Supporting the Industrial Design Process With Spatial Augmented Reality

Shane R. Porter* Ross T. Smith† Bruce H. Thomas‡

University of South Australia
Wearable Computer Laboratory

1 Introduction

Our research involves using Spatial Augmented Reality (SAR) for industrial design. SAR allows us to project onto physical objects to give them a different appearance. This is beneficial for industrial design because we can project a design for a device directly onto a physical prototype. This projected design can be interactive which also means it can be modified in real time.

An example of this method of prototyping is shown in Figure 1. We constructed a low-fidelity prototype of a car dashboard out of medium-density fibreboard (MDF) and painted it with a matte white paint. We then project a design onto the prototype.

The use of AR for design has been investigated in the past. Car manufacturers have used AR for evaluating a car interior design [2]. Our design evaluation system differs in the display technology used. Our SAR implementation is based on Shader Lamps [1] which uses calibrated projectors to change the appearance of objects.

2 Demonstration

Our dashboard prototype allows users to rearrange the layout of common components of a car dashboard. The user can move the air vents, speedometer, and various other components. The aim is to allow a designer to iteratively improve the design of the dashboard.

Another application that we support is using SAR to compare different designs on the same physical prototype. Various configurations of components are saved to create a selection of possible designs for the prototype. These textures can be swapped onto the prototype at the press of a button. This allows a quick method of evaluating several possible designs for a prototype.

During the demonstration, participants will be able to move various components around on the SAR dashboard. In addition, multiple people will be able to view their design and possibly provide feedback for the participant. There will also be a button to change to a comparison mode, where multiple snapshots of component layouts can be compared. An advantage of this demonstration is that no prior knowledge of SAR is needed to participate and users can be easily trained to interact with the system.

2.1 Motivation

There are several benefits of using SAR for industrial design. In the past, electronics needed to be installed to create a functional prototype with working components. Using SAR, we project the components directly onto the prototype and their functionality is programmed into the SAR system. The main advantage of using SAR is that the configuration of components can easily be changed. The projected components can just be moved by the user into a new layout. It takes longer to move a hardwired component since a new physical model of the prototype may need to be made, and then the electronics will need to be installed again in this new configuration.

*e-mail:shane.porter@unisa.edu.au
†email:ross@r-smith.net
‡email:bruce.thomas@unisa.edu.au

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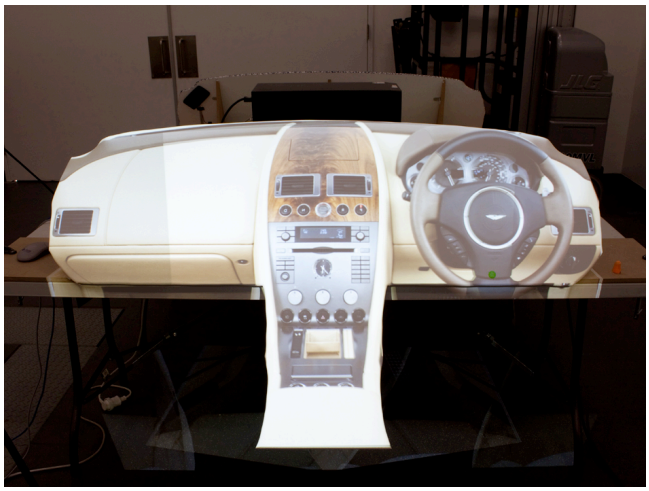

Figure 1: The dashboard prototype augmented with a leather interior.

Secondly, multiple people can view the SAR projections at the same time. This allows several people to collaborate on a design for a prototype. For example, stakeholders and designers could collaborate, with each of them providing immediate feedback on the design. The users may also obtain a better understand of the device with SAR compared to the understanding they would get from looking at a 3D model on a computer screen.

Another advantage of using SAR is that no additional hardware needs to be worn by users in order to see the augmented prototype. Other AR display technologies, such as hand held screens or head mounted displays, need to be held or worn by each user for them to view the augmented prototype. SAR does not require users to wear this additional equipment. This also reduces the risk of damaging the hardware since the projectors can be mounted out of reach of the users.

3 Conclusion

We have developed a method of using SAR for interactive rapid prototyping. We project onto a physical model of a prototype and allow the user to change the design in real time. The texture can be changed to reflect design decisions and several designs can be compared by evaluating snapshots of possible layouts. This demonstration shows the advantages of using SAR for design. These include the collaborative properties of projected images and the advantage of not wearing additional hardware to view the augmented prototypes.

References

[1] R. Raskar, G. Welch, K. Low, and D. Bandyopadhyay. Shader lamps: Animating real objects with Image-Based illumination. In *Rendering Techniques 2001: Proceedings of Eurographics*, pages 89–102, 2001.

[2] H. Salzmann and B. Froehlich. The two-user seating buck: Enabling face-to-face discusssions of novel car interface concepts. In *Proceedings of the IEEE Conference on Virtual Reality*, pages 8–12, 2008.