Emotional mapping and its participatory potential: Opinions about cycling conditions in Reykjavík, Iceland

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ABSTRACT

Many cities have prioritised the provision of bicycle infrastructure, as part of a transition to more sustainable transport. Information from the users of bicycle facilities is crucial for successful bicycle planning. The article presents a case study of Reykjavík, Iceland, where a simple 'emotional mapping' platform was used to enable cyclists to express their emotional reactions to routes and places. A sample of 100 users identified some 541 features - lines and points - on a map of the city, associated them with either 'good' or 'bad' emotions and wrote textual comments to elaborate on the reasons for their judgement. The results indicate clearly the importance of the natural environment for cyclists, as well as the negative feeling engendered by cycling close to car traffic or in the street with the cars. These data support the emphases found in the present bicycling plan of Reykjavík city. In general, volunteered geographical information and crowdsourcing has much potential for increasing citizen participation in urban planning. A flexible software platform for participatory mapping, such as the one used in the study, can be a valuable addition to the planner's toolbox.

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1. Introduction

Sustainable urban transport has become one of the most important planning issues that city governments have to deal with (Banister, 2005). Cycling is seen as a central plank in sustainable transport policies. In recent years, and similar to many other cities around the world (Pucher, Dill, & Handy, 2010; Pucher & Buehler, 2012), the city of Reykjavík, Iceland, has aimed to increase the popularity of cycling as a mode of transport. A cycling policy was adopted in 2010 (Reykjavíkurborg, 2010) that envisaged a network of dedicated bicycle paths traversing the city region, and the adaptation of existing streets to accommodate bicycles. Design guidelines have been drawn up (Erlendsdóttir, 2012) and considerable resources have been allocated to building the infrastructure for cycling. Many different solutions for cycling have been tested in Reykjavík, including fully segregated bike paths, paths shared by cyclists and pedestrians, on-street bicycle lanes, and chevrons that indicate the presence of cyclists on the streets.

The policy has been successful: the proportion of trips made by bicycle has grown steadily. According to a survey of travel behaviour in Reykjavík, carried out in October and November 2014, 5.5% of all trips were made by bicycle (Reykjavíkurborg, 2015), an increase from 4.7% in a similar survey in 2011 (Capacent Gallup, 2011). In 2015, a new policy was drafted for the period 2015–2020 (Reykjavíkurborg, 2015). A goal is set for increasing the modal share of bicycling to 6.5% and to

have some 8% of all bike routes completely separated from car traffic and pedestrians at the end of the period. The development of a network of separated bike paths is to be continued.

However, little concerted effort has been made by the city's planning authorities to collect information directly from those who make use of the cycling infrastructure – the cycling public. This paper reports the results of a pilot study of 'emotional mapping' as a participatory tool for urban planning, with cycling routes in Reykjavík as the empirical example. Apart from yielding valuable information to planners, we argue that such emotional mapping can also be seen as an important way of increasing the level of participation by specific stakeholders or interest groups in urban planning, i.e. as a procedural innovation as much as an instrumental one. The outcome of the pilot study can be seen as a version of a cycling map created by a community. 'Official' cycle maps usually only focus on infrastructure, and omit the community's views and emotional responses (Perkins & Thomson, 2005). More participatory input from the cycling public is desirable.

Numerous methods have been developed for increasing public participation in planning. Some of the most interesting relate to the emerging technologies of 'crowdsourcing' (Howe, 2006; Brabham, 2009; Seltzer & Mahmoudi, 2012), or 'volunteered geographical information' – VGI (Goodchild, 2007; Elwood, Goodchild, & Sui, 2012) coupled with GIS analysis and the presentation of data. Bicycle planning is an area that lends itself well to such methods, as active cycling depends on a certain spatial awareness, and in cycling cultures there is moreover a certain tradition of sharing information about route conditions (Kessler, 2011). Adaptations of conventional transport engineering

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approaches are commonly used in current practice, such as the Bicycle Level of Service (BLOS) index (Landis, Vattikuti, & Brannick, 1997), together with GIS-based analysis (Rybarczyk & Wu, 2010). Such approaches stress the technical parameters of bicycle facilities, but arguably they do not adequately take into account the subjective experience of those who use the facilities. Here, we consider that crowdsourcing GIS methods, together with the collection of subjective and qualitative data, hold much promise.

2. The concept of emotional mapping

Emotional mapping enables the display of subjective, qualitative and bottom-up spatial information about the environment in highly hierarchical, quantitative and top-down GIS settings. Emotional maps are often a neglected part of cartography, yet they contain relevant information, especially for urban planners and city administrators. Participatory approaches in mapping and qualitative elements of GIS (sometimes also called GeoParticipation) allow city planners and decision makers to deploy new tools and methods that can collect both qualitative and quantitative data about cities, their dynamics and the people living in them (Kloeckl, Senn, Di Lorenzo, & Ratti, 2011).

The basis of emotional mapping is the fact that emotions, spaces and places are very much connected. Emotions are one of the defining characteristics of every human being and yet their presence in maps and spatial data is uncommon (Griffin & Mcquoid, 2012). Several authors (e.g. Reeve, 2014; Russell, 1980; Barrett, 2006) have described emotions as a two-dimensional structure, with the axes being pleasant-unpleasant and high arousal-low arousal. Geographers, on the other hand, have described emotions as subjective, relational flows between places and people (Smith, Bondi, & Davidson, 2012), adding a crucial spatial dimension. Every location can evoke an emotion (Mody, Willis, & Kerstein, 2009) and places can be felt to be attractive, boring, dangerous or scary, among other emotions (Korpela, 2002). Emotions provide a strong influence on how the environment is perceived and emotions have an effect on the spatial distribution of the perceptions (Zadra & Clore, 2011). The physical layout of the environment and the built structures affect the emotional perceptions of the place (Hille, 1999; Schmeidler, 2000). For example, this is especially evident when exploring fear of crime (Block & Block, 1995; Sherman, 1995).

