Stereoscopic Imaging in Architectural Design: A Communications Experiment

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Abstract

Stereoscopic imagery is finding new uses with the growth of computer applications in design and entertainment endeavors. This can be demonstrated in part by the substantial interest in immersive virtual reality systems. Since visual communication is an important tool for describing projects and stereoscopic imagery is receiving considerable attention in software development , an experiment was conducted to examine some of the characteristics of architectural communication using stereoscopic methods.

Resumo

Imagem estereoscópica tem encontrado novos usos com o crescimento de softwares para desenho gráfico e jogos no computador. Isto pode ser demonstrado em parte pelo interesse substancial em imersivos sistemas virtuais. Haja visto que comunicação visual é uma importante ferramenta para representar projetos e imagem estereoscópica tem recebido atenção considerável em desenvolvimento de softwares, uma experiência foi elaborada para examinar algumas das características de comunicação arquitetônica usando métodos estereoscópicos.

Subjects were first shown a plan and section of an interior space in a small university library. Later, they viewed multiple projected stereoscopic images and then were interviewed to compare the experiences. The architectural drawings were at a scale of 1/8" = 1'0" and showed a reasonably high level of detail. The stereoscopic images consisted of a view looking down the central nave of the library. A reading table was placed at the foreground of the computer model, then moved farther back into the space in the subsequent slides, from foreground, to middle, and then to background. At each distance, there was a view of table in the middle of the room, unobstructed by any surrounding furniture, and then a second slide with the same view but the table moved behind objects of a dimension unknown to the subject. The depth cues used to aid the subjects' perception of the three dimensional space were: relative object size, object overlap, and accurate light and shadow casting. All three depth cues were computer rendered.

Two types of subjects were used in the experiments. The first type included only architecture students in their final semester of the undergraduate program. The second type included university students from other majors not including architecture-related programs.

The space used for the experiment judging depth perception and scale estimation was the Hoose Library on the second floor of the Mudd Hall of Philosophy at the University of Southern California. The library was an appropriate candidate for the experiment for a number of reasons: 1) it is a relatively long, linear space with equal bays and repetitive elements, 2) light and shade play a large role in depth perception, the library has an ample amount of natural illumination from large windows on both sides of the nave 3) the detailed architectural drawings were available, and could therefore be used to build an accurate 3D computer model of the space, and also used in the experiment as the two dimensional representations.

The experiment revealed substantial differences in perception between architecturally trained individuals and those without formal architectural educations with regard to the use of the particular stereoscopic method. Both groups reported specific advantages and disadvantages of stereoscopic imagery in the experiment. For example the architecture students reported feeling more comfortable looking at the stereoscopic and sensing the scale of the interior space when the table didn't obscure any furniture that occupied the same depth plane it did. The non-architects, to the contrary, seemed to rely heavily in the overlap cue, as they reported that once the table moved close to the object of unknown dimension, they could easily translate their size estimations from one object to the next. The architecturally trained students seem to have learned not to always trust their eyes. The subjects indicated that shadows and light sources played a "somewhat important" to "crucially important" role in helping them to determine the depth, and in turn, better understand the space through that feeling of depth provided by the stereoscopic image. For example, all of the subjects claimed that the three dimensional image was more immediately informative. One non-architect claimed that it "removed the burden" on the part of the client to try to read and interpret the two dimensional scaled drawings (figure 1).

Keywords: stereoscopy, communication, digital imaging

figure 1