Development of Android based Smart Power Saving System

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Abstract: An android based smart power saving system has been presented in this paper. For this purpose, an application is developed for controlling the intensity of an AC supply using a dimmer circuit in android platform and to monitor the current flow on different intensity level a current sensor is used in the circuit. Dimmer circuit provides a 16-different intensity level to control the flow of current and help in power saving. The system is very simple and robust as it is based on android platform.

Keywords— Power saving system, Microcontroller (Atmega 328P), AppInventor, Dimmer circuit, Current sensor

1. INTRODUCTION

Presently, a common agreement of every country is energy saving, carbon reduction and environmental protection. To act in accordance with these energy policies, the most important demands for new electrical devices are lower power consumption, high lumen efficiency, lower lifespan and lower pollution. For intensity control a power electronic device known as dimmer is used in various applications including industrial and also in residential lighting control. Dimmer gives a control to adjust the artificial lighting level and also conserving energy.

In different process control applications embedded wireless system has been widely used for monitoring and control. The development of smart power saving system based on android has been presented in this paper. Presently, in human life Smartphones are playing a vital role. Smartphones are cost effective, promising and durable device that helps in performing daily tasks using the android application software. The main goal of this paper is to control the intensity of light as per the requirement of a person from the android application [1-2] software using Bluetooth wireless communication [3] and also to monitor the flow of current in the circuit for power saving.

A user-friendly app is customized in the Massachusetts Institute of Technology (MIT) App Inventor 2 [4] software. The Bluetooth MAC address of user PDA is made to be paired with the android application software which creates a personal area network. Based on the command send from user PDA to the Bluetooth interface Microcontroller (Atmega 328P) at the receiving end, the sixteen-different intensity level is obtained and then these sixteen levels are used to control the intensity level of the bulb to save power. Also, a current sensor is connected to Microcontroller (Atmega 328P) to monitor the different current levels.

The paper is organized as follows: The proposed architecture is described in Section II and its implementation is explained in section III and Results in section IV, which is followed by Conclusion and Future scope in section V.
2. Proposed Architecture

In the proposed system android app is designed in MIT app inventor. The MIT App inventor is an open source web application to create software application for the android device using a “drag-and-drop” graphical interface. The proposed system uses Bluetooth module as a communication interface between the android device and the Microcontroller (Atmega 328P). The Microcontroller (Atmega 328P) uses these commands to control the digital dimmer [5]. This digital dimmer provides a 16 level of intensity control that can be set from fully off (0%) to full on (100%) depending on the input control levels. Also, a current sensor is connected to the load and Microcontroller (Atmega 328P) to see the different current levels on different power control levels.

![Block Diagram of Proposed Architecture](image)

Fig. 1. Block Diagram of Proposed Architecture

| Input Value | D3 | D2 | D1 | D0 | Dimming Level |
|-------------|----|----|----|----|---------------|
| 0           | 0  | 0  | 0  | 0  | 100% = ON     |
| 1           | 0  | 0  | 0  | 1  | 85%           |
| 2           | 0  | 0  | 1  | 0  | 80%           |
| 3           | 0  | 0  | 1  | 1  | 75%           |
| 4           | 0  | 1  | 0  | 0  | 70%           |
| 5           | 0  | 1  | 0  | 1  | 65%           |
| 6           | 0  | 1  | 1  | 0  | 60%           |
| 7           | 0  | 1  | 1  | 1  | 50%           |
| 8           | 1  | 0  | 0  | 0  | 40%           |
| 9           | 1  | 0  | 0  | 1  | 30%           |
| 10          | 1  | 0  | 1  | 0  | 25%           |
| 11          | 1  | 0  | 1  | 1  | 20%           |
| 12          | 1  | 1  | 0  | 0  | 15%           |
| 13          | 1  | 1  | 0  | 1  | 10%           |
| 14          | 1  | 1  | 1  | 0  | 5%            |
| 15          | 1  | 1  | 1  | 1  | 0% = OFF      |

TABLE I. Dimming Level Corresponds to Input Signal Level

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3. System Implementation

The application based on android platform was designed using the MIT App inventor. The main screen of app is shown in fig-2. Now as the Bluetooth is not connected so the status is showing not connected. When we press on the Bluetooth button then it will show all available devices nearby. And when we connect it to any device then the status becomes connected. As shown in figure 3.

![Main screen of android app](image1)

**Fig. 2. Main screen of android app**

![Available bluetooth devices and status after connecting to bluetooth device](image2)

**Fig. 3. Available bluetooth devices and status after connecting to bluetooth device**

There are sixteen buttons on app which corresponds to sixteen different levels of the dimmer. When we press a button on app the binary code corresponding to that button is set by the microcontroller (Atmega 328P) and send to the digital dimmer. This digital dimmer then sets the intensity level corresponding to that binary code as shown in table1. A current sensor in series with load is connected and the output pin of the sensor is connected to the microcontroller (Atmega 328P) analog pin. The value of current is shown on the serial monitor of Microcontroller (Atmega 328P) app as shown in fig.-5.
4. RESULT

Smart power saving system based on android platform was developed and successfully implemented. Different sixteen levels provide the sixteen-different intensity level of and by this way we can conserve electricity. At different intensity levels, the value of current changes. The value of current is displayed on the serial monitor as shown in figure-5.

Fig. 4. Flowchart Of implemented System

Fig. 5. Current value for different dimming levels
5. CONCLUSION & FUTURE SCOPE

The system is simple and easy to use as it is based on android application software which is widely used throughout the world. By using this system, one can easily see the power consumption of his electrical appliances and can control the power consumption. However, by experiment the intensity of light has been controlled and achieved all sixteen intensity levels. So, the intensity of light has been controlled as per the requirement and also monitored the current used in each intensity level. As the intensity of the light decreases the current value also decreases. So as the current decreases the power consumption is also decreased.

In proposed system, we can monitor current value only on serial monitor to overcome this limitation a system can be designed in which sensor data is shown on the same app. The system can be further improved by IOT. An Algorithm can be further developed for calculating the electricity cost for each device.

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