It would be possible to argue that 'emotional mapping' is not the correct term, as it is not exactly 'emotions' that are mapped, but merely perceptions or experiences from/with a place. Nevertheless, the authors have decided to continue using the term emotional mapping, mainly based on the argument of Perkins (2009, p. 130), who states that "emotional maps chart human feelings onto a cartographical landscape and allow users to devise and customise their own emotional landscape, choosing what kinds of thoughts or experiences, feelings or passions, to map".

Griffin and Mcquoid (2012) distinguished three categories when talking about maps and emotions. These categories are (1) maps of emotions, (2) using maps to collect emotional data, and (3) emotions while using maps. The case study described in this paper is a combination of the first two categories. Maps were used to collect the emotional information and to visualise the emotional data. Although historically, cartography was mainly focused on representing that which is objective, visible or measurable, and can be mapped (for example, air temperature or wind speed) (Wilson, 2011), critical cartographers have always advocated mapping a space as people experience it, with subjective emotions as well (Pearce, 2008).

In the past ten years, several projects have dealt with georeferenced emotions and/or perceptions. Emotional maps have been produced in various fields, such as tourism (Mody et al., 2009), navigation (Huang, Gartner, Klettner, & Schmidt, 2014; Gartner, 2012), urban safety (Salesses, Schechtner, & Hidalgo, 2013; Pánek, Pászto, & Marek, 2017) and city planning (Raslan, Al-Hagla, & Bakr, 2014). Yet, emotional mapping has largely been an academic exercise, as Hauthal and Burghardt

(2016, p. 2) state: "mappers of georeferenced emotions are almost exclusively researchers". This contrasts somewhat with various community mapping methods that have gained popularity, especially after the development of the Local Agenda 21 Planning Guide created during the United Nations Rio Conference on the Environment in 1992, where community mapping was identified as a best practice for locally-based sustainability planning (ICLEI & IRDC, 1996). Since the Rio conference, many scholars have been engaged in both the theory and the practice of community mapping (Chambers, 2003, 2006; Perkins, 2007; Glöckner, Mkanga, & Ndezi, 2004; Pánek & Vlok, 2013; Forrester & Cinderby, 2012; Elwood, 2002; Craig & Elwood, 1998; Parker, 2006). Nevertheless, it was only recently that a subjective layer (Huang et al., 2014) or the concept of qualitative GIS (Elwood & Cope, 2009) was introduced. In this case study, the authors perceive cyclists to be a specific community with whom to work, in order to understand their preferences and behaviour while using bicycles as a means of transport.

The methods used to gather emotional data can be divided into three groups: (1) biometric measurements (Bergner, Zeile, & Papastefanou, 2011; Nold, 2009), (2) extraction from user-generated content such as Twitter, Flickr, Facebook, etc. (Biever, 2010; Bollen, Mao, & Zeng, 2011; Mislove, Lehmann, Ahn, Onnela, & Rosenquist, 2010), and (3) surveys (Huang et al., 2014; MacKerron & Mourato, 2010; Mody et al., 2009). The authors' approach falls under this last category. More specifically, it is a version of a Computer-Assisted Web Interviewing (CAWI) method, which is in alignment with the concept of participatory planning support system (PPSS) as defined by Kahila and Kyttä (2009). Regarding cyclists specifically, the need to understand emotional responses has also been highlighted in several studies concerning the perception of safety (Møller & Hels, 2008; Lawson, Pakrashi, Ghosh, & Szeto, 2013), as well as studies focused on using cyclists as sensors (Reddy et al., 2009; Reddy et al., 2010).

3. The online mapping tool: technical aspects

The data were collected via the crowdsourcing online tool *PocitoveMapy.cz*, which is designed as web-application based on a Leaflet library. Similar to other web-based tools for crowdsourced mapping, it allows users to collect spatial data on a slippery map background. Unlike Ushahidi, Umap, ArcGIS Online and many others, PocitoveMapy.cz does not require the registration or installation of any specific software, plug-in or virtual server. The application is created as a single-page web application using two main open-source JavaScript libraries; jQuery for basic user interactions and app control and Leaflet, the library for map interactions. The source code of the frontend part is divided into small modules. The crowdsourced data are saved in a MySQL database, which is usually available on every hosting, and therefore there is no need to have specialised hosting or own server with geodatabase installed. Each entry in the database contains a unique user-ID (randomly generated), question identifier, number of points/lines/marked and geometry. These entries are later merged together by GeoJSON PHP library script (Mikola, 2015) which allows GeoJSON to maintain data from multiple users. Furthermore, simple SQL queries can be used to filter data, based on the user ID, type of the question, etc.

Up to now, the predominant methods for spatially-explicit preference mapping have been marking points for locations or sketching polygons annotated with expressions of preference (Jankowski, Czepkiewicz, Młodkowski, & Zwoliński, 2015). Brown and Pullar (2012) suggested that points instead of polygons be used in future PPGIS applications, but their study was focused on mapping large-scale landscape values. This article presents mapping using two methods that are closely linked to the topic - lines for bicycle routes and points for events/places on the bicycle routes. The application by default allows users to also mark polygons by clicking or by free-hand drawing, but these features were not used in this case study.