Self-Calibrating Camera-Projector Systems for Interactive Displays and Presentations

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1. Introduction

We demonstrate a self-calibrating system that employs uncalibrated cameras and microportable projectors to create novel interactive displays and presentations.[1] Three benefits of our system are detailed in the following sections.

2. Automatic Keystone Correction

The image generated by an off-center projector appears distorted (Figure 1, left). Using an uncalibrated camera pointed at the presentation screen, our system automatically recovers the projector-to-screen homography and pre-warps the computer output to produce a keystone-corrected image (Figure 1, right). This allows the presenter to place the microportable projector anywhere in the room without sacrificing presentation quality. Automatic keystone correction is also attractive in a home theater application where the user could place a microportable projector on a bookshelf at the side of the room and project an undistorted movie on an adjacent wall.

Figure 1: Automatic keystone correction.

3. Laser Pointer Interfaces

The camera employed above for automatic keystone correction also tracks laser pointer dots on the presentation screen at 20 Hz. This enables users to interact with the display in a very natural manner: pressing virtual buttons to move through a slide show, activating hyperlinks or even "drawing" on the display (green arrows and ovals in Figure 2).

[1] An earlier system is described in [1].

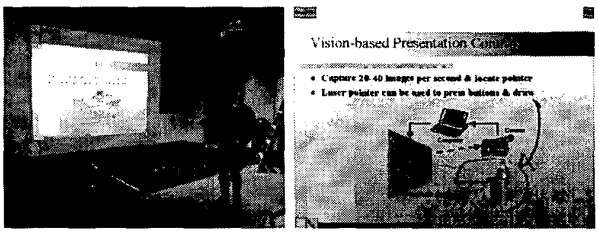

Figure 2: Laser pointer control for interactive presentations

4. Dynamic Shadow Elimination

One problem with interactive displays based on front-projection is that users cast undesirable shadows. Unfortunately, the naive solution of simultaneously displaying the presentation from multiple projectors does not solve the problem as shadowed regions still appear visibly darker. We dynamically identify occlusions using cameras, and eliminate shadows by appropriately adjusting the output of the other projectors. We plan to demonstrate preliminary experiments involving a shadow-free interactive "virtual" poster.

Acknowledgments

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References

[1] R. Sukthankar, R. Stockton, and M. Mullin. Smarter presentations: Exploiting homography in camera-projector systems. In *Proceedings of ICCV*, 2001.

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