



Modern Lifestyle Centric Automated Illumination and Dimming Control Application

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Abstract: The design of a smart environment illumination dimming control can be operated by using an Android Application. Arduino is used to connect to the Database Management System (DBMS). In order to make a simple and efficient dimming-control of the user's home illumination, the DBMS can synchronize with a central controller. A linear dimming scheme is adopted to reduce the light gleaming. To achieve suitable variations in the illumination environment, a three-color LED is used as the light source. This work gives the designs of five environment illumination controls for users through mobile phone to the central controller. The light controller mainly controls the LED and the application. The overall view of the project is to make easy for the people to get use of mobile applications in some useful ways for their daily activities.

Keywords: Database Management System, illumination design, Zig-Bee, Bluetooth, Android App.

I. INTRODUCTION

IoT (Internet of Things) refers to the networked interconnection of everyday objects, which are equipped with ubiquitous intelligence. IoT will increase the ubiquity of the Internet by integrating every object for interaction via embedded systems, which leads to a highly distributed network of devices communicating with human beings as well as other devices. IoT is opening tremendous opportunities for a large number of novel applications also that improves the quality of our lives [4].

The current digital era and access to home internet has improved our modern lives. An E-Home can be classified by seven indexes. They are information and communication, safety and disaster prevention, health and comfort, energy-saving, system integration, and facility management. In this paper, we focus on information and communication, and system integration. Illumination is a basic necessity for a household [13]. Illumination can make a home more modern and comfortable.

Bluetooth [1], [2] and Zigbee [3] are most commonly used in wireless remote lighting controls. Bluetooth is a wireless technology standard. It is used for exchanging data

over short distances from fixed and mobile devices, and building personal area networks (PANs).

Arduino is an open-source prototyping platform based on easy-to-use hardware and software [7]. Arduino boards are able to read inputs from light on a sensor, a finger on a button and it generates an output by activating a motor, turning on an LED. By sending a set of instructions to the microcontroller on the board to do the desired actions. For programming the microcontrollers, the Arduino provides an Integrated Development Environment (IDE).

Energy saving is an important issue due to environmental protection. In tradition, different colors of fluorescent tubes were used for lighting control. This approach consumes more energy and it is inefficient. Therefore, LED lights are more commonly used nowadays [5]. In this work, RGB LED was used which simplifies its installation. Arduino microcontroller is used to control the lights based on the options. The control can be operated using an Android App using Bluetooth to connect to a Database Management System (DBMS). Therefore, this work mainly focused on using a simple method that can remove the light sparkling effect.



The rest of the paper is categorized as follows. We discuss System Configuration in Section II. Section III describes the Operation of the Android Phone. Section IV finally concludes the paper.

II. SYSTEM CONFIGURATION

The necessary factors to achieve household illumination are:

- User friendly operation
- Small volume and easy installation
- Efficiency in lighting

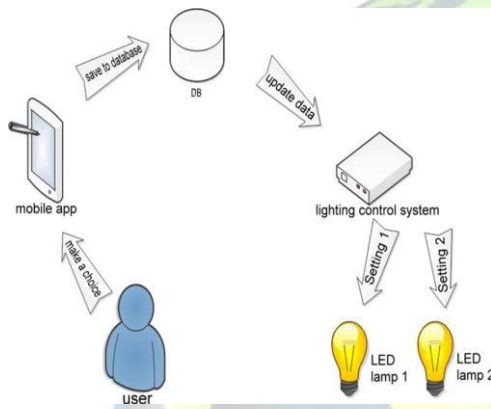


Fig 1. System Illustration

Fig 1.shows a flow diagram of the system control. The user makes a choice on the mobile device with different modes on it. Based on the chosen mode in the mobile device it will control the seek bar and send the data to the database. In the database, there were several fields to change the general and customizable event of the RGB lights. The database will update the data in the lighting control system (Arduino) in which Bluetooth is connected. The lighting control system will dim and control the RGB LED lights.

A. Android App Development

Fig.2 provides the Android Application features. In that application, the user can choose the area of room in which he/she wants to on the light or off the light. Now he/she can select mode, from the five different modes provided in the app for his/her convenient. Then he/she can choose which side of light to on/off. i.e., left or right. Finally, we can dim and control the LED lights.

