CO-063

LOCATION-BASED EMOTIONS RELEVANT FOR PEDESTRIAN NAVIGATION

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ABSTRACT

Every human perceives urban space differently. Some places are seen to be unsafe, others as especially beautiful. This perception is subjective and emotions of the person influence it. We want to collect those location-based emotions to use them for enhancing pedestrian navigation. Traditional survey methods to collect similar data are quite small in scale and therefore too high in data granularity. To overcome this and to get a higher quantity of data we want to use crowdsourcing to collect data in-situ. Before this can be done we need to know which emotions or factors to ask for. In this paper we sum up some ideas and basic findings in that matter.

INTRODUCTION

The aim of this paper is go give a basic literature review on emotion sensing. It documents the first step in the two-year project "EmoMap". The basic assumption in this project is that every human perceives urban space differently. For example, some places are seen to be unsafe, others as especially beautiful. This perception is subjective and emotions of the person influence it. The idea of the project is to collect this emotionally colored data about space in a crowdsourcing approach. The resulting data can be used for various purposes; in our project we focus on the visualization of the data and its use to improve pedestrian navigation systems. In this paper we analyze the methods to sense emotion and we review literature to find out which types of emotion are relevant.

SENSING EMOTION

In the field of product and service development there are, according to Westerink et al. (2008), standard procedures for measuring experience-related emotions. They can be divided into three basic groups: (1) descriptions and judgements by the user, where interviews and questionnaires are used to collect an overview of user experiences, (2) physiology recordings through sensors (e.g. electrocardiogram, electromyogram, galvanic skin response, photoplethysmography) with the advantage that the user does not have to interpret or even recognize his emotions himself, but with the disadvantage that the collected data is harder to interpret, and (3) behavioural observations (observation of user's actions and facial expressions) with similar advantages and disadvantages as sensor measurements. For our project all three methods might be an option, but as we want to use a crowdsourcing approach to get a high data volume, we have to concentrate on the first option. This also follows the tradition of mental mapping.

The terms mental mapping and cognitive mapping were coined by Downs and Stea in 1973. They refer to various psychological processes of mental collecting, coding, storing, reloading, and decoding information about the spatial surroundings. By definition, a mental map of a person is a subjective image of the world and the contents of mental maps vary among individuals. However, by collecting and combining many mental maps into collective mental maps it is possible to get an average subjective image of space. Matei (2003) developed a standardized method to do so. The main principle is to collect a large number of mental maps with a survey and to combine these into one average map. The result of such a process can be, for example, an overview map of a city showing the perception of safety or beauty or similar factors. Due to the method of collection, the resulting map scale is quite small and the granularity quite high. Although this information is valuable for many disciplines like regional planning (e.g. "district A is perceived as unsafe, district B as beautiful"), it can not be used for large-scale applications like pedestrian navigation. Also, the survey method is retrospective and might be heavily based on preconceived opinions about specific places (as probably not ever participant has been to every place in the survey area). Our approach is to collect data in-situ with the help of mobile technology and volunteering users. The method to collect the data is not yet decided on in detail, but existing similar systems (e.g. http://www.mappiness.org.uk) show how it can be done. However, the details of the collection method can only be specified when it is decided which types of emotion are to be collected. The next section tries to give an overview of literature in that area.

TYPES OF EMOTION

There is no generally agreed-on definition of the term emotion (Latin for "out of movement"), but some sources can be summed up to define it as the psychophysiological experience of an individual's state of mind. This experience is based on internal (biochemical) and external (environmental) influences. There is

no definitive taxonomy for emotions, but a wide range of suggested taxonomies. These vary greatly in number of differentiated emotions, depending on the purpose they were intended for: for example, in some theoretical psychology papers four basic emotion types are used, Tosa and Nakatsu (1996) investigate emotions that can be detected in voice and refer to various taxonomies with four to seven emotions, and Wikipedia has a long unstructured list of 127 emotions as well as an article on each of them. For our project we wanted to take a look at taxonomies used in fields of research similar to ours, namely location-based emotions. Mody et al. (2009) developed a prototype system for location-based emotion tagging. In a first step they did tests to find the relevant emotions. Their findings were that it is not possible to define a generic set of emotions to choose from because there are too many different emotions and they are very varying among users. However, they found out that there were two commonly and intuitively used variables: liking a place and feeling comfortable at a place. The two factors were not necessarily correlated (Test persons liked some places, but didn't feel comfortable at the same time or they didn't like a place but felt comfortable at the same time). Therefore they developed an emotional matrix for their prototype with one axis containing values from "uncomfortable" to "comfortable" and the second axis containing values from "don't like it" to "like it". The authors evaluated this system as intuitively usable. Unfortunately, we didn't find too much other work beside of this one dedicated to location-based emotion taxonomies. Therefore we want to took a look at existing applications that use location-based emotions to eventually find an underlying taxonomy.

