken into consideration in architectural and urban projects, the four kinds of urban population have been generalized into two main groups which are: *inhabitants* and *commuters*. What would be considerable here are the differences between spatial qualities of experiencing the urban spaces of those who have a constant interplay with urban spaces and those who interact with them temporarily. The aim of inserting such category into the matrix is to study the impact of new communication devices on people’s spatial interaction with urban spaces which, theoretically and practically, should address towards the urban project’s functionality considering the multimedia devices.

The successive category regards the different ‘aggregations’ moving through the spaces. In other words, while the previous category was about mega-divisions, this category goes in deep to the micro-fluxes of the people completing the previous one. In fact, it would be these so called ‘micro-fluxes’ to be considered as interactors with the physicality and immateriality – in terms of information flows- of the spaces. Beside the literal division, the core of this category is in the scale-crossing issue, from massive population scale to the paths made by individuals and groups of people where of course the modality of using the spaces and, recently, using the communication devise will alter from mass media to the personal communicative devices.

The ‘tone’ category, relates to the classic spatial division regarding the urban scale: ‘*intimate*’: places physically and/or psychologically close to us, ‘*collective*’: which mediating between ‘public’ and ‘private’ spaces would be interpreted as physical and cultural containers of people’s life, mentality and social interactions, ‘*common*’ and ‘*public spaces*’: *urban spaces that are accessible to everyone in all times; in-between areas that soften the distinct divisions within the urban context*. Despite the lexical meanings, what makes such category considerable, is not the net division between individual definitions of such palaces but their coexistence and superimposition within the city that in some cases, especially when the communication issues are concerned, it would be hardly possible to draw distinct lines and borders for such places. In other words, having the wireless internet access which makes any place-where the human body would fit – be a layover place, raises the question of ‘spatial dimension’, especially public spaces dimension. Beside social celebrations such as concerts, electoral campaigns, street manifests, sports or any collective activities, the public spaces today are, seemingly, restricted into internet spots scattered around the city and even in public parks, the people’s concentration would be higher near the Wi-Fi areas called as ‘hot spots’. Therefor the question of the dimension of these places and their existence with or without global communication access is mainly the motive of this category insertion.

“Walking as an autonomous work of art, capable of modifying metropolitan spaces to be filled with meanings rather than things” (Careri 2001) is an interpretation of the complex spatial and mental qualities of experiencing the places by



**Fig. 1** Conceptual Terrains of Socio-Spatial Relations, Static Condition (Raana Saffari and Luca Carizzoni 2012)

moving through them; sensing the places not only by physical senses but also by the metaphysical act of ‘giving meanings to’ and ‘being meant’ by them. ‘Dynamics’ is the next category of ‘elements’ in which it has been tried to imagine different situations where we interact with the places moving through them: different possible viewpoints to observe or react with the spaces.

‘Time Lapse’ is the category in which the matter of time-spending in the urban spaces – by both inhabitants and commuters – has been considered in the linear passage of time. Of course the real intricacy in defining the spatial interactions raises when the superimposition of the spatial experiences and the time passages are considered; The concept of space-time, – *chronotope*: “spatial and temporal indicators [as] fused into one carefully tough-out concrete whole [where] time thickens, takes on flesh, becomes artistically visible and space becomes charged and responsive to the movement of time, plot and history”<sup>1</sup> – studied by vast ranges of scholars from mathematicians and physicians to sociologist, artists and architects; Time as an im-material dimension unit and an independent variant which, despite different endeavors made during the scientific and philosophic developments, has been still remained ambiguous. Under the light of such philosophical interpretations, it has been tried to study the concept according to the emerging time unit of information flux and the problematic of measuring its complexities in relation with physical space.

The ‘theme’ category regards to the mega-terrains of final functional themes in which a project would be addressed; the non-contextualized ambits of metropolitan dynamics.

<sup>1</sup> The term ‘Chronotope’ literally ‘time-space’ has been proposed by M.M. Bakhtin in the literature ambit while The ‘space-time’ concept has been driven from mathematic and Einstein’s theory of relativity.

