Geostatistical Analysis for the Study of Relationships between the Emotional Responses of Urban Walkers to Urban Spaces

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ABSTRACT

The described study aims to find correlations between urban spatial configurations and human emotions. To this end, the authors measured people’s emotions while they walk along a path in an urban area using an instrument that measures skin conductance and skin temperature. The corresponding locations of the test persons were measured recorded by using a GPS-tracker (n=13). The results are interpreted and categorized as measures for positive and negative emotional arousal. To evaluate the technical and methodological process. The test results offer initial evidence that certain spaces or spatial sequences do cause positive or negative emotional arousal while others are relatively neutral. To achieve the goal of the study, the outcome was used as a basis for the study of testing correlations between people’s emotional responses and urban spatial configurations represented by Isovist properties of the urban form. By using their model the authors can explain negative emotional arousal for certain places, but they couldn’t find a model to predict emotional responses for individual spatial configurations.

KEYWORDS

Emotion, Geo-Statistical Analysis, GIS, GPS, Isovist, Point Pattern Analysis, Regression Analysis, Space Syntax Theory, Urban Design

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INTRODUCTION

A procedure for the evaluation of urban design proposals from a human centered perspective is important in the planning of cities. One of the key steps in the planning of cities is the definition of urban form in which decisions about shape, dimensions and arrangements of buildings are made. These decisions have a relatively long lasting impact on the future development of a city, because once built, streets and buildings are hard to change. It is, therefore, important for planners to assess the implications of their decisions as early and as comprehensively as possible. A better understanding of the impact of urban form on the behavior of people can improve the design of cities (Hillier, 1996; Gehl, 2010).

A relatively new and promising design method is termed evidence-based design, which aims to evaluate a certain level of design quality by measurable criteria (Chong et al., 2010, p.1 ff.). In our context, an important aspect is to predict the most likely behavioral responses to a specific design proposal. Capturing the most likely behavioral reactions is crucial, because cities are typically designed for long time spans and must satisfy the needs of many individuals. Given the fact that individual actions are probably never fully rational and predictable and depend on many factors that are not a direct consequence of urban design (such as prior personal experience, cultural background, health, wealth), it is only possible and useful to identify the potential for promoting or avoiding certain behavioral reactions. In the framework of this paper we investigate emotional responses to space and assume that our emotions are an important aspect that influence behavior (Zajonc, 1984, Winkielman, Berridge, & Sher, 2011).

We start from the hypothesis that people have different emotional responses to different urban spaces. Based on this we structured this study in two phases: In a first step we measure human emotional responses in space using a sensor-wristband (Smartband), developed by Bodymonitor (Papastefanou, 2013a) in combination with a GPS-tracker. In a second step we look for correlations between the measured emotional responses and Isovist properties (Batty, 2001; Benedikt, 1979; Turner & Penn, 1999).

As a methodological basis for both phases we present a GIS-based spatial analysis method for evaluating the collected data. In the analysis we examine the probability that the distribution of emotion values occurs by chance, where the areas of clustering of high and low values of emotional response are, and finally if this clustered arousal in certain locations is caused by Isovist properties.

An Isovist describes the part of an environment that can be seen from a single observation point (Benedikt, 1979). Various parameters are derivable from an Isovist, such as the area, the perimeter, compactness and occlusivity. The area of an Isovist is a measure of how much one can see from a certain vantage point. The property of compactness describes the relationship between area and perimeter in relation to a perfect circle. It indicates how complex or compact the field of view is. Occlusivity indicates the amount of open edges. An open edge denotes an edge line of the visual field which is not defined by physical boundaries (e.g. walls). Occlusivity is small in locations in which only a few or no views into other parts of the spatial configuration are possible (e.g. when occlusivity = 0, the space is entirely enclosed). We use Isovist properties for this study, because they can be computed by using building footprints only, which are available for every location via Open Street Maps.

In a wider context, the study intends to contribute towards a Computationally Aided Evidence Informed Design process (CEID). The main idea of CEID is that features of the urban form are derived directly from the specific design proposal, and therefore no a priori categorizations are necessary. Here we would like to add the ability to estimate human emotional responses to urban spatial configurations, which we estimate using Isovist properties. There are studies that cover other ways of analyzing urban form according to aspects such as visibility (Bittermann and Ciftcioglu 2008), accessibility (Hillier, 1996; Sevtsuk, 2010) or daylight (Ratti et al, 2003; Compagon 2004). A key question in this context is how to determine if there are significant correlations between the measures derived from the computational analysis, and identifiable human behavioral responses to urban form.
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