Mapping citizens’ emotions: participatory planning support system in Olomouc, Czech Republic

Jiří Pánek

Department of Development and Environmental Studies, Palacký University Olomouc, Olomouc, Czech Republic

ABSTRACT
Community mapping and emotional cartography have close links to participatory planning in the urban environment. The case study presented in this paper describes the deployment of the Emotional Maps platform for the collection and visualisation of spatial data related to the participatory planning of public space. The results (Main Map) presented are a combination of paper-based and web-map surveys. 2117 respondents from Olomouc (2% of the city’s population) marked 25,760 points, lines and polygons, and made 4801 comments. Six spatial questions were asked in the survey and four of them are presented in the attached map. The questions were related to the general attractiveness of the city, safety, satisfaction with public transport and suggestions for the future development of some areas. The outcomes of the survey served as the groundwork for the Strategic Plan of Olomouc for 2017–2023.

1. Introduction

Both perception and knowledge are highly spatially oriented. The perception of geographical space is the creation of an image of your surroundings in your consciousness (Siwek, 2011), while spatial knowledge is often related to spatial control (Harley, 1988). The introduction of GIS to the field of Citizen Participation is also sometimes called GeoParticipation (Pánek, 2016) and it can be seen on two levels – global platforms such as Ushahidi, OpenStreetMap and Public Laboratory, and local projects which use geospatial tools in order to support citizen participation. The local projects can vary from environmental monitoring (Kubásek, 2013), national park protection (Valůch, 2011), applications for student protests (Austen, 2011; Goodman & Khanna, 2013), monitoring air pollution (Cístý komín, 2015), pot-hole mapping (Výmoly, 2015) and “simple” citizens reporting such as CitySourced in the USA, FixMyStreet in the UK and Odkažprestarostu.sk in Slovakia, along with many others around the world. GeoParticipation is based on the use of spatial tools in order to involve citizens in community participation. In some countries (Jankowski, Czepkiewicz, Młodkowski, & Zwoliński, 2015; Kahila-Tani, Broberg, Kyttä, & Tyger, 2015), GeoParticipation is the future of Public Participation GIS and Participation Planning Support Systems as it provides an easy-to-use environment and social engagement, while creating a feeling of belonging to a certain social group or community. Emotional mapping can be traced back to the ground-breaking book by Nold (2009) Emotional Cartography, but the concept has been theorised on many levels since he wrote his book. Three conceptual frameworks of emotional data collection have been defined by Griffin and Mcquoid (2012), and emotional maps have been used in various fields, such as tourism (Mody, Willis, & Kerstein, 2009), navigation (Gartner, 2012; Huang, Gartner, Klettner, & Schmidt, 2014), city planning (Pánek & Pászto, 2017; Raslan, Al-hagla, & Bakr, 2014), biking infrastructure research (Lawson, Pakrashi, Ghosh, & Szeto, 2013; Møller & Hels, 2008; Pánek & Benediktssson, 2017; Reddy et al., 2010), safety mapping (Lipscomb, 2014; Pánek, Pászto, & Marek, 2017; Traunmueller, Marshall, & Capra, 2015), and in combination with the data mining of social networks (Biever, 2010; Caragea, Squicciarini, Stehle, Neppalli, & Tapia, 2014; Hauthal & Burghardt, 2016).

The paper reports on the deployment of the Czech web application Emotional Maps (Pánek & Růžička, 2018), which was used as a crowdsourcing tool for the collection of citizens’ perceptions of Olomouc, and was part of the preparation for the Strategic Plan of Olomouc for 2017–2023. The main aim of this paper is: (1) to present the author’s own web application, as used for the data collection; (2) to present the results of the Emotional Map of Olomouc (Main Map); and (3) to discuss the possible replication of the approach in other scenarios and case studies.
2. Study area

Olomouc is a historical city in the Czech Republic, with a population of 100,154 (Czech Statistical Office, 2016). It is also the seat of The Regional Authority of the Olomouc Region and the sixth largest city in the country. The city is sometimes called the “city of parks” due to the several parks that surround the historical city-centre. Although the parks are perceived as a source of pride for the city, they are often a source of danger and criminality, mainly in the evening and at night. The Olomouc Region stated, in its Strategy of Criminality Prevention 2013–2016 (Olomouc Region, 2015), that one of its four visions is to increase the sense of safety in the region, therefore one of the researched questions mentioned below, also concerned people’s perceptions of safety in Olomouc. Although there have been several case studies regarding the perception of safety in Olomouc (Hýža, 2016; Pánek et al., 2017; Rychtáriková, 2017), the dataset on which this paper is based is the largest dataset collected so far.