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## 2

### Step 2. Network of Relations: Dynamic Condition

So far, the previously explained matrix acts as a container of possible groups of conceptual and practical fields where a project can be addressed. It is clear now that the 'linear matrix' could only exist in a 'stable' condition while in the reality, according to the multi-layered totality of today urban spaces, those classified groups will never occur individually and in an absolute condition but through the juxtaposition and co-existence of all of those issues – and more other ones- simultaneously. Such a condition needs to be perceived and analyzed within an organizational and conceptual 'whole' passing through the comprehension of its constitutive layers and their relational dimensions. Addressing to the previous statements this conceptual 'whole' could be broken into the physical and non-physical sub-divisions including the variant concentration of tangible and intangible components and qualities. The mentioned 'whole' is generated from intra/inter relational domains between subdivisions and their corresponding components. The intra-relations domain regards to interaction between layers such as geographical, social, economic, and technological, etc. in other hand, the inter-relations domain of this entity occur through the components of each group. For example, regarding the linear matrix, the intra-relations would occur between 'users' and 'tones' groups, which would be the interaction of inhabitants and commuters within different spatial tones, while the inter-relation happens, simultaneously and continuously, between 'inhabitants' and 'commuters' as well as through the changing 'tones' of spaces in terms of scales, images, forms and etc.

Based on what has been explained, although our today city is generated as a network of more or less independent parts with no consistent and regular pattern; a dispersed urban fabric, But actually this irregular geometry is produced by interactive relations between correlated physical and non-physical layers. Therefore, recognizing the new spatial configuration in today cities depends on the cognition of those layers and their intra/ inter relations. This association between the contemporary city pattern and its fundamental generator networks lead to the consideration of new spatial configurations as ordering the chaotic tendencies and 'changes- in- process' in the network of relations which define our recent developments and societies.

Addressing the previous discourse, in this step it has been tried to imagine some of the possible relations between the groups of the matrix. It is clear, that the imagined relations are context-less, or better to say, without defined spatial and temporal orders leading to the occurrence of mutations. Therefore, through an expletive representation, it is tried to imagine those relations in a three-dimensional system – rhizomatic system –, potentially capable of represent the evolving and changing.



### 3

## A possible Framework

Studying the actual communication level in relation to space-use, space publicness, and potential but poorly frequented areas such as historical and cultural heritage, the research aims to examine ‘Tones’ of continuity, connectivity, permeability and porosity – physical and virtual- of the area to define strategic ‘fields of actions’ where future urban projects would embrace and enhance the communication layer and –as previously mentioned- increase the relational possibilities of use of the urban spaces in both ‘user-user’ and ‘user-environment’ aspects. “What defines a character of a city is its public space, not its private space. What defines the value of the private assets of the space are not the assets by themselves but the common assets. The value of the public good affects the value of the private good. We need to show every day that public spaces are an asset to a city” (Matheu 2011).

### 3.1

#### Physical Fields of Actions

The project regarding the ‘physical fields of actions’ is mainly structured by three tasks:

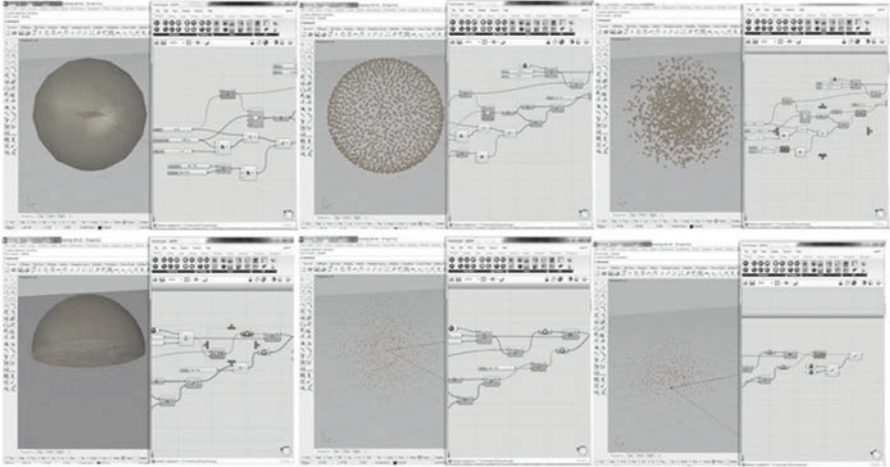
**Explore** The project starts with the exploration of layers regarding to the contextual and intellectual evolution of the city, the areas of attraction, natural and agricultural potentials and etc. called: ‘ambits’ as accumulators in a complex and multidimensional network through which the city will interact with its inhabitants.

