Large Scale SAR Prototypes for the Industrial Design Process

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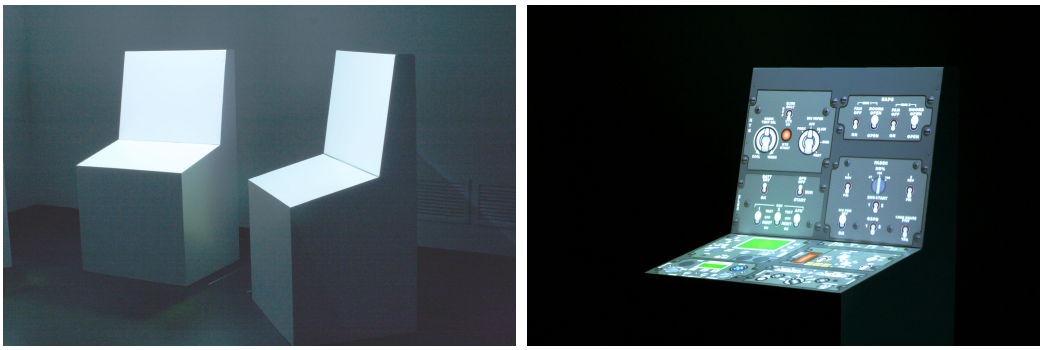

(a) White light illuminates the props. The props are light-weight wooden frames, skinned with white foam-boards and are easily movable by a single person.

(b) An example interface is projected on a prop. The switches and dials are life-sized.

Figure 1: The SAR system.

ABSTRACT

This demonstration describes the use of large scale physical props to support the industrial design process using SAR.

1 INTRODUCTION

Spatial augmented reality (SAR – or 'shader lamps' [2]) uses projectors to illuminate simple blank models with light and texture information. Projected textures replace elaborately detailed models,reducing production cost and time to create these props[1].

Textures also define the simulated functionality As the presented functionality of the simulated objected is also presented through a texture, it allows changing the presented object's *type* in addition to its *appearance*.

The SAR installation therefore allows rapid prototyping of design and interfaces on a real-life scale. It can be used to evaluate interface design or general control layout.

2 IMPLEMENTATION

The physical models – *props* – for our system resemble nondescript control consoles with large flat areas that are ideal as projection surfaces. They are constructed as a light-weight wooden skeleton and skinned with white foam-plates. Construction time and material costs were minimal.

A virtual model of the complete control console was created. After initial tests, it was reduced to the interesting two surfaces that face the user. This allows a better utilisation of texture space as well as selecting the best projector to illuminate each surface. Although the system allows surfaces being lit by multiple projectors, this approach removes areas of higher brightness where projections overlap.

The application allows the user to change the current texture of two surfaces on a single prop, to swap textures between props and to load new position matrices it. The textures are loaded from the hard drive. By creating a template in a image-editing software, multiple configuration of the same texture can be created in a short time. The layout and design of these textures may come directly from technical drawings, renderings or product catalogs.

Because of the nature of SAR and even after selecting the best projector for a surface, optimal surface alignment is not guaranteed. Contrary to multi-projector wall displays, surfaces of models in SAR systems might be illuminated at angles lower than 90°. Multiple tests with different texture filtering methods showed that the optimal solution for SAR is mipmapping with anisotropic filtering.

3 DEMONSTRATION

The demo allows the following operations. Single elements of a control panel can be exchanged on the press of a button. Whole control panels can be switched from one prop to another. Finally, the props themselves might be moved with the system still operating correctly.

REFERENCES

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