

Scope

The scope of the research is to develop a toolbox that helps visualizing how people use, perceive and conceive a given spatial environment. The scope is not to visualize the process that a decision-maker goes through when he or she is making a mental representation of this environment, but rather to visualize the actual representation itself. This representation is further referred to as a mental map. Finalized, the toolbox should help tracing the relation between the features and atmospheres of a given environment, and the trajectories, actions and behavior of people in this environment. Insight in these relations could help, for example, planners, urban designers, and architects to measure the impact of a planned urban scheme, or a local authority to measure the impact of a (spatial) information campaign. A toolbox, thus to assess spatial interventions.

The innovative aspect of this research is to rely –for the development of this toolbox- on recent advancements within locative and media technology, specifically on advancements within the emerging culture of ubiquitous gaming. Ubiquitous games are games that take place in our everyday surroundings, but that rely on locative and media technology to augment these surroundings and objects in these surroundings with invisible and networked computing functionality (McGonigal, 2007). We argue that ubiquitous games can help visualizing how people use, perceive and conceive a given spatial environment. The scope of this research is to validate this argument.

To further frame the research, this validation will be applied to a well-defined urban area (still to be defined), and within a clear theme (so far defined as leisure). Within the chosen context, all spatial behavior (related to the theme) will be recorded relying on locative and media technology: which information people collect, where they move, how they perceive their environment, and so on. The idea is that by visualizing these recordings, one will be able to reconstruct the mental map of those people using this context. Once a first mental map is generated, one can then start changing the urban context, to then assess the spatial impact of these changes by regularly redrawing the mental map. In its final form, the toolbox should be able to be employed as an assessment tool to visualize the impact of spatial interventions on the (spatial) behavior of people using this environment.

Mental maps

Research on how people make decisions points out that decision-makers first try to assess the impact of their decision before making their definite choice (March, 1994). The assumption is then that decision-makers rely on a mental map of their environment that allows them to simulate potential impact-scenarios. The problem now is that this environment is so complex, that this map necessary has to be a simplified version of the real thing; a simplification where only a limited number of aspects is taken into consideration. The question as to how close this simplified version is to the original one, depends, among others, on the cognitive capacities of the decision-maker, and on the specific situation in which the decision has to be made (Downs and Stea, 1973; Garling and Evans, 1991). To gain insight into how people make decisions in a particular environment thus requires first and foremost gaining insight into how these people use, perceive and conceive this environment. For, those places that do not appear on the mental map, simply do not exist.

The translation of an actual location into a mental map is an iterative process, during which a decision-maker continuously collects information on the actual situation, each time refining this map. Along this refinement process, this map is said to sequentially adopt a number of so-called knowledge structures. Kitchin (1997), for example, specifies three of such structures, each one based on another type of knowledge: declarative knowledge, procedural knowledge, and configurational knowledge. In the field of behavioral geography these three structures are referred to as landmark-, route- and survey-knowledge (Mondschein, Blumenberg and Taylor, 2005). Declarative (or landmark) knowledge refers to knowledge on facts and features of a given location. The decision-maker, in fact, composes a database of impressions and experiences, but is not yet able to link up elements in the database. Procedural (or route) knowledge refers to knowledge the decision-maker collects on a location while following procedures, such as, walking along a route. Executing the procedure, relations (between elements of the database) start to become clear, but do not necessarily lead to insight yet. Configurational (or survey) knowledge, finally, refers to knowledge of (data)configurations. The decision-maker is now able to recognize patterns in his/her database, patterns that no longer only relate to recent impressions or experiences. The separate data-pieces synchronize into one figure: a mental map.

Once the decision-maker ran through this translation-process, he/she is able to make a strategic decision: firstly representing and assessing a number of alternatives, secondly choosing the best alternative, to only then start to act. There are situations though in which a decision-maker does not effectuate all three knowledge structures: in case of routine actions, for example, where the decision is kind of fixed, as such not requiring the repetitious assessment of choice alternatives; or in case of coincidental situations, requiring fast decisions, so that the decision-maker is not in the position to assess all possible implications. The mapmaking-process does thus not only depend on the cognitive capacities of the decision-maker and on the specific situation in which the decision has to be made, but also on the type of decision (i.e. strategic, routine or impulsive).

In other words, the way in which people make decisions is an utmost complex process. This complexity makes that there exist a multitude of – mostly very different – methods to reconstruct mental maps. A multitude which can be partly explained by the large number of scientific disciplines that, each from within their own realm, do research on decision-making behavior; such as neurology, behavioral geography, information technology, linguistics, and behavior sciences. Within this multitude two approaches can be distinguished: a more theoretical versus a more empirical approach.

The theoretical approach typically starts with formulating a conceptual framework structuring how individuals make decisions. This generic framework is then calibrated to an actual situation relying on a survey and statistical information. An example of such an approach is the employment of Bayesian Networks to model mental maps (Arentze and Timmermans, 2005). A Bayesian Network is built around the assumption that the probability that an event will occur depends on the occurrence of other events, and structures these dependencies in a framework. Translated to knowledge structures, one could argue that a Bayesian Network represents the configurational knowledge of the decision-maker, i.e. those aspects of a situation that a decision-maker considers relevant and the relations between these aspects. Depending on the current knowledge on one of these aspects, the decision-maker will then revise his/her judgment. For example, the decision as to -whether or not- buy a house in a particular neighborhood, might become an obvious one, once the decision-makers gets to know that a square in this neighborhood will be refurbished.