**Extract** After the exploration and identification of the ‘ambits’, ‘interface elements’ of each ambit were extracted. The so called ‘interface elements’ intend to be acting as components of a system of ‘symbolic inter-mediators’ that accompanying with temporal mediators and spatial operations would be able to embody the collective memory, time and spatial experiences.

In order to activate them into a system which embodies their both physical and mental relations, they will be categorized, itemized and differentiated based on their geographical, historical and social characteristics and finally arranged in a matrix. Such matrix has basically two major functions:

1. *incubator of data related to the so-called ‘interface elements’;*
2. *the generator of narrations between them.* Such narrations will actually make comprehensible the relation between the elements by generating physical paths on the territory.

Another group of components of the matrix will be the ‘varying data’ that user would upload using the multimedia geo-referenced devices. In other words, the user following the physical paths- generated by the matrix –, and based on his own spatial-



**Fig. 3** Data processing with grasshopper (Raana Saffari and Luca Carizzoni 2012)

virtual experience of the area, he can add some other data to the existing ones that will act as new elements and so will produce new levels of relations which will lead to the generation of new paths. This in fact, will make the system be participatory in both data production and output actualizing. Needless to say, that all of these processes will be possible through the use of communication devices and internet platform.

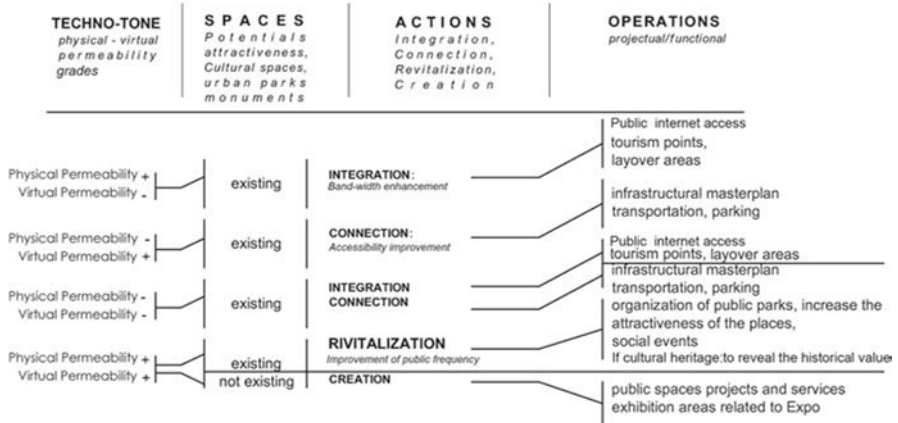
### 3.2

#### Transition from Physical to the Virtual Ambit

In this step, the ambit of analysis has been shifted to the non-physical sphere which in our case is the communication ambit due to the fact that the recent urban dynamicity has been mainly intensified by the emergence of intangible components of the communication era, the main focus of this part would be on the cognition of the non-physical layers – with the highest decentralization of tangible components and their detachment from the urban built fabric. Since the architecture is somehow the physical embodiment of man's interaction with his environment, such shifting scale, above all other features, have had consequences also in architectural and urban project. The next step relates to examine and map the floating 'wireless' environment as an upper level of complexity above the physical urban spaces which is meant to be integrated to the previous elements in order to prepare the basis for the so called: 're-examination and verification progress of the traditional spatial indicators'.

