Transportation safety architecture: Measuring senses of safeness

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Introduction

Increasing mobility in cities requires additional and better stations for public transportation. This is motivated by the need to reduce congestion, but also because public transportation is much safer than travelling by car. The stations or so called 'hubs' are designed to accommodate various means of transportation. A better understanding of new modes of transfer is required before the actual design is carried out. Transferring from one mode of traffic to the other will be encouraged if the resultant streams of passengers can move freely and their sense of danger is reduced. This study focuses on bundling and streaming passengers from private into public space or more precisely, from a private into a public mode of transportation [1].

A new and specific model (transit hub for car/underground and bicycle/bus) allows research to be carried out on how to optimize the spatial and directional setting for providing unhampered and safe flow [2].

The hypothesis also states that optimal physical surroundings, combined with naturally lit outlet areas, compensates for the sense of danger or, better put, enhances the feeling of commuting comfortably [3].

Research questions

The questions to be considered are:

- How do passengers perceive bundling into transportation streams?
- Does a change of floor level in stations influence their sense of safeness?
- Does a longitudinal approach as opposed to a perpendicular approach induce different senses of safety?
- To which extent does architectural space with natural light enhance notions of safety?
- Does optimizing the situation require complete or partial separation of passenger flows and, therefore, zoning the stations in specific entities [4]?
- Does having an overview of the activities going on in and around a building in all cases improve the notion of safeness?
- To which degree does the station's orientation relative to the surrounding environment, including oncoming traffic, affect senses of safety?
- What is the relationship between human proximity and fear?
- To what extent can a virtual design model correlate with the actual physical building?

Type of research

The research involved is empirical with an inductive approach. Based on specific observations of behaviours, an attempt will be made, on the one hand, to deduce general rules. On the other hand, it is assumed, as a deductive hypothesis, that the presence of natural light will enhances the feeling of safety. Also, having an overview of the spatial surroundings generally seems to be appreciated. The research will consist of questionnaires being administered at specific intervals while respondents (arbitrary travelers and experienced commuters) are exploring the virtual environment. A survey will therefore be combined with a case study in order to test the hypothesis. For instance, the respondents have to answer questions on how safe and smooth (on a scale of one to five) they perceive the space they are virtually wandering through. Or how they appreciate having to change levels in order to get to the underground or their car. Recording their behavior during the simulated process of

passing through and exploring the virtual architectural space will provide an insight into the psychological perception of spatial information. In this process, the respondents' physical condition, i.e. their eye movement, perspiration and heart rate are measured to register any corresponding level of anxiety. Depending on the number of measurements, the research will primarily be qualitative in nature. Only limited statistical calculations will therefore be necessary. The objective is naturally to achieve a neutral result by applying an appropriate methodology and precise focus.

Research methodology

Precise measurements can be achieved by working with two distinct groups, comprising: daily commuters using public transportation and novice users of public transportation. Within a given time frame, the subjects within each group are to explore the virtual models of the stations and respond to specific questions put to them. Set-ups A and B will then be examined and compared. The comparison will depend on the data gathered. Set-up A, the *horizontal* station: switching from car to underground and vice versa. Set-up B, the *split level* station: switching from bicycle to bus and vice versa. All subjects will first travel alone and then together in small groups during the test. It may be necessary to combine different types of participants, but this will depend on the results of the initial tests. Moreover, relevant questions will be put regarding comfort and orientation – i.e. the mental condition of subjects before and after the tests – with the answers being compared with their actual behavior [5].

Implementation of research

The current architectural Preliminary Design (see below) will be converted further into a semi-realistic environment using advanced visualization and gaming techniques. Subjects will explore the interior environment – either individually or in groups – by means of computer interfaces. They will interact with computer screens while sitting on chairs at gaming consoles. This can be done, for instance, at the advanced gaming facilities at the University of Twente (T-Xchange). This non-direct method (registration of mental decisions) will make it possible to measure the mental process of safety assessment.

General constraints

- Realistic model (architectural design model converted into real-life visualization)
- Representative measurement (large enough number and representative groups of subjects)
- Applicable (usable protocol for professional architects as a result)

References

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