The empirical approach does not rely on a theoretical framework, but on individual observations. A very popular technique within behavioral geography is, for example, the drawing of (mental) maps: a person is asked to draw the route he/she travels from his/her house to work (Lynch, 1960). On the basis of these drawings, one can then derive which (spatial) information is relevant to this person, which information he/she leaves out, or whether he/she systematically enlarges particular proportions. A second technique is the composing of mental atlases (Kuipers, 1982): a person is asked to draw not only one, but a series of maps. A third technique, finally, is the creating of cognitive collages (Tversky, 1993): a person is allowed, not only to draw, but also to use pictures, or text to illustrate a particular environment or route.

Independent of both approaches, a number of common research theme's can be distinguished, returning in the earlier mentioned scientific disciplines. Mark et al. (1999), for example, list four of such theme's: a first theme focuses on how decision-makers collect (geographical) knowledge; a second theme on how they represent this knowledge; a third one on how they use this knowledge; and a fourth one, finally, on how they communicate about this knowledge. Mark et al. (1999) point out that the representation of knowledge (i.e. the second theme) in fact involves both collecting and representing data and information. Two activities which are, according to the authors, inseparable. In other words, the mental map depends on the type of information that is being collected, and what is being collected depends on the decision that has to be made (and thus on the mental map). The consequence is that, according to Mark et al., there is no standard method to trace which information decision-makers do collect, or to trace how they then represent this information. The method simply depends on the situation in which the decision is being made. This turns each creation of a mental map into a pioneering act.

We argue that the recent developments in the area of new media might provide these pioneers with a roadmap to guide them along their mapmaking. Think, for instance, of phenomena such as weblogs, social virtual worlds (e.g. Second Life), User Generated Databases (e.g. Flickr, Wikipedia), social networks (e.g. Facebook, MySpace), Volunteered Geographic Information (e.g. Open Street Map), or Ubiquitous Urban Games (e.g. 7Scenes). Characteristic of these phenomena (or instruments) is that they are interactive (i.e. two-way information: information reacts to and evolves with the input of the users); that there are multiple authors; that quasi all content is generated by the users; that the same piece of information can be represented in multiple ways; that collected data can be analyzed instantly (be it by software or not); that the type of information is irrelevant; that registration is continuous, etc. All characteristics that allow to get insight, in a natural fashion, into how people experience, perceive and conceive their environment (be it virtual or real), as such allowing to register and reconstruct the associated mental map.

Ubiquitous Urban Games

Weiser predicted, already in 1991, that computers would leave our desktop and move out, into our daily environment. Each single object would be equipped with sensors –sensing our presence- and processors –processing personal information - upgrading them into intelligent machines. The computer of the 21st century, he proclaimed, would be ubiquitous: all over without us noticing it.

Today, almost two decades later, the actual implications of Weiser's prediction start to become tangible: everyday objects such as our (mobile) phones, id-cards, cars, and kitchen

appliances possess almost as much processing power as computers at the time of Weiser's future telling; they are all hooked up into a network; and they are programmed to – autonomously- update their behavior. This evolution obviously has repercussions on how we use and will use our spatial environment: in the near future it will, for example, be possible to interact with any object in our environment, communicate via objects with other people, and even use these objects to get to know these other people (McCullough, 2005; Greenfield, 2006).

A potential that the gaming industry is also discovering. Ubiquitous Urban Games (UUG), for instance, are a category of computer games that take place in the physical environment, but rely on technology to augment this environment with invisible and networked computing functionality (McGonigal, 2007). Players of UUG are not immersed into a virtual world (as PC players are), but blend the real with the virtual. These games rely on devices such as mobile phones, location aware devices, and digital cameras to interact with the environment and other players via WIFI, RFID, Bluetooth, cell-phone networks, etc.

An example of an UUG is 7Scenes, a platform, developed by Waag Society, for multi-user real-time gaming with mobile and location-specific technology. "7scenes lets you place stories, routes and games virtually onto the real world. You can discover and experience these scenes on location along with other people using your mobile phone. Scenes are active and social by nature. All your outdoor experiences can be played back on the web and shared with your friends" (www.7scenes.com).

Up to now, UUG remain first explorations though, developed mainly by artists or academics (von Borries, Walz and Böttger, 2007): games developed to simply experiment with the new technology; to teach, for example, history; or to stimulate collaboration. We claim that UUG can also be employed as a tool to generate mental maps, in addition to the above explorations. First and foremost because UUG are location based: they can be used on site, while performing actions, if necessary without the user being consciously aware of it. A second argument is related to the nature of UUG, typically involving the use of a geographic positioning and/or tagging device (allowing the player to read and write messages linked to a particular location). In mapping the data collected by both devices, (primitive) mental maps can be –quasi automatically- generated. A third argument is that UUG can be designed to be interactive, for example to confront the gamer with particular spatial configurations. A fourth argument is that UUG are not confined to one day, but can stretch out over a longer period of time, offering a more clear insight into the spatial behavior of a 'gamer'. Important is also that UUG can be played in group, increasing personal engagement, but also incorporating the impact of the social surroundings on the formation of mental maps. All arguments thus to employ UUG as a toolbox to generate mental maps as representations of how people react to, perceive and conceive spatial environments (and changes in these environments).

The scope of the research is to validate these arguments by actually developing an actual UUG and applying it to a well-defined context and theme (leisure). Two experiments will be conducted:

- (1) A first experiment involves people who are familiar with the outlined context. These people will be invited to participate in a long term UUG. An important partner here is ICity, an organization subsidized by the Flemish government and Europe, providing 'the largest living lab' to test mobile applications;
- (2) The second experiment involves people who are not familiar with the outlined context. These people will be invited to participate in a short term UUG related to the outlined theme;

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