**Data capturing process** This first step has been developed according to three modalities:

1. City-wide intensity reading. Strength signals will be captured at pre-defined places of interests.



Projectual operation according to the places existing potentials and improvement requisites

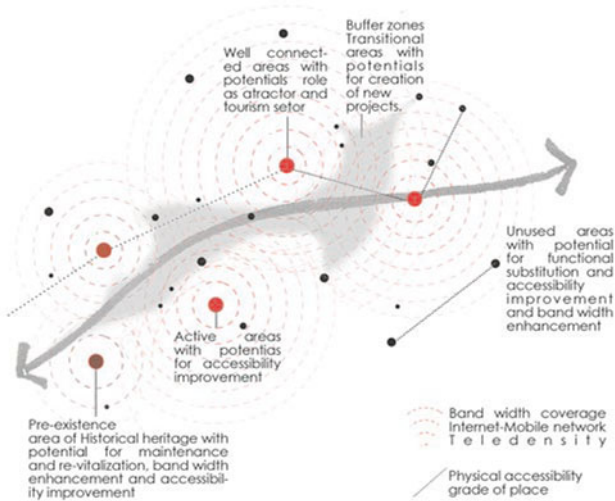


Fig. 4 Grades of permeability, actions and operations

2. Point-to-point intensity reading. Strength signals will be captured every of 100 meters and pinpointed with an interval of 500 meters.
3. Random on-field signal search.

**Intensity contextualization** In the second step, the captured data are processed basing on their intensity and illustrated in three-dimensional graphic. *Grasshopper* is used as processing program and *3D Studio Max* to generate the final illustrations.

By reviewing different technical information, it can reasonably be estimated that each Wi-Fi provider covers a spherical area with 50 meter long radius (Wi-Fi Alliance 2004) Since we capture data ‘on’ the physical surface, the lower half of the

spherical area has not been considered for the processing operation. Therefore, there were semi-spheres to be assumed as quantitative factor for the active Wi-Fi areas. The qualitative factor is the signals intensity which degrades from sphere center towards the outer surface, as shown below

**Enrich** Based on the defined matrix in the previous task, a new layer will be hypothesized and overlapped with the existing ones, called the ‘prevision map’ as a model, where potential areas and strategic actions will be defined.

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## 4

### Expected Results

The final results would address towards the identification of series of actions leading to project operations which enhance the qualitative and quantitative connectivity and porosity of the areas in local and regional scale as well as their ‘being-in-network in the inter-regional and international scale. Here are hypothetical schemes for expected operations

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# From Digital to Physical Spaces and Comeback: Some Feedback on City Transformations

Bruna Vendemmia

This work aims to connect the new information technologies with the transformations they have triggered on physical environment. If from one side is possible to understand that new information technologies create several possibilities for social relations, and for the exchange of information and knowledge, from the other side, it is still difficult to recognize how these technologies are distributed in physical space and what are the influences that they have in our everyday life. One of the main difficulties to read ICT effects on the physical World is that: as they are ephemeral and in many cases invisible, is not always possible to know their position in space and to map their presence. Many recent researches are focused on the understanding of this relation. A survey conducted on the State Library of Queensland's by Dan Hill, for example, showed that the distribution of the WI-FI system inside the building influenced the localization of people. This is true both at the scale of the single building as well as at the city scale. Matthew Zook underlines that even if Internet is a horizontal network, it grows around some hubs. Zook's work highlights that the most important hubs correspond to the World Global Cities, suggesting that the development of new information technologies contributes to make those cities more competitive. These two examples demonstrate that the presence of ICT contributes to raise the concentration of people and business, intensifying networking capacity. It has become clear that ICT influenced our lifestyle, reducing the distances between people, increasing our capacity to make relations and, as a consequence, creating new possibilities and new reasons to live and to travel through a wider territory. At the same time, people using ICT are sensors making possible to analyse the physical world and the on-going transformations. Going through some research projects that use innovative technologies to study urban space, we will understand the importance of this tool to comprehend the processes in act.

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## 1

## From digital to Physical Space: The impact of Information and Communication Technologies (ICT) in Citizens' Lifestyle

Many researchers guessed that ICT would overwhelm traditional way of travelling and transfer people, information and goods. A main effect of this transformation is a collision of scale and speed, which came together with the idea of a general collapse of face-to-face relations. The Complete Spot Challenge<sup>1</sup> (Fig. 1), launched by the Gagosian gallery, represents an example of the possible transformation of time-space relation due to the development of a new systems of communication. For the opening of the exhibition “Damien Hirst – The Complete Spot Paintings 1986–2011”, Gagosian was offering as a present a work signed by the artist to the guests who came across all the different eleven locations scattered around the world.

