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A METHODOLOGY FOR MEASURING PREFERENCES OF DESIGN ALTERNATIVES USING INTERNET

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Abstract. This paper describes the design of an experiment based on conjoint measurement that explores the possibility of using Internet to measure preferences of design alternatives.

1. Introduction

Conjoint analysis or experimental choice analysis represents a widely applied methodology for measuring or analyzing consumer preferences. Conjoint analysis, sometimes also referred to as stated preference modeling, involves the use of hypothetical choice profiles, constructed according to the principles underlying statistical experiments, to measure individuals' preferences for choices for new profiles. These profiles are presented to individuals, who are requested to express their degree of preference for these profiles. The profiles are usually described in words. While such verbal description may be acceptable in many choice contexts, our interest was triggered by the possibilities of virtual reality systems, which offer the potential of moving the response format beyond these traditional response modes. When visual information is important either to better understand the meaning of the attribute levels used to define the choice alternatives, or as a choice dimension in its own right, the verbal presentation format might imply a potential lack of realism. If a graphic means of representation is better in particular circumstances, then one might argue that the actual

experience of design alternatives in virtual reality might even be a better format.

We therefore combine the capabilities of virtual reality for visualization of design features with the power of conjoint analysis to capture the “voice of the consumer” in the design of the real “product”. The result of VR-based conjoint analysis is a quantitative assessment of subject preferences for design features. Herein, a subject is a participant of the experiment. The primary objective was to develop tools using the power of virtual reality that allow subjects, or potential users of the realized building design, to both see and freely interact with the design alternatives they are evaluating. The first results of a stream of related research projects (Dijkstra and Timmermans, 1997a; Dijkstra and Timmermans, 1997b), which aim to explore the possibilities of developing a conjoint analysis and virtual reality system, have been reported in Dijkstra and Timmermans (1999). This system has been given the acronym ICARUS, which stands for A System for Interactive Conjoint-Bases Analysis in Virtual Reality of User Satisfaction and Decision Making.

We take this one step further by using the communication power of Internet. A conjoint analysis experiment with image based virtual environments is accessible via the browser. These images are panoramic views. In that way, subjects are able to interact with the virtual environment. The experiment is set up for the evaluation of interior design alternatives for the new building of the Faculty of Architecture, Building and Planning at Eindhoven University of Technology.

In the next section, we will describe the experiment. We will conclude with a brief discussion.

2. Experimental Design

A server hosts the experiment and supports a series of page accesses by the same client; this is called a session. General information about the subjects is logged by the server prior to the start of the experiment. Session state information is collected during the course of the experiment.

Subjects are asked to view hypothetical choice profiles and requested to choose the profile they like best. The hypothetical choice profiles are derived from a snapshot in the preliminary design process of the workplaces in the new faculty building where the workplaces are situated. They can look around in the panoramic view of a profile. The profiles are distinguished from each other by a number of attributes, each of them with different levels (see Table 1). These attributes with different levels are called features; an example of such a feature is the transparency of walls. The demonstrated profile is randomly selected from a set of profiles.

TABLE 1. The designed profiles characterized by attributes and attribute values.

Attribute	Values
Wall between workplace and open space	<ul style="list-style-type: none"> • Transparency (50%) • Transparency and no transparency alternated by vertical strips • Closed
Wall between workplaces	<ul style="list-style-type: none"> • Closed • Transparency and no transparency alternated by vertical strips
Dividing wall between workplaces in the open space	<ul style="list-style-type: none"> • No • Yes

Subjects are involved in four evaluations of three profiles in each evaluation. In each profile, they can look around in the panoramic view. In each evaluation, they will choose the profile of their preference. Figure 1 gives an impression of the panoramic view of a profile.

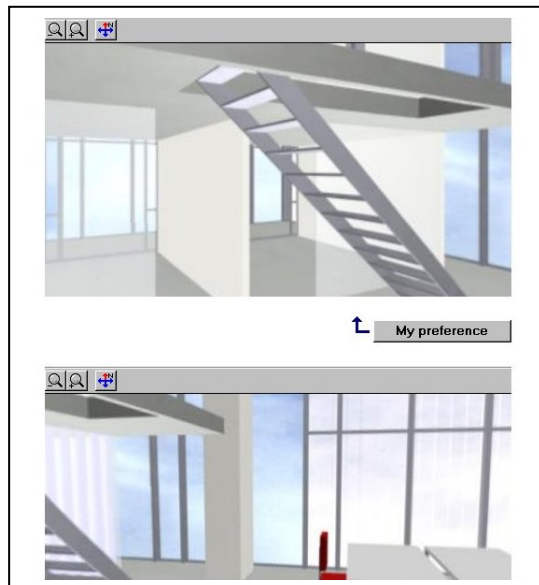


Figure 1. Profile preference measurement.

As mentioned before, a server hosts the experiment and supports the session. Profile information about the attributes, set up information about the selection of profiles in an evaluation process, general information about the subjects logged by the server prior to the experiment, and session state information collected during the course of the experiment are recorded in

files in a database. Figure 2 shows the relationships between these files in the database.

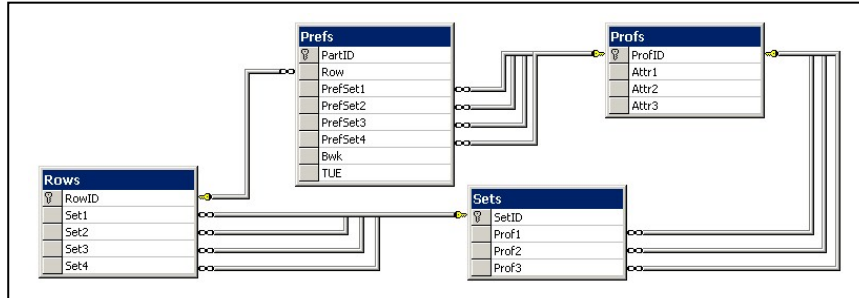


Figure 2. The database structure of the experimental data.

3. Discussion

The experiment is currently implemented. At this stage, data is being collected of the profile choice measurements. In the next stage, a preference function will be estimated from these choice data, and the profile to the subject's overall preference can be constructed.

The major conclusion from this project is that this methodology offers the potential of an a priori evaluation of design performance and an opportunity for generalizing the findings, even beyond the actual environments that were incorporated in the virtual environments. Using conjoint analysis techniques on a large number of subjects for the evaluation of a set of design features proves an invaluable decision support mechanism for designers, both in early and in later stages of design.

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