Integrating VGI system in a Participatory Design Framework

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Introduction

Over time, urban planning has been based on analyzing and evaluating expert knowledge of interested area of change. However, citizens participation is still a crucial issue for designers who have used different strategies which are more and more related to the use of new technologies in order to involve the public (Healey 1997, Gordon, Schirra and Hollander 2011, Jones et al. 2015, Kleinhans Van Ham and Evans-Cowley 2015). These efforts have been focused mainly on the planning activity without considering the potential of the local knowledge as input for a new plan. In this contribution, we propose a methodology integrating new technologies to allow bottom up knowledge of places emerge. Notably, besides planners expertise we introduce the so-called "wisdom of the crowd"(Surowiecki, 2005) within the design process as the local expertise related to the uses and the values people add to spaces. Spatial values, indeed, might vary significantly, which is easy to understand if one can imagine that each place could have a different environmental context related to different cultural, temporal and locational characteristics (Borges, Jankowski and Davis Junior 2015a).

The opportunity of using local knowledge is given by the emergence of Volunteered Geographic Information (VGI) systems. VGI systems have been used with many different purposes so far; however, a clear classification of VGI types is not already consistently defined. Considering the way of contributing we can distinguish "active" and "passive" volunteers (Fast and Rinner, 2014). In our proposal we would use both of them in order to characterize the socio-spatial behaviour and the collective spatial values in the first place. With this input the design process can be based on the specific socio-cultural context of the area to be changed as well as the measurement of the impact. Our contribution results in an integrated design methodology for both the planning activity and the VGI system conceptual modeling.

The article is structured as follow: the state of the art related to VGIs and to the notions of space as social construction as well as the spatial value will be presented; also, two already completed case studies will be briefly presented to give an idea of possible improvements in applying the new framework; then, the framework will be explained through the description of the workflow we created as proposed methodology;. Finally, future works and possible application of the framework will be discussed.

State of the art

Landscape and urban planning can take advantage of new technologies to facilitate its process using crowdsourcing of data strategies such as Volunteered geographic Information. In a large sense, VGI systems allow collection ofdata produced by the engagement of large numbers of private citizens without any pre-required Geographic Information System (GIS) skills (Goodchild, 2007). According to Elwood (2008), it is digital spatial data that are produced not by individuals and institutions formally classified as data producers, but by citizens that gather and disseminate their observations and geographic knowledge. Similarly Public Participation Geographic Information Systems and Participatory GIS regards to the use of geographic information systems (GIS) to broaden public involvement in policy making" (Sieber, 2006).

The methodology proposed here makes use of a VGI system to collect volunteered information to supply the design process and it is based on the Geodesign workflow proposed by Steinitz (2012) which favors the participation during the design decision. Notably, it is not only related to understand problems or collect proposals from citizens as it is done in many projects (i.e. Fix My Street, Improve My City). Participation should allow a deeper understanding of the designer about the collective use of spaces and their associated spatial values.

Our preliminary assumption is that space can be considered as a social production. This is not a new idea since it has been introduced in the late eighteens by geographers such as Bourdieu (1989), Lefevbre (1991), Soja (1989). Their main contribution has been to reverse the way of conceptualizing space from a mere "container" to an entity that is constucted on the basis of socio-cultural structures. Also, literature on the concept of place underlines the difference between space and place which are considered as the opposite extremes of a continuum going from the ideal geometrical abstraction of space to the experiential world of place (Couclelis, 1992). In Tuan (1979) space becomes place as we get to know it better and endow it with social and cultural values.

However, notions of social space and place are surrounded by vagueness and are difficult to be represented as reference in IT systems. Nowadays, VGI data is opening up the opportunity to identify that notions since user-generated content is often experiential and largely personal in nature (i. e. geotagged photos), giving information concerning the space of personal activity (i. e. cellular phone tracking) (Feick and Roche, 2013). There are studies trying to use VGI data to extract pattern of collective behavior (Sagl et al., 2012) and to make it usable for planning (McLain et. al., 2013). However, in this work we underline the need of a VGI system properly designed to allow the collection of this type of data rather than proposing the use of existing data sources.