To this regard, and in a less optimistic direction, Paul Virilio in 2002 forecasted the “polar inertia” due to the rising speed of digital media communication (Virilio 2002). To him, this change in communication technologies will make people travel always less till the immobility, as it will be possible to reach all our needs without any movement. Virilio push the concept till the replacement of the real world with the virtual one:

“Tout ce qui se jouait jusqu’alors dans l’*aménagement des abords de l’espace reel de la ville ou de la champagne, se jouera demain dans la seule organisation du contrôle de la conductibilité des images et de l’information en temps reel*”.



**Fig. 1** The complete spot challenge. Credits to Alessandro Giuliano

<sup>1</sup> More details about the project available at: <http://www.gagosian.com/spotchallenge>. Accessed 2 October 2013.

“Everything that was, until that moment, performed through the requalification of real space, inside the city or in the countryside, tomorrow will be done through the media communication in real time”<sup>2</sup>.

Development of ICT has always influenced the form and the dynamics of cities (Gen. Schieck 2009). Actually, new medias have improved the ability to act at distance, multiplying the possibilities for social relations, they contribute to make physical spaces more complex and create new possibilities to exchange information and knowledge. They enable new connections between people and, consequently, they materialize a third invisible level for human interactions. This level modifies the organization of physical space. As many authors argued<sup>3</sup> the development of information and communication technologies, if from one side allows to travel more and to experience a wider territory everyday, from the other side increases face-to-face relations, promoting the concentration of people and ideas and consequently rising the importance of cities and their size. Manuel Castells describe the phenomenon introducing the concept of the “innovative *milieu*” (Castells 2006). Thanks to the configuration of “innovative *milieu*” cities continue to attract always more people and to build bigger networks of relations. Besides, the possibility to travel further and faster engenders deep transformation in the urban environment. Progress in technologies always determines changes in the structure of the city. The improvements of transport technologies allowed people overall the world to travel big distances in shorter time. Then, Paul Virilio vision failed. Instead of becoming motionless, being faster make people travel more, covering in our everyday displacements a wider territory than before, as the protagonist of the Complete Spot Challenge.

It is not already been defined an administrative entity that can describe this new way of inhabiting urban spaces, and this is because there are no precise boundaries to describe them. But, considering space not as defined by its boundaries, but as “an inherently dynamic simultaneity” (Massey, 1994), we can describe those territories through the flows that cross them. Edward Soja identifies this passage as a shift from a “distinctively metropolitan mode of urban development to an essentially regional urbanization process” (Soja, 2000). This process involves radical changes not only in the economical and the social structure of our cities, but also in the physical organization. We used to live in Metropolis with a centre and a suburb. We live now in bigger regional cities: urbanized areas that cannot be consider with traditional categories as they involve farmlands and woods, brown fields, industrial areas, services and residences with completely different identity and densities, dispersed all along transport axis. Soja defines it Regional City. It is clear that regional cities are not bigger Metropolis but different spatial organizations with new rules of development, characterized by the functional connection between many activities sprawled in a vast territory. ICT facilitated the development of these connections.

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<sup>2</sup> Translated by the author.

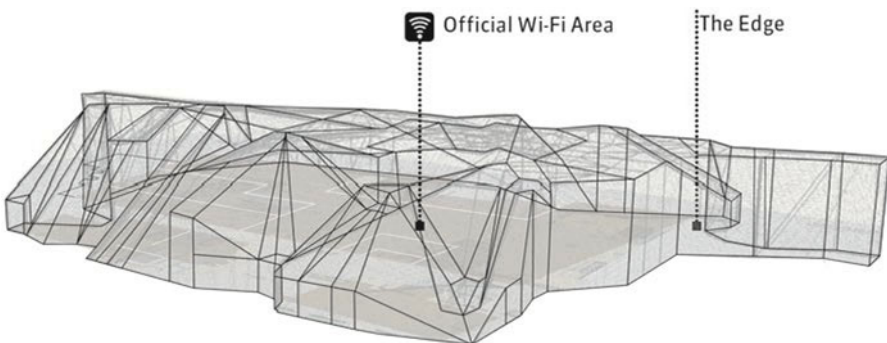
<sup>3</sup> We refer here to many works, among them the researches developed by Manuel Castells and Saskia Sassen who support the hypothesis of a rising importance of the city due to the ability to create a convergence between people and information.

