

CONSIDERING AFFECTIVE RESPONSES TOWARDS ENVIRONMENTS FOR ENHANCING LOCATION BASED SERVICES

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KEY WORDS: Affective responses towards environments, Crowdsourcing, Location Based Services, Navigation, Routing

ABSTRACT:

Research on environmental psychology shows that stimuli and environments are perceived not only according to their physical features, but also affectively. Some places are experienced as unsafe, while some others as attractive and interesting. These affective responses are unequivocally subjective and shaped by people's interpretation of space. Experiences from daily life show that many of our daily behaviours and decision-making are often influenced by this kind of personal perception and subjective evaluation of space. For example, some environments might be experienced as stressful or unsafe and hence may be avoided; while others might attract people to sojourn and approach. Location based services (LBS) are often designed to assist and support people's behaviours and decision-making in space. In order to provide services with high usefulness (usability and utility), LBS should consider these kinds of affective responses towards environments. However, most current LBS rely on objective geospatial data only to provide services and decision support to their users.

This paper reports the results of the EmoMap project, which studies how people's affective responses towards environments can be modelled and acquired, as well as how LBS can benefit by considering these affective responses.

1) Acquiring people's affective responses towards environments: For collecting people's affective responses towards environments, we used a crowdsourcing approach to collect data from people using their smartphones. In order to make these affective responses easily reportable, an Affect-Space-Model was developed. In this model, a two-level structure was adopted. On the first level, people's level of comfort in space is gathered, whereas on the second level, users can optionally report more specific information regarding their affective experiences in space, specifically in the aspects of safety (unsafe/safe), attractiveness (unattractive/appealing), diversity (monotonous/diverse), and relaxation (hectic/calm). These aspects were derived from a focus group (with 9 participants), and refined in an online questionnaire (with 102 participants). Affective responses are automatically annotated with GPS locations to free the user from manually reporting her/his location and thus facilitate the way of contributing. Based on the model, a mobile app prototype (working on smartphones with Android 2.1 or above) was developed to enable people to report their affective responses towards space anytime and anywhere. Strategies of encouraging different groups of people for active contributing were also explored and developed. Until December 2013, more than 3200 contributions from 193 people were collected with this approach. The number of affective contributions is still steadily growing. Experiences from this data collection show that crowdsourcing approach is very useful for collecting people's affective responses towards space. More importantly, the crowdsourcing approach enables a direct, efficient, real-time collection of data, evoked by realistic scenarios, leading to highly valid results.

2) Enhancing LBS: In general, the affective data collected can be used for studying how people interact with the environment and developing innovative applications. In this paper, we focus on incorporating these affective data into LBS. As an illustration, we study how these affective data can be used in mobile navigation systems, which are one of the most popular LBS, to provide more satisfying routing results. Current routing algorithms often fail to provide other routes aside from time-optimized and distance-optimized routes. However, research has shown that humans may favour different route qualities in their path selection over shortness, such as safety, attractiveness and convenience. We addressed this problem by incorporating people's affective responses. The basic idea is to aggregate affective ratings of similar users to model/approximate the current user's perception of different street segments. With this, a street network, in which each segment is encoded with a collective rating, can be generated. Based on this kind of street networks, we can compute routes with different qualities, such as the most comfortable route and the safest route. Results from an empirical study (with 64 participants) show that the routes generated by considering people's affective responses towards environments are significantly preferred over the conventional shortest ones, which are employed in car navigation systems and many online route planners. In conclusion, considering people's affective responses towards environments leads to more satisfying routing results.

Applications of affective geodata will not be restricted to the aspects mentioned above. We expect the inclusion of a subjective layer will bring benefits to different disciplines, not only Information and Communication Technology (ICT), but also Urban Planning, Architecture, and Policy Making.