Another crucial concept in our perspective is related to the values people give to spaces depending on their way of experiencing them. For instance, either Cullen (1971) and Tuan (1974) stated different types value attribution or perceptions that people give to a place both "cognitive" and "sense" related . Amongst others serial vision, altimetry contrasts, color, texture, as characteristics that give singularity to places: Genius Loci.

The framework proposed here starts from the assumption that social spaces and spatial values can be considered as a necessary knowledge to produce a design grounded in the city of people. Furthermore, to have this knowledge citizens must be involved in the process in such a way to increase participation in the planning process through the use of VGI system.

Case studies

So far, countless experiments of VGI systems' use have been done. Here, it is mentioned few examples intending to clear the understanding of the proposal.
During the Collaborative Mapping and Citizen Participation course in Architecture and Urban Planning Program at the Federal University of Minas Gerais students used Ushahidi's Crowdmap tool to develop a Genius Loci-related subject, which they named "Sensory Drift" (Borges, Jankowski and Davis Junior, 2015a). This case study exemplify the application of a VGI collection of value attribution. The categories of collection were sound, smell, texture, illumination, colour, temperature and feelings. The case study shows clearly that it is possible to collect the cognition using a VGI project but not group the people into their activities and motivations which makes hard for a designer to identify which are the affected groups of a potential change proposal.
During a project at the University of Torino called HackUnito a mapping activity with students has been organized. In this case, the focus was on understanding how students use the city in their daily life. Therefore, the map's legend was defined collectively and then POI have been collected in the area surrounding the University Campus (Calafiore et al. 2014, Calafiore and Dansero 2016). In this case, information mapped is related to the way a specific group use the city but without having knowledge of how they evaluate their experiences.
As for passive VGI analysis we present two case studies performed by Borges, Jankowski and Davis Junior (2015b) on the first case Tweets' collected during the world cup in Brazil clearly shows grouping classification by game, by nationality and by geotag of Tweet. The same pattern could be seen on the second case study where Instagram posts were selected and spatially analyzed using density of posts.
From these cases studies it is possible to learn that the combined use of spatial value attribution and grouping classification is not present in a regular VGI approach.

New Methodology Proposal

The Participatory Design Framework proposed here is based on a methodology aimed at increasing participation in the planning process. In section 2 it has been shown that VGI systems can be considered as tools to enhance participation in collecting geographic information of various nature ranging from activity's spaces to value attribution to spaces. However, to make use of this data the design of the VGI system itself is a crucial aspect. Notably, the proposed framework which integrates the two perspectives of the planning process and of the VGI system modeling. It concerns the collection, organization and analysis of data to inform and support spatial change design. Also, it takes the Geodesign Framework by Steinitz (2012) as reference in defining the steps to be followed answering specific questions.