## 1.1 ICT as Flows Condenser

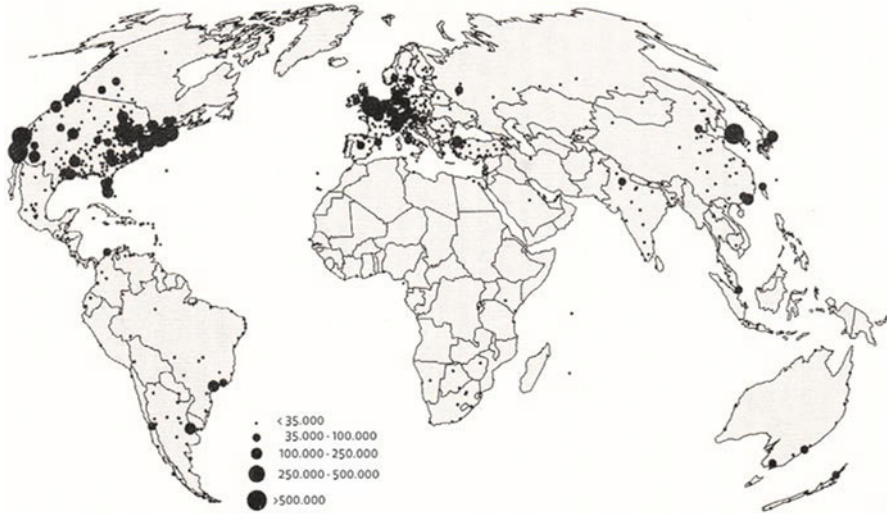
The analysis of the relation between physical spaces and telecommunication systems highlights how those last affect spatial configurations. This influence is verified at different scales: from the building to the territory.

Working on the evaluation of the State Library of Queensland in Brisbane, designed by Donovan Hill and Peddle Thorp in 2007 (City of Sound 2008b), Dan Hill underlines the correspondence between the strength of Wi-Fi signal and the distribution of people into the space of the library. A net-cloud is designed to visualize the invisible (Fig. 2), giving a shape to the frequency. Afterwards this graphic was compared to the circulation of people inside the building. Many places characterized by a high frequency of the Wi-Fi signal were the one more attractive for people, suggesting a correlation between the use of the space, its shape and the strength of WI-FI signal (City of Sound 2008a). Definitely the distribution of the invisible Wi-Fi network influences the spatial configuration and the use of the space. Following Archigram statement about weather: “when it rains in Oxford street the architecture is no more significant than the rain” (City of Sound 2002), we can assert that ICT influence the use of space as well as meteorological conditions.

At a territorial scale Manuel Castells observes a correlation between the supremacy of some cities and the distribution of Internet hubs. Internet is organized in hubs that are connected to a backbone. Looking at the distribution of the hubs is evident a geographical correspondence with the most important metropolitan areas. Whatever has been created a new global hub, it expands generating a new spatial form. And in fact, a research elaborated by Matthew Zook (Castells 2006; Zook 2005), shows that the distribution of Internet domains follows a model of high spatial concentration (Fig. 3). The creation of Internet domains, although free, is strongly localized in some of the most important metropolitan areas. There are many reasons to explain this concentration. First of all, being localized in the proximity of global cities allowed Internet domains to relate with the organizations that produce information



**Fig. 2** State Library of Queensland Internet diffusion. Credits to Dan Hill / cityofsound.com reworked by the author



**Fig. 3** Distribution of .com, .org and .net and national url code, July 2000. Source: Zook MA in (Castell 2006)

and knowledge; then, this position creates the possibility to build networks between different “innovative *milieu*”, providing the know-how for the development of further projects. In brief, from one hand, global cities attract Internet domains; from the other, the growing density of Internet flows makes some cities more competitive in the global network, and then reaffirms their supremacy. Some cases that witness the emerging of this network spatial organization are, for example, the bay area of San Francisco, or the Region of the Pearl River Delta, or in Europe the area of the Rijn Ruhr, the Randstad or the Great Paris, the Great London and the region of Milan.

