Tablescape Plus: Upstanding Tiny Displays on Tabletop Display

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1 Introduction

Placing physical objects on a tabletop display is common for intuitive tangible input. The overall goal of our project is to increase the possibility of the interactive physical objects. By utilizing tabletop objects as projection screens as well as input equipments, we can change the appearance and role of each object easily. To achieve this goal, we propose a novel tablescape display system 'Tablescape Plus' (see Figure 1). Tablescape Plus can project separate images on the tabletop horizontal screen and on vertically placed objects simultaneously. No special electronic devices are installed on these objects. Instead, we just attached a paper marker underneath these objects for vision-based recognition. Projected images change according to the angle, position and ID of each placed objects. In addition, the displayed images are not occluded by users' hands since all equipments are installed inside the table.

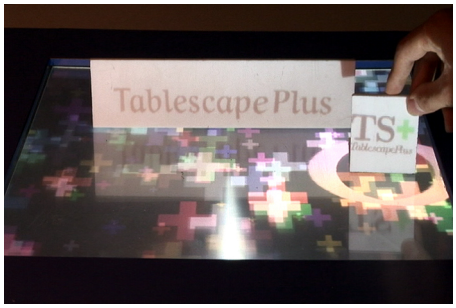

Figure 1: Tablescape Plus.

2 Tablescape Plus

We offer four core technical innovations:

- Optical design of special screen made from the combination of a Lumisty film, a Fresnel lens and projectors to display separate images to a tabletop horizontal screen and small-sized tabletop objects.
- The function of capturing the appearance of the tabletop from inside the system by using the transparency of the screen. When physical objects are placed, the ID, position and rotation of each object are recognized by using the ARToolKit library.
- A method for adjusting projector images geometrically. The calibration of projected images is absolutely imperative so that the system can project images appropriately according to the position and orientation of each tabletop object.
- A method for harmonizing projected images. Each projected image should change relatively to one another according to the input information of placed objects.

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3 Applications

On Tablescape Plus, we have already developed some applications which harmonize the tabletop screen image and the tiny display images. One is an application for digital kiosk (see Figure 2). Map information is displayed on the horizontal screen. By placing a tiny display, you can see additional information related to that geographic area on its surface. Another application is for tabletop theater(see Figure 3). When you put a tiny display on a tabletop miniature park, an animated character appears and moves according to the position and direction of it. In addition, the actions of the characters are changed by the positional relationship of objects. There are various interactive events possible on the tabletop miniature world.

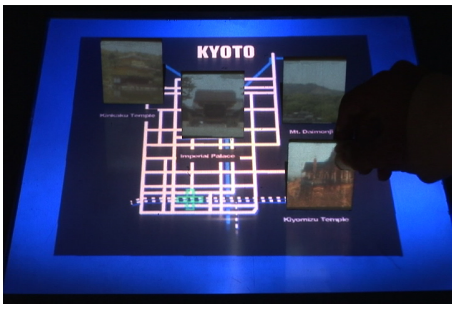

Figure 2: Application for Digital kiosk.

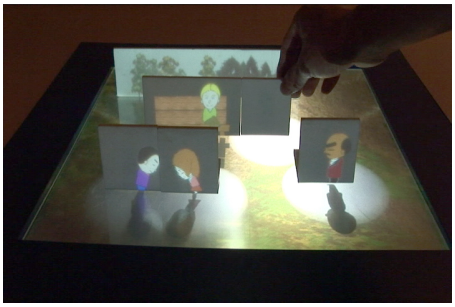

Figure 3: Application for Tabletop Theater.

4 Conclusion

Tablescape Plus could open up new types of tabletop applications for games, simulation, education, and scientific visualization. Because it can use ordinary materials and items, it could provide a variety of new experiences in daily life. It enables future combinations of touch sensors and camera-based hand gesture recognition. The system can be networked for distance interaction. And it could also become a base technology for media art works as well.

Finally, special thanks go to Prof. Hiroshi Harashima for his helpful advices.