

# PhantomParasol: a parasol-type display transitioning from ambient to detailed

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**Abstract.** The combination of ambient and detailed information is important for displays in pervasive environments. We propose a parasol-type display called the “PhantomParasol” which can display both ambient and detailed information with smooth transition.

The PhantomParasol consists of LED arrays, a gyro sensor, and micro-controllers put at the rear side of a parasol. When a user of the PhantomParasol holds it still, he can obtain ambient information from the blinking patterns of LEDs. When he rotates the PhantomParasol, he can see detailed 2D images composed from moving blinking LEDs. In this paper, we describe the concepts, implementation, and application ideas of the system in detail.

## 1 Introduction

People’s attention in the real world can be classified to either “foreground” or “background” [2]. Foreground media (e.g. conventional displays) can transmit large quantities of information to the user quickly, but it prevents users from paying visual attention to other tasks. On the other hand, many background media (e.g. ambient lights) can transmit various information to users at the same time, although the amount of the transferred data is small.

Since both foreground and background media have their own merits, the combination of foreground and background media is important in pervasive environments. Background media may be useful when a user is walking, while foreground media are more useful when the user stops walking and wants to see more detailed information. Meanwhile, ambient (background) information and detailed (foreground) information are often provided separately, and smooth transition between the two state is important in many applications.

We propose a parasol-type display called the “PhantomParasol” which can smoothly change the state of ambient and detailed display in the mobile environment, providing the user with appropriate information according to the user’s activities.

## 2 PhantomParasol

### 2.1 Concepts

The basic concepts of the PhantomParasol are as follows:

**Smooth transition from ambient display to detailed display** The PhantomParasol can provide smooth transition from ambient display to detailed display by making use of afterimage effects. When holding a PhantomParasol, a user can obtain ambient information (ambient light) from blinking LEDs. When he rotates the PhantomParasol, he can see detailed information (images and messages) with the afterimage effects of moving blinking LEDs (Fig. 1).

**Using an everyday device** People carry parasols in their everyday life, and carrying a device like the PhantomParasol doesn't look unfamiliar.

**Various applications in mobile environment** The PhantomParasol can be used for various purposes, especially in mobile environment. It can show weather forecasts, maps, timetables, and so on.

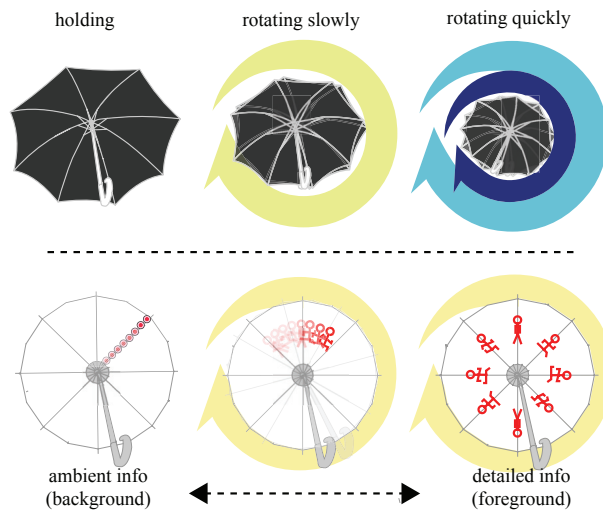
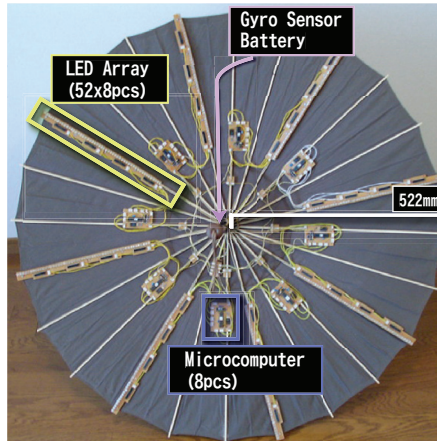


Fig. 1. Basic usages of the PhantomParasol



**Fig. 2.** Prototype system of the PhantomParasol

## 2.2 Prototype Implementation

We developed a prototype PhantomParasol with the above concepts. The prototype system consists of a gyro sensor for detecting the rotation speed, LED arrays to display ambient and detailed information, and microcontrollers to control these devices (Fig. 2).