Furthermore hypermobility and de-materialisation engender social transformations. The presence of ICT systems transformed both social and physical relations, and allowed us to live stretched spaces far beyond traditional physical and administrative boundaries. Those spaces are defined mainly by trajectories of different inhabitants and population.

Saskia Sassen identifies, among the consequences of the use of ICT in our everyday life, a mesh-up of the traditional order and class interaction: the rise of a new dynamic, where “top sectors and bottom sectors partly inhabit a cross-border spaces that connects particular cities” (Sassen 2009). Those areas are ideal spaces for urban transformations.

Currently the challenge is to locate and specify such new spatial configuration. In fact traditional topographical representations of the city tend to emphasize the differences between various socio-economical sectors, instead of visualizing the net of connections between the different actors. ICT can help us to describe this phenomenon, as they are both a trigger element of this process and a tool to describe these interactions and to represent it in a spatial context.

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**2****From Physical to Digital: How Innovative Technologies Can Help Us to Understand and Interpret Physical Spaces**

As we underlined before our cities are experiencing a process of radical transformation. The development of ICT provoked many important changes in contemporary city structure. From the Metropolis-like organization we are passing to a spatial model that does not correspond anymore to the existent administrative boundaries and that is crossed by several populations with different needs. The traditional data used to analyse urban context cannot be considered as useful as before to study cities transformation. This is mainly because traditional tools are based on the elaboration of static data as, for example, data about resident population, which do not correspond anymore to the real city users; furthermore data and information are collected on the base of administrative boundaries that do not match the real dimension of the city. Certainly the combination between the information obtained, thanks to new technologies, with other data, as Land Use or Land Cover, can help us to better understand our reality. In this context people moving with a mobile phone can be seen as sensors sprawled everywhere. They can describe, in real time, our contemporary habits. Mobile phones are automatically tracked and so they generate continuous feed back about the way we use the city. From a methodological point of view mobile phones represent an interesting tool to analyse and understand urban context; besides they give us the possibility to be informed in real time and then to change the way we cross and inhabit the space. Additionally, using for example mobile phone to understand and describe space allows us to take into account big sample of population; furthermore it can be improved without developing new infrastructures, as mobile phone exploit a network that already exists. This data can help us to read and interpret numerous events in the city as for example high dense concentration, flows and movement.

Researches as the LOCAST<sup>4</sup> project, the mobile-phone traffic analysis<sup>5</sup> in Milan, the Portolan App<sup>6</sup>, or the DOLLY Project (Digital OnLine Life and You)<sup>7</sup>, highlight the importance of citizens as living sensors. Moving through the city they can be able to return in real time a picture of the urban transformation process and of the radical lifestyle changes.

LOCAST is a MIT project developed by Mobile Experience Lab lead by Federico Casalegno, which was tested in different context, both geographical and social: Memory traces, Rio Youth Mapping and Rai Local Abruzzo. Memory Traces is the construction of an interactive story about Italian immigrants living in Boston; Rio Youth Mapping is a mapping platform used by youth to report and map different social issue in their own community; last, Rai Local Abruzzo, is based on the idea of reimagining the tourism in Abruzzo Region through the feed-back of users.

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<sup>4</sup> Further details available at: <http://locast.mit.edu/>. Accessed 03 October 2013.

<sup>5</sup> We refer here to the research elaborated by Paola Pucci and Fabio Manfredini at Politecnico di Milano.

<sup>6</sup> Further details available at: <http://www.unipi.it/index.php/tutte-le-news/item/1612-volontari-cercasi-per-tracciare-la-mappa-dei-domini-di-internet>. Accessed 04 October 2013.

<sup>7</sup> Further details available at: <http://www.floatingsheep.org/p/dolly.html>. Accessed 04 October 2013.

Portolan App, instead, is an application based on a crowdsourcing system applied to research. The goal is to map Internet domain starting from the final user. Everybody can participate up-loading the application. All this projects are based on the idea of a conscious use of smart-phone in order to create interactive description of our context. In this way every single people can be part of a complex representation of reality built out of countless point of view.

