Exploring Design Seeds for Urban Transformation

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Abstract
There is a growing interest in considering interaction aspects for the design of urban public places. Emerging approaches present different frames inherent to the interplay among people and information between us and address the role of urban infrastructures and technologies in encouraging interactions. In this paper we use the concept of Urban Interaction Design to provide a framework for understanding transformations due to urban design, while bringing new values and perspectives into the design process itself. This framework is a product of three design seeds: participatory urbanism, urban data visualization and urban gamification. Each one of them contributes with specific insights and mechanics to re-defining urban interaction. We use three design cases to illustrate how Urban Interaction Design is a promising path to follow in the context of sustainable HCI. The concepts are discussed highlighting the main assets for future development.

Author Keywords
Urban Interaction Design; sustainable HCI; participatory urbanism; interaction design; smart city; open platforms; open source.

Introduction

The modern city is becoming a networked system where people interact through multiple hybrid levels. The city is not just used as a physical place but also as a tool for accomplishing social practices while moving around and learning from mixed environments.
Historically, design responds to change in human context conditions. Today, short interactive loops of feedback typical of digital settings, provoke transformations in the traditional relationship between design and the city, blurring physical bonds and calling for new ways for people to interact with their surroundings. This is argued by science and technology studies [3] as well as design research [6] to strengthen the emergent power of social technologies in shaping social engagement within cities, for environmental sustainability and in communities.
As new practices have developed new technologies - mixed or augmented reality and urban screens interventions - new forms of design will continue to emerge in the modern city.
Institutions play an important role in influencing the understanding and the recognition of the elements of the city, but their decision-making processes sometimes continue to use conventional prescriptive approaches. Interestingly, other fields are emerging from grassroots communities to inspire idea generation in the context of urban transformation and sustainability. This suggests that the use of digital tools and open visual instruments probably could be essential for further development in the bottom-up appropriation of the public urban context.
There is a long history around new participatory urban lifestyles that create new shifts in communication tools usage and social networking. Over the past decades, Alexander [1] has theorized the concept of a pattern of events as a close connection between events and the space where they occur. More recently Sterling [12] has described the concept of the synchronic society where every object worthy of human or machine consideration generates a small history. All these histories are informational resources that are manipulable in real time.
The use-value of these techniques is an important aspect since interaction technologies provide new active sites for starting a political discourse as well as a dynamic framework for citizen engagement.
In line with this perspectives and considering the development of certain events which set up important transformations in people productive and communicative activities [7], here we see two germane connection points. First, a new domain that explores the relationship between events, communication materials and places. Second, an urban open authoring system that involves public participation and sharing.
The goal of this paper is to provide a practical lens for designers which will allow a discussion on how an Urban Interaction Design methodology might be defined end used to enhance the design of new ways of participation.

Practice for urban transformation: case studies

The analysis of the state of the art is particularly relevant to interaction design in general and to urban studies in particular, where a more systemic attention is given to how people live a city [8], interact with physical and digital information, share their experiences and activities. As urban interactions move increasingly to participatory design approaches, cities need to be understood and designed considering contextualized and networked data.

The connection between interaction design and urban transformation is becoming relevant both as a teaching method for different scale of projects that include participatory oriented approaches, and as a urban design research framework to envision local and territorial services related to context-based data.

The following three projects are all part of a design approach that is applying participatory urbanism and urban gamification. All projects aim to foster a proactive role in citizens by providing enabling open platforms. The underlying concepts have been developed within two academic contexts in the Republic of San Marino and in Switzerland.

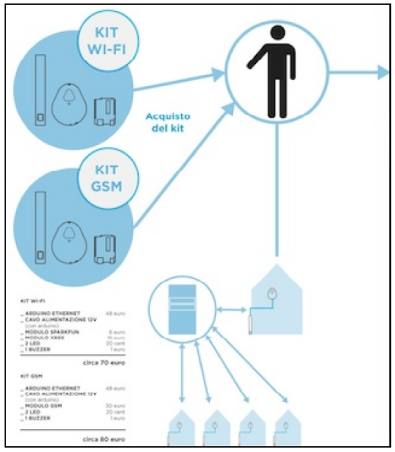

Figure 1. Logic diagram of the project DROP (2013) by R. Panici

DROP project by Roberto Panici
The city of San Benedetto del Tronto in Italy has a problem of excessive running waters and land flooding. Solving the inefficiency of the public administration through a bottom-up approach is one of the most challenging projects developed during the Master programme in Interaction Design 2013 in the Republic of San Marino. A participatory platform, mediated by open-source mesh network and DIY technologies (Figure 1), provokes a new opportunity for individual citizens to become actively part of their city and urban system. It radically alters the current public administration communication system with a collective shared real-time measurement from the network of citizens. All data flow into an accurate server platform making accessible - through GPRS - the city situation as a shared visual map.

GrigioTaranto for social integration by Rocco Leggieri
The city of Taranto is known to have one of the worst toxic pollution problem in Italy, due to the activity of the steelworking plant called ILVA. This project concept offers people a visual tool to promote public awareness on the almost hidden health impact of such pollution and foster a large participative discussion. Started as a Bachelor thesis at the Republic of San Marino, this project proposes dynamic real-time infographics that inform citizens on the air quality. Data are measured by sensors, processed with Arduino in infographics and projected on the urban facades (Figure 2).