We attached eight LED arrays on the ribs with forty-five degree intervals. Each LED array consists of fifty-two LEDs and four demultiplexers<sup>1</sup>. We put a 1-axis gyro sensor<sup>2</sup> on the handle of the parasol, and the output of the sensor is connected to the microcontroller through a 10-bit A/D converter. We attached microcontrollers<sup>3</sup> on the ribs beside the LED arrays. Adjacent microcontrollers are connected serially, and exchange messages with each other. In addition, one of the microcontrollers (a host microcontroller) receives data from the gyro sensor, and exchanges commands (e.g. rewriting contents) with a host PC or a PDA via RS232C interface.

Fig. 3 shows a simple usage of the prototype system. When a user holds the PhantomParasol still, it presents ambient information with two LED arrays, just like the LED level meter of audio devices. If the user rotates the parasol, it presents weather forecast icons with all flashing LED arrays.

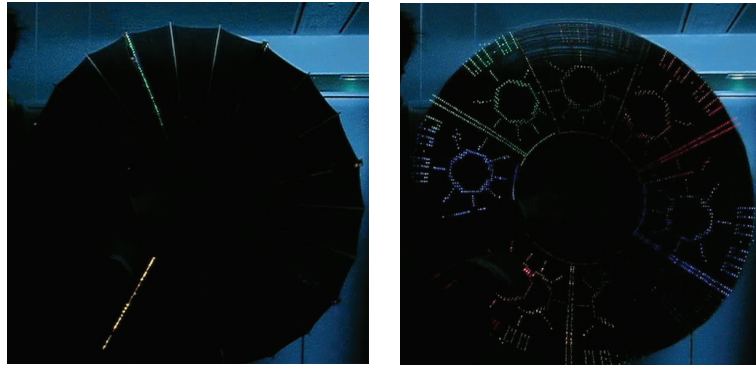
## 2.3 Application

We can use the PhantomParasol for various real-world applications and entertainment use. Here, we show how we can use a PhantomParasol for route navigation.

<sup>1</sup> 74HC154

<sup>2</sup> ENC-03J by Murata Electronics

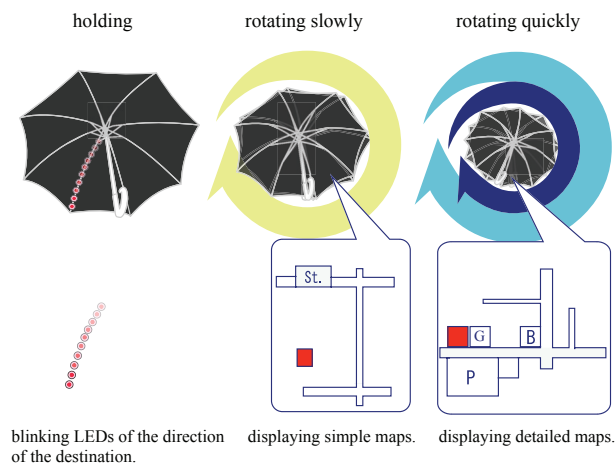
<sup>3</sup> PIC18F452 by MicroChip



**Fig. 3.** Usage of the Prototype (left: ambient information in a holding state, right: detailed information in a rotating state)

When a user holds the PhantomParasol still, it can light one of the LED arrays to show the direction of his destination, and he can walk to the right direction to the destination. When he needs detailed information, he can see the map of the destination by rotating the parasol. He can obtain more detailed information by rotating the parasol more quickly (Fig. 4 ).

In this way, using the PhantomParasol, users can always perceive ambient information and obtain detailed information quickly if necessary.



**Fig. 4.** Application of route navigation

### 3 Related Work

Various information systems and digital toys use afterimage effects of LEDs for displaying 2D information, since it costs less than using a static array of LEDs. Lighttalk[3] is a stick-type afterimage display with a hand scanner. It can scan simple images or messages, and present them in mid air when shaken by users. HokeySpokes[1] is an afterimage display attached on a spoke of a bicycle for displaying various textures and messages. Since the rotation of the bicycle spokes is stable, users can see a clear afterimage display generated by HokeySpokes. While these systems show information only when they are shaken or rotating, PhantomParasol can show appropriate information according to the moving state.

There are some research projects on peripheral displays in pervasive environment[4, 5]. These projects are mainly focused on the interaction with displays fixed in the surrounding environment (e.g. large displays). PhantomParasol provides ambient and explicit display for mobile environments.

### References

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