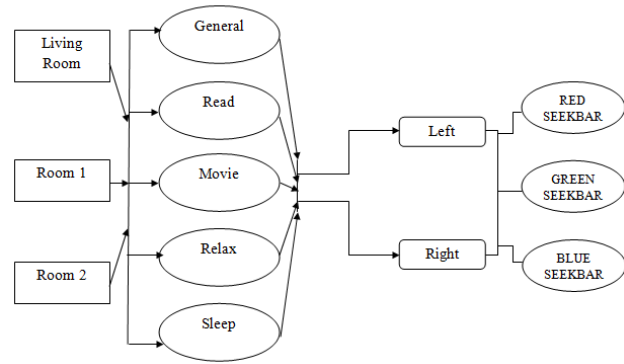


Fig.2 App Development

B. Database Designing

Table 1 gives the statement of system database. The database contains tuples with following fields,

Field Name	Purpose
id	Selecting the correct light. 1-3 represent double lights while 4-9 are single light. This field is a primary key of the entire database.
state	Select the corresponding situation. 1-6 are the situation of double lights. 7 is the general mode of single light. 8 is the customizable mode of single light.
R	After selecting status lights that corresponds to red light. Range 0-9.
G	After selecting status lights that corresponds to green light. Range 0-9.
B	After selecting status lights that corresponds to blue light. Range 0-9.
rd_flag	This field is to ensure that both phones and computer's button selection can be updated simultaneously.

Table 1. Statement of System Database



C. Arduino Interface Controller

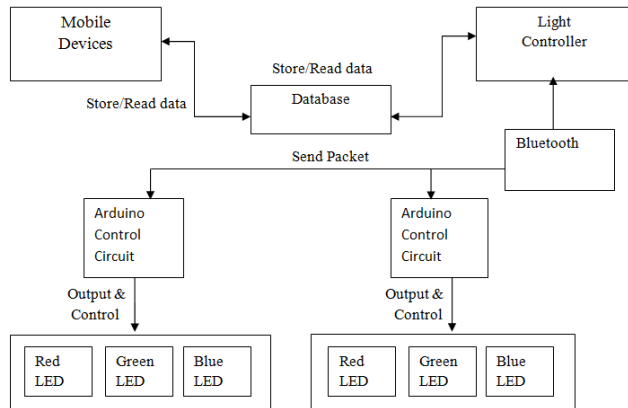


Fig.3 System Architecture

Fig.3 shows the System Architecture of the light illumination and dimming control application. The user chooses different modes in the mobile device. Based on the chosen mode in the mobile device it will control the seek bar and send the data to the database. In the database, there are several fields to change the general and customizable event of the RGB lights. The database will send the control to the Bluetooth which is connected in light controller. The Bluetooth will send packet to the Arduino control circuit. Then the Arduino control circuit will dim and control the RGB led lights.

III. OPERATION OF THE ANDROID PHONE

Arduino microcontroller is used to control the lights based on the options. The control can be operated using an Android App using Bluetooth to connect to a Database Management System (DBMS).

Fig.4 shows the initial operating window of an Android phone with three touch squares simply correspond to the living room, room 1, and room 2.

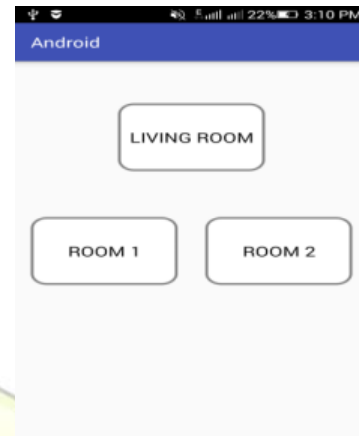


Fig.4 Mobile App's Initial Operating Window

After entering the mode selection screen, we are prompted with six different modes namely General, Read, Movie, Relax, and Sleep. "Return to Index" is also shown on the screen for users to return to the previous page.

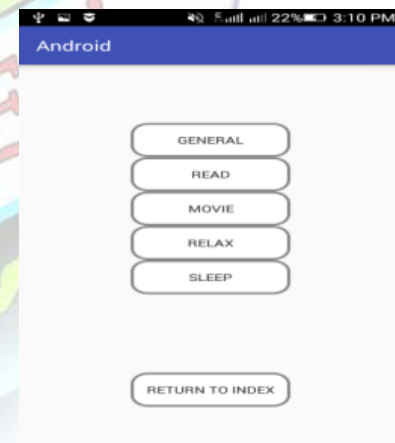


Fig.5 Environment Selection Screen

If the General mode is chosen (Fig 5.), the light mode selection will appear. There will be two buttons corresponding to the left and right lights of the room. A user can drag the bar to adjust the light level of the mode. "Return to Index" allows them to go back to the top function page.