Social Power Game by Vanessa De Luca and Roberta Castri
The game concept aims at encouraging energy saving through social interaction. The game system, based on an interdisciplinary research conducted in Switzerland [4], would provide visible links between physical locations and energy saving behaviours occurring at those places. In this way, the game interface offers a clear graphical visualization of social data and personal contribution to the community achievements (Figure 3). The game is inspired by the metaphor of the hive as a natural structure created by multiple entities working in parallel. Like hives, the game environment is composed by energy-related points of interests (POI) created by players that can be tagged on a shared map, created, explored and commented.

While applying the concepts of Urban Interaction Design in university settings, courses and research projects, we have discovered that the social use of location-based mobile technology is particularly relevant to urban interaction design, where more attention is given to people interaction and aggregated data. The case studies show that the connection between interaction design and bottom-up practices is important to orient a dynamic analysis of urban data

Figure 2. Dynamic infographic of the project GrigioTaranto (2011) by R. Leggieri

Figure 3. Hives map view, Social Power Game (2014) by V. De Luca and R. Castri

contexts in alternative practice-based methods for design learning as well as in research frameworks. This newfound connection is the core of this paper to start a discussion on open tools and approaches for engaged design practices that move citizens participation.

Evolving design Space

There is a well defined movement within the HCI community that emphasizes the democratic potential of involving end users in data collection [6, 11]. As part of such movement, we begin our analysis by presenting three seeds intended to be used for a new design framework: participatory urbanism; urban data visualization and urban gamification. These three seeds need to be further framed in field experiments point of view. Each of these seeds characterize some fundamental assets for a creative development of tools and methodologies for urban interaction design.

participatory urbanism

In recent years, the more and more widespread development of self-build devices for data collection, based on open-source platforms, has allowed an increasing design activity on collaborative systems. These projects created by citizens without any professional relation with the governance of the city are often based on a voluntarily participatory action of people. The convergence of these factors could confirm the evolution towards the synchronic society [12]. If we associate this with the experimental replications of the interaction model of the Wikicity project [3] and their consequent proliferation, we could assess that this has led to a new democratic way of collecting data. Many open source projects contributed to this change and opened new approaches to data collection in crowdsourcing, thereby strengthening the lateral approach in designing new tools for improving participatory urbanism.

urban data visualization

The large amount of urban data, generated by billions of interconnected devices and diffused sensors, can play a key role in the understanding of environmental changes. This transformative contest offers new possibilities for investigating cultural processes that influence cities growth. When datasets and digital tools become widely accessible, data visualizations increase the opportunities a city is explored, shared and interpreted in a collaborative way. Through dynamic open-source maps, urban visualizations create meaningful insights for perceiving differently the interactions between people and the data environment [2]. Urban data visualization can facilitate awareness about important urban issues and provide open platforms for both collective problem-solving and decision-making processes. In this way the design and improvement of open-source instruments for making visible urban issues, such as air quality is a fundamental objective for the Urban Interaction Design.

urban gamification

From the very beginning the "gamification" approach - that is the use of game mechanics and game design techniques in real-world contexts - developed in the field of Human Computer Interaction [5], was coupled with mobile applications as a strategy for the people engagement in societal issues. Methodologies in this work vary, including psychology [e.g. 9] and social behavioural change approaches [e.g. 10], recently "gamification" techniques have been adopted in different fields ranging from energy management services to training and learning applications. We

suggest that the design of gamified motivational systems finds in mobile applications its own prominent force for revitalizing urban interactions. Using such mobile applications, it offers the opportunity to actively provide visible links between physical and motivational domains, triggering people participation. We see that gamification applied in urban contexts is a powerful connector for new forms of hybrid interaction.

Open discussions and conclusion

Urban Interaction Design is an emerging paradigm for HCI. It is related to the role of urbanism in the study of a city growth but looks at different interaction design scales from objects to complex places. As mentioned in previous paragraphs, urban interaction design is changing the way data and places are connected by providing tools and interfaces that include the possibility of citizens participation in the production of these interfaces and data visualization.

It encompasses design strategies employed for creating bottom-up instruments - sometimes critically oriented - that integrate individuals in the social information system. In fact, contemporary rituals and daily habits are creating continuous synchronic actions that contribute to increase the socialization between citizens as well as to trigger urban transformations.

In such framework, aggregated data is approached in an analytical way as to consider all the interconnected elements useful to design urban interfaces and services. The urgency to think about new tools and methods for enabling new participatory urbanism occurs as democratic solution for sharing, remixing data and places and design legible and open urban interfaces. In reporting project cases we seek to position a first framework of Urban Interaction Design to support its design process and teaching methodology. In the previous section we have described three tools - participatory urbanism, urban data visualization and urban gamification - that are related to specific fields: floods, air quality and energy management. Despite the interdisciplinary nature of this discussion, those three seeds emerge from the analysis as key topics for future design discussions and approaches in Urban Interaction Design. A striking characteristic of the mentioned case studies is the relative untied actions between the participatory actions and the local authorities. In this way, this paper advocates the development of new communication and shared tools that include a synergy among involved actors and voices. The call is for tools that can capture organized data - about environment and people - to shift urban interaction design to a more dynamic and collaborative approach to face changes at many scales. For example, we further suggest an information cluster for open data integrated to open-source platforms. We believe that those platforms could impact future people participation to their city and neighbourhood and as a consequence, the implementation of the Urban Interaction Design framework.

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