With a completely different methodology, the project developed in Politecnico of Milan by Paola Pucci and Fabio Manfredini<sup>8</sup> use the mobile phone as a basis to map the presence of people in the urban context considering different moments of the day and different events. This project represents an effort to combine mobile phone traffic data with traditional information about the city. It is an attempt to evaluating the density of presences and the movements of people in the Metropolitan region of Milan, using mobile phone traffic data. This project highlights some problems linked to the use of mobile phone, as for example the limits linked to the privacy of the data, or to the nature of the data itself. The data analysed by Pucci and Manfredini are expressed in Erlang. An Erlang is the equivalent of one call in a specific channel during 3600 seconds in an hour. The Erlang is a unit of communication system and it is not directly connectable to a phone number (Pucci and Manfredini, 2011). Is it clear that the Erlang data allow us for example to understand the density of calls in a defined area, and so to map the presence of people, but can not be used to work on individual life style and trajectories.

An important possibility of the use of aggregated data is to make a comparison between the different situations. It is possible to build maps that compare day/night or workday/holiday intensity of use (Pucci and Manfredini 2011). For example in the work of Pucci and Manfredini for Milan some maps that represent the different density of population related to Milano Design Week have been elaborated (Fig. 4). Comparing the map of phone call density with the map of the events and land use, it has been possible to understand that the main density was reached in some specific points of the city as the zona Tortona for the event of Fuorisalone or the San Siro stadium in correspondence with the football match. Furthermore the comparison between a day during the event and a normal workday, help us to comprehend big event effects on the city, and can support the definition of strategies of intervention linked to the management of public transport. Moreover the comparison of the data in different moment of the day allows building dynamic maps that show the rhythm of the city.

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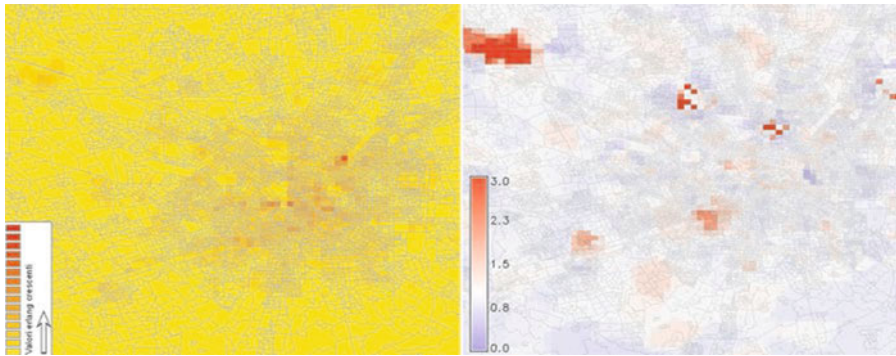
### 3

## Conclusions

Zook research puts in evidence the relation between the concentration of Internet domains and the increasing importance of the cities where these domains are local-

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<sup>8</sup> The information contained in this paragrapher are deduced by (Pucci and Manfredini 2011) presented to the XIV National SIU Conference, Turin, March 2011.



**Fig. 4** Left: Milan. Phone traffic concentration during the Salone del Mobile. Right: comparison between ordinary day phone traffic concentration and Salone del Mobile (Pucci and Manfredini 2011)

ized, in a continuous process, where big global cities attract hubs of the net, and the presence of the hubs, in the other side, make the same cities more important. In fact hubs generate big flows of people, information and knowledge and, consequently, the dimension of the city and its inhabitants increase. On parallel, at a completely different scale and working on the use of public space, Dan Hill shows that also at the scale of the building there is a strong correlation between the use of the space, its shape and the frequency of signal. To read this connection we need to reflect about the fact that innovative technologies allowed us to leave, consciously or not, more traces of our behaviours on the urban context. It is possible for us to use these traces in order to interpret and represent reality?

The example of the mobile phone traffic has showed the problems connected to the use of this new kind of data. Even though is clear that the use of innovative technologies is very important to understand contemporary urban dynamics. Definitely we can consider it as a cultural understanding tool as far as an operational tool which made architects, planner and inhabitants more conscious about the way to live urban space and, hopefully, more active in the decision making process.

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