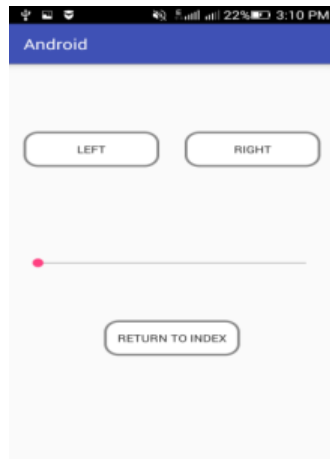


Fig.6 Environment Lighting Selection Screen

Fig.7 shows the Light Function Setup. If “left light” is chosen in the Environmental Lighting Selection Screen (Fig.6), the light function settings will appear. There are now two modes of operation General and Customizable. The general mode helps in adjusting the light level of a single light, while the customizable mode can control the RGB tri-colour adjustment.

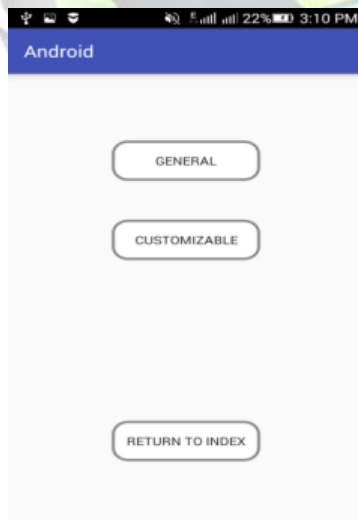


Fig.7 Light Function Setup

In Fig.7 if the general mode is chosen, the light color settings will appear for users to adjust the colors. There are three bars to control the RGB colors.

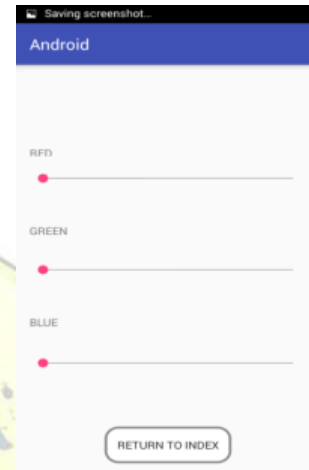


Fig.8 Light Color Settings

Fig.9 shows the light illumination and dimming control for the Sleep Mode. The single Red LED is lighting for the Sleep Mode based on the control of the user in the general event.

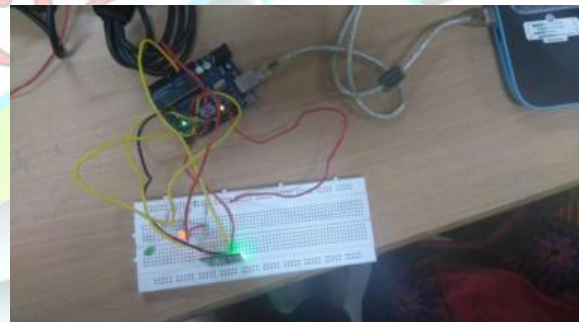


Fig 9. Display Single Red LED in Sleep Mode

Fig.10 shows the light illumination and dimming control for the Read Mode. All the three LEDs are lighting for the Read Mode based on the control of the user in the general event.

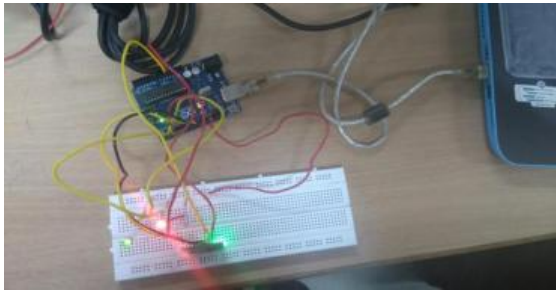


Fig.10 Display LEDs in Read Mode

IV. CONCLUSION

An automated light illumination and dimming control application is designed and it includes the main control system, an Android App, the establishment of a MySQL database, a controllable current LED driven circuit, and Bluetooth. Users are able to control home lighting by operating mobile phones via wireless Bluetooth. Problems such as installation, operation, and remote control were carefully considered. In addition, the module design furthers the system's practicability such that general families would be more willing to install the system at home.

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