ChameleonBall

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TEI 2010, Jan 25 – 27, 2010, Cambridge, MA, USA
ACM 978-1-60558-841-4/10/01.

Abstract
We propose a novel ball-type input/output (I/O) device—the ChameleonBall—that allows users to interact with colors in the real world. The ChameleonBall mainly consists of multiple color I/O units in an acrylic ball. It can detect the colors of objects in the real world and emit similar colors. We have developed a prototype system and a few applications using this device.

Keywords
I/O device, color sensor, LED, ball

ACM Classification Keywords
H5.2 [Information interfaces and presentation]: User Interfaces.

General Terms
Human Factor

Introduction
In our daily life, we interact and identify with various colors that are replete in our surrounding environment. For example, we generally identify the arrival of spring from the green color of new leaves; similarly, we associate autumn with the red color of autumn leaves. Some of us incorporate these colors into commonly used articles such as clothes, wallpaper, and carpets. In this study, we propose a novel ball-type input/output (I/O) device—the ChameleonBall—that allows users to interact with colors in their surrounding environment.

Using multiple color I/O units, the ChameleonBall can detect the colors of objects in the real world and emit similar colors (figure 1).

figure 1. Photograph of the ChameleonBall

ChameleonBall

The ChameleonBall mainly consists of multiple color I/O units, a main board, a lithium ion battery, and expansion modules (figure 2). Each color I/O unit consists of input devices—a color sensor, an infrared reflection sensor and a white LED—for detecting the color of an object that has been touched, and output devices—full-color LEDs—for displaying colors. The main board consists of a microcomputer and circuits to control the above devices. In addition, in order to increase the applicability of this device, we attached a Bluetooth module (BestTechnology BlueStick) and a wireless 3-axis acceleration sensor (WirelessTechnology wireless-T). In the developed prototype, we assembled six color I/O units and other relevant components within an acrylic ball having a diameter of approximately 12 cm.

We have developed an application that is installed on a host computer to control the illumination of a room on the basis of the color information received from the ChameleonBall. The software controls full-color LED illuminations using DMX512 (an RS-485 based communication protocol for controlling stage lighting and effects). The ChameleonBall is also capable of gesture recognition; this is realized by using an acceleration sensor. Currently, we have configured two gestures: "throwing and catching" and "shaking". We have already developed some applications, as mentioned below: after inputting several colors to the ball, a user can mix these colors by "shaking" the ball; when a preferred color has been created, the user can illuminate a room with a color similar to that of the ball by "throwing and catching" the ball.

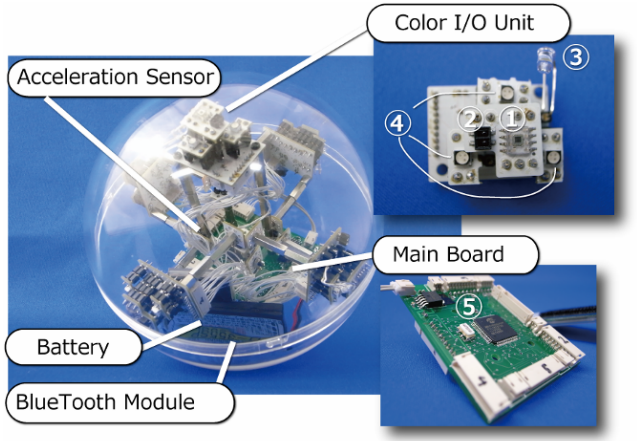

figure 2. Device architecture of ChameleonBall: (1) color sensor (TAOS TCS230), (2) infrared reflection sensor (Sharp GP2S40), (3) white LED, (4) full-color LEDs (Osram LATBT66B), and (5) microcomputer (Microchip PIC18F2550)

Citations

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