2.1 Methods

The collection of data was conducted during November and December 2016 via (a) paper-based questionnaires in the streets of the city (n = 500) and (b) an online web-map questionnaire (Figure 1) with the same questions as the paper-based version (n = 1746). The selection of respondents for the paper-based questionnaire was intended to be as close to a random sample as possible. Interviewers were scattered around the city of Olomouc in order to interact with people on the streets. The online web-map was presented via the social networks of the city council and the university. Furthermore, the article concerning the research was published in the municipality’s newspaper which is delivered to every household in the city. After the empty and incorrect responses were discarded, the final number of respondents was 2117 (481 from paper questionnaires and 1636 from web-map).

For the data collection the author’s web-application, Emotional Maps was used. The application is based on Leaflet library and it allows users to collect and store spatial data as GeoJSONs. Unlike Ushahidi, Umap, ArcGIS Online and many others, the app does not require registration, installation or any special plugins, hence it can be used freely in any available browser. The only limitation is the connection to the internet as it does not operate offline. The application runs with MySQL database in the backend and it uses PHP to operate the frontend. Through the web-app, the respondents were asked six spatial questions (see Table 1) about the city, and various spatial features (points, lines, polygons) were used to mark their answers, depending on the question. In every question, the number of features referred to was limited to five locations per person. Each answer could also be annotated by a comment and users were able to change the background map to the aerial image or OpenStreetMap, etc. Following the map section, the demographic questionnaire required information regarding the gender, age, education, economical status and neighbourhood of the respondent. The paper questionnaires were analogue copies of the web-map questions, and they consisted of two double-sided A3 maps of the city and suburbs and one A4 questionnaire with demographic and follow-up questions. Each map included three spatial questions and respondents were able to mark up to five locations for each question. Various

Figure 1. Printscreen of the web-app used for crowdsourcing the data.
collection methods were used in order to reach different target groups and to receive as wide a range of answers as possible. The results from the paper-based questionnaires were manually digitised via the web-interface used for online data collection. The main reason for using paper-based questionnaires was to ensure the inclusion of those citizens (mainly seniors) who would have had some difficulty participating in an online survey. The author is aware of possible errors entered while digitising, but the georeferencing of 1000 maps was beyond the timescale of the project.

3. Results

In total, 25,760 points, lines and polygons were collected and 4801 comments were added to the locations marked. The gender balance was 42.7% men and 57.3% women and is linked to the age distribution of the respondents, which included a high number of students as Olomouc is a university town with more female students than male students. The age distribution was from 8 years to 88 years, and almost half (46.4%) of the respondents were over 26 years old (Tables 2–4).

3.1. Which is a pleasant public space?

The author analysed clusters and hot-spots in all answers and several locations appeared. The most frequently marked locations were in the historical centre – the Upper square had 13% of the responses to this question, the Lower square (4%), Saint Wenceslas Cathedral (5%), the Church of Saint Michael (3%) and the Teresian armoury (currently the university library) (2%). Outside the historical centre, the city parks were mentioned in 25% of the answers (three parks together), as well as the Minor Basilica of the Virgin Mary on Svatý Kopeček (2% – including the area near the ZOO), and the shopping centre Šantovka (2%).

3.2. Where do you feel unsafe?

The perception of safety is a matter of long-term research by the author of this paper (see Pánek et al., 2017). The results of this case study confirm the previous findings which show the most marked locations to be around the main train station (16%), the area around the Mausoleum to Yugoslav Soldiers in Olomouc (3%) and locations associated with groups of homeless people, such as Bishops square (2%), Republic square (2%) and tř. Svobody street (3%).