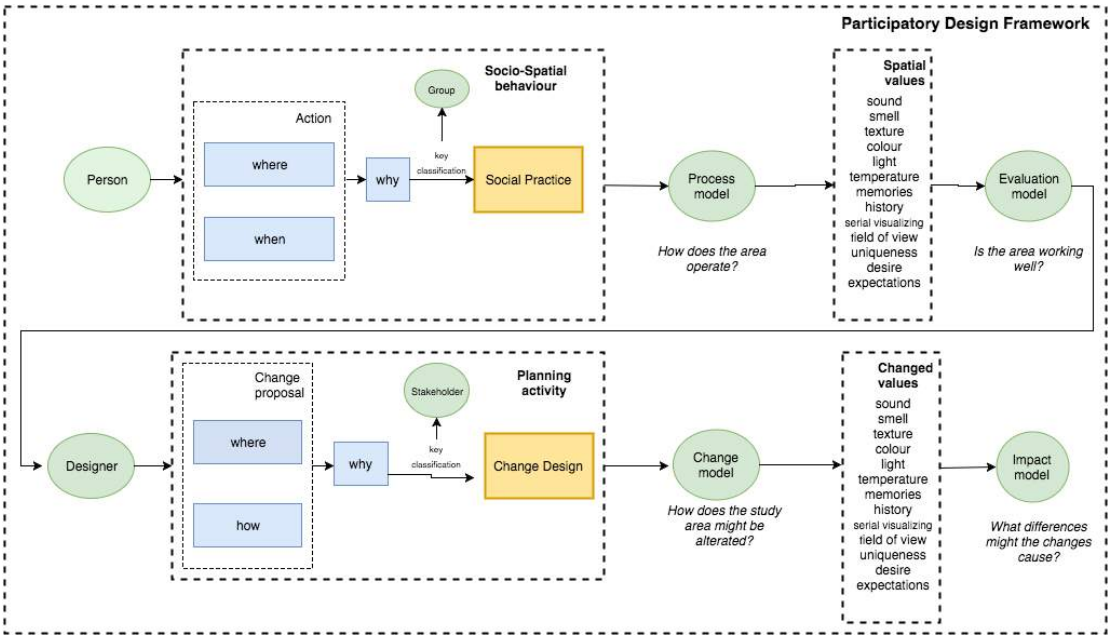

Fig. 1. Framework for VGI system modeling proposal.

The Framework, as it is shown in Figure 1, can be described as a workflow. Each dashed square represent models that answer questions presented in the geo design framework (Steinitz 2012). After data is collected, a designer, who is not necessary an expert designer since the framework we are proposing entails essentially the participatory construction of a change design in the planning activity frame but it does not include all the planning process.

The first part of the workflow presents the description of the area (process model) and the assessment of the area (evaluation model) are the starting state of an area which is represented as socio-spatial behaviour and spatial values. The socio-spatial behaviour is related to actions that a person performs in space at a certain time. Also, to understand the sociality of the spatial behaviour we need to know the 'why' of an action to relate it with particular groups of persons. The 'why' consists in the intentionality of an action or, in other words, in the "aboutness" of it (i.e. "going to the university is about to be a student"). Particularly here the focus is on the intention of a group in performing some spatial actions because we assume that the spatial behavior changes depending on different group's interests. Actions that are related to specific groups are defined as social practice to underline the "we-attitude" in performing the action (Tuomela 2002). An example of application that enable users to create groups and adding places in relation to groups is First Life (firstlife.org). As a result, a process model represents different spatial configurations of social practices depending on different groups. While the process model answers the question how the study area operates, it is also needed to answer if the area is working well or not. In order to do this, we introduced a preliminary glossary of spatial values that are selected on the basis of cognitive and senses perception (Cullen 1971, Tuan 1974). In this way we would collect the quality of the spatial experiences. In particular, spatial values are a way to attribute common sense assessment (cognitive and sense related) to an area.

The designing activity is described in the second part of the workflow and it is based on the evaluation model as input. It ends up with an impact model which takes into consideration the dynamics of change not only in reference with space but also with social practices performed by specific social groups. Here, the designer, who is aware of the socio-spatial behaviours of different groups and of the related spatial values, makes a proposal of change explaining where to make a change and how. Even in this case, the designer proposal is related to the "aboutness" of the change i.e. "making new infrastructures is about being a developer". Our assumption is that every change embeds some particular intention and it will affect different social practices related

to different groups. This does not allow us to talk about “groups” but “stakeholders”, which are groups of people interested by the social practice change and also related to the space change that should be taken into consideration. The output then is a change design related to different stakeholders which gives us knowledge of the change model (how might the study area be altered?) depending on stakeholders intentions. Also, stakeholders evaluate the change on the basis of their perspectives. Therefore, the impact is measured on many layers representing how a changed state in spatial configurations and spatial values will affect different groups of people.
This framework allows to represent and reason in a planning process not only on physic characteristics of spaces but also on human experiences and their way of living the city through collecting that information using a VGI system.

Conclusions

The proposed framework is a preliminary work based on different experiences in using VGI systems i.e. in the presented case studies. Nowadays, it can be said that there is a general trend of using VGI systems (i.e. Ushaidi) or VGI data (i.e. geotagged photos) for urban planning. However, there is no convergence in a common use of these technologies to effectively support spatial decision making while increasing public participation in the definition of a plan as well as in scenary simulation. The framework described here goes in the direction of understanding an efficient way to collect, organize and analyse crowdsourced data. Also, it is the basis for identifying the VGI system requirements to be fit for use in the participatory design of a urban plan. The framework will be tested in a case study using the proper technology. Finally, in the structuring of the case study engagement strategy will be assessed.

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