The UK service Mappiness (http://www.mappiness.org.uk) asks its users twice a day via their smartphones to rate how happy, relaxed, and awake they are. For each of the three factors eleven steps from "not at all" to "extremely" are available. Some additional questions are asked (e.g. for current company and activities) and the user's current position is stored. Although the service was set up for research purposes, no papers are yet available which could explain why those three factors were selected.

The service glow (http://glowapp.com) asks its users via smartphone, "how do you feel?" The data input is done via a rating system of one to five stars. Again, the information is stored geocoded. Personal results as well as the combined data of all users can be displayed on heat maps with a color range from blue ("awesome") to red ("not so awesome").

QikTalk (https://market.android.com/details?id=com.qiktalk.lite), another smartphone application designed to "share happiness" allows selecting one of eleven moods which are ordered on a bar from zero to ten: I need help, depressed, hurting, sad, need a hug, bored, cool, super happy, giving hugs n'kisses, having a blast, and in 3rd heaven.

The Dutch company Scapps (http://www.scapps.nl) offers two smartphone applications for geocoded data collection for scientific purposes: Happymap and Safety Map. Both applications allow input on a scale from one to ten. Unfortunately, no further information about theses services is available.

Feeling Now (http://www.feelingnow.com) is another commercial smartphone application that asks the user in regular intervals for his or her emotions. The information is stored without a location. The user can select from 700 predefined emotions.

The service Ghostly Discovery (http://ghostly.com/discovery/play) allows automatic music playlist generation based on the user's emotional state. The service offers seven moods: aggressive, frenetic, energetic, neutral, laid back, introspective, and sad. Of course, this service is not in any way spatial. Also, it targets the general, longer lasting mood of the user, whereas our project is focused on short-time emotions.

All presented services and applications do survey user's emotions. But in comparison to our project they all tend to look for the general mood of the users and not so much for the momentarily experienced emotion caused (at least in part) by the spatial surroundings. Of course, it can be argued that the general mood is also influenced by spatial surroundings, but to get "cleaner" data it might be good to inform the user about the goal of the data collection and by designing the input situation more specific, e.g. by asking "How do the surroundings make you feel?" instead of "How are you?" Research in one of our previous projects, FEMroute (Schmidt et al. 2011), has shown that there are three important factors for route quality in pedestrian navigation: safety, convenience, and attractiveness. And although these factors are not emotions itself, they are very subjective and the rating of a specific place in respect of these three factors would probably be related to the emotions caused by being in the specific environment. Therefore we suggest that it is also possible to ask users for ratings instead of asking them for their emotions directly. This would bring the advantage, that the collected data is probably "cleaned" (at least to a certain amount) from basic un-spatial feelings of the person. However, it has to be made sure that the users are not encouraged to try to objectify the task to give totally rational ratings instead of emotionally colored ones. The three mentioned factors of Schmidt et al. (2011) were split up further in sub-categories (e.g. "footpath

width" or "bustle") – we do not recommend usage of these categories because of the before mentioned reason.

CONCLUSION AND OUTLOOK

Our literature and service review showed that there are quite many fields were emotions are surveyed. However, there is no work done that is similar enough to ours that we could use it to build upon. Therefore we want to develop an emotion taxonomy based on our experience in pedestrian navigation together with experts from psychology and/or sociology. We will then test this "draft" taxonomy in a small-scale experiment for usability and practicability. This will help us to improve the taxonomy for the large-scale crowdsourcing approach.

We are planning to store the crowdsourced emotional data in an open database which allows its use for various purposes by everyone. For our own use we face further challenges: How can we visualize the data in a cartographic manner? How can the data be used in routing algorithms to improve the user's experience? And finally, how can we evaluate our "emotional navigation system?"

ACKNOWLEDGEMENT

The work was partly funded by the Austrian Federal Ministry for Transport, Innovation and Technology (BMVIT) in the thematic research program iv2splus/ways2go.

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