3.3. Which areas should be improved regarding public transport?

For this question, respondents could mark points (locations) as well as polygons (whole areas), therefore the interpretation of this map is slightly difficult as it contains a lot of data. Nevertheless, the most marked places were Zikova street (10%), the area around the main train station (8%) and the bus station close to the city centre (7%). Furthermore, whole neighbourhoods were often marked, mainly areas on the outskirts of the city.

3.4. Which places should be improved regarding walkability?

As with the previous question, respondents could use two spatial features to mark their answers to this question.

| Table 1. Overview of how many features were collected in each question. |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                  | Which is a pleasant public space? (points) | Which is an unpleasant public space? (points) | Where do you feel unsafe? (points) | Which areas should be improved regarding public transport? (points and polygons) | Which places should be improved regarding walkability? (points and lines) | Which location in the city should be developed in the future? (points and polygons) |
| Total            | 8169            | 6052            | 4606            | 2531            | 2536            | 2972            |
| Via the web-application | 6290            | 4620            | 3716            | 1565            | 1965            | 2391            |
| Via the paper-based questionnaires | 1879            | 1432            | 890             | 966             | 571             | 581             |

| Table 2. Age structure of the respondents. |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Age group       | Up to 15 years  | 15–24 years    | 25–34 years    | 35–44 years    | 45–54 years    | 55–64 years    | Over 65 years |
|                 | 0.2             | 46.0            | 27.0            | 12.0            | 5.7             | 2.3             | 3.4             |
| N/A             | 3.6             |                 |                 |                 |                 |                 |                 |

| Table 3. Highest level of education achieved by the respondents. |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Level            | Primary         | Secondary       | Tertiary        | N/A             |
|                  | 4.1             | 46.9            | 45.3            | 3.7             |

| Table 4. Economic profile of the respondents. |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Employment status | Primary school pupil | Secondary school student | University student | Employed | Unemployed | Parental leave |
|                  | 0.5             | 3.7             | 46.6            | 39.3           | 0.6           | 1.9             |
|                  | 3.6             | 3.0             | 1.0             | 1.0            | 2.8           |                 |

Table 1. Overview of how many features were collected in each question.
Walkability is only a linear movement so the polygon feature was replaced by the line feature and points were used to mark specific locations (cross-roads, bad corners, etc.). Half of the answers (50.9%) were marked as lines so it was a complicated process to locate single hotspots. The areas marked the most include the whole main road from Žižkovo square towards the city centre (15%), the crossroad close to the local court (3%) and the crossroad next to the shopping centre Šantovka (4%). Outside the road network the highest amount of respondents marked the paths along the river Morava (2%).

4. Conclusions

This case study can be compared to a large scale participatory planning exercise conducted in Helsinki (Kahila-Tani et al., 2015), where a total of 3745 residents (about 0.6% of the population) were willing to share their opinions. They marked 32,989 locations on the map. This case study, with 25,760 points, lines and polygons collected and 4801 comments added from 2117 respondents (2% of the city’s population), has proved that participatory mapping has the potential to address the critical crowd. The results of this study were included in the preparation of the Strategic Plan of Olomouc for 2017–2023, together with further survey data collections, a SWOT analysis and interviews. Some of the results confirmed ideas already acknowledged in previous research, and some of the information was new and will be dealt with accordingly. Further analysis of the demographic profiles of the respondents and their home locations, as well as textual analysis of their comments, will increase our understanding of why people marked certain locations. The author compared the results on the basis of the gender of the respondents and also compared the responses of University students (as the city has a high density of students) with the non-student population. No statistically significant differences were found among the main hot-spots for these four groups, nevertheless, the author is confident that some differences would be found if maps were created for various age groups – for example, teenagers vs. senior citizens.

Software

Our own web-app, EmotionalMaps, was used to collect the data. QGIS 2.18.0 and ESRI® ArcGIS® 10.0 were used to convert the data from GeoJSON to Shapefile, to clean the data sets and to prepare the data for visualisation. Corel X6 was used for the final data visualisation.

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ORCID

Jiří Pánek http://orcid.org/0000-0002-6390-3149

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