Smart Home Automation using Arduino UNO Microcontroller

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ABSTRACT

In this study, the design and prototype implementation of Smart Home Automation System is proposed. Home Automation is a budding technology. Modern homes are becoming Smart Homes. These homes are progressively shifting from conventional switches to a centralized control system. At present, conventional wall switches located in different parts of the house make it difficult for the user to go near them to operate. Furthermore, it becomes more difficult for the elderly or physically handicapped people to do so. The system incorporates microcontroller and Bluetooth module to provide automation capability to various household activities. A microcontroller offers high performance and flexibility. The author has adopted an Arduino UNO microcontroller for controlling various appliances. The main objectives of the Smart Home Automation System are to provide a low-cost solution to minimize the energy consumption, provide support and comfort, and make life easier.

Keywords: Android, Arduino UNO, Bluetooth, Smart Home

I. INTRODUCTION

Home automation refers to providing the capability to control as well as monitor various household activities. These may include lighting, heating and air conditioning, security locks on the doors, multimedia, and various appliances.

Why Home Automation

- Automation of homes is adopted not merely to provide ease, convenience, and comfort to the user but also to minimize the energy waste and ensure home security.
- An ideal home automation system has the capability to sense its environment, process and act with minimal supervision.
- It is reliable, secure, user-friendly and cost effective.

Applications

- **Lighting control system:** Lighting control systems serve to provide the right amount of light where and when it is needed.

- **Appliance control and integration** with the smart grid and a smart meter, taking advantage, for instance, of high solar panel output in the middle of the day to run washing machines.
- **Home automation for the elderly and disabled:** These smart homes allow older adults and people with disabilities to stay in their homes where they feel comfortable, instead of moving to a costly health care facility.
- **Security:** A household security system integrated with a home automation system can provide additional services such as remote surveillance of security cameras over the Internet, or central locking of all perimeter doors and windows.

Limitations

- Home automation suffers from platform fragmentation and lack of technical standards. Customers may be hesitant to bet their IoT future on proprietary software or hardware devices that use proprietary protocols that may fade or become difficult to customize and interconnect.

- The nature of home automation devices can also be a problem for security, since patches to bugs found in the core operating system often do not reach users of older and lower-price devices.

A home automation system can have varying degrees of intelligence and complexity.[1,2] Automation of homes is adopted not merely to provide ease, convenience, and comfort to the user but also to minimize the energy waste and ensure home security. An ideal home automation system has the capability to sense its environment and is reliable, secure, user-friendly and cost effective. The home automation systems are not limited to lighting, HVAC and security systems, but have evolved into fire detection systems, entertainment systems and energy management systems as well.

Bluetooth is the ideal way to use wireless communication between various devices in a home automation system. The Bluetooth technology operates over unlicensed and globally available frequency of 2.4GHz. [3,4]Also, Bluetooth based Home Automation System is safe from an internet hack or power failure. The objective of this study is to design and implement a Smart Home Automation System. [5,6]The system incorporates the use of a microcontroller as a control module and uses Bluetooth technology for wireless communication between the smart phone and the control module.

II. MATERIALS REQUIRED

Hardware Peripherals

- *Microcontroller*

A microcontroller is used to act as a brain to the home automation system. A microcontroller is a highly integrated chip where all the peripherals like CPU, timers, counters, RAM; ROM, registers, I/O pins, clock circuit, etc. are built in.

- *Bluetooth Module (HC-05)*

The Bluetooth module HC-05 is a MASTER/SLAVE module. By default the factory setting is SLAVE.

- *Bread Board*

A breadboard is a solder less device for temporary prototype with electronics and test circuit designs.

- *Resistors*

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element.

- *LEDs*

A light-emitting diode (LED) is a semiconductor device that emits visible light when an electric current passes through it.

Software Used

- *Arduino Web Editor*

The Arduino Web Editor allows you to write code and upload sketches to any official Arduino and Genuino board from your web browser (Chrome, Firefox, Safari and Edge) after installing a plugin . Google Chrome is recommended.

- *MIT App Inventor*

App Inventor is a cloud-based tool, which means you can build apps right in your web browser. This website offers all the support you'll need to learn how to build your own apps.

III. DESIGN
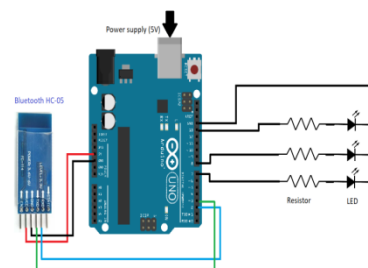
IV.   WORKING

In today's scenario, most homeowners already have at least one smart phone having Bluetooth compatibility (or even a tablet, or PC for that matter). This makes the incorporation of a Bluetooth based Smart Home Automation system highly convenient. The proposed Smart Home Automation System incorporates the use of Bluetooth technology for wireless communication. The user can monitor and control their lighting, fan, and security system with the help of a user-friendly application. The author has made a Bluetooth terminal application using MIT App Inventor. A connection is established between the mobile Bluetooth and Bluetooth module, using a 4digit postcode. Next, the

user inputs clicks on a button on the Bluetooth Terminal application. The button then sends a character, which is then received by the Bluetooth Module. The microcontroller reads the input character and performs the corresponding function.

V. CONCLUSION

In today's world, there is a developing trend of incorporating smartphone and other such devices into Home Automation Systems. Since, most of these smart devices are Bluetooth compatible, it makes good sense to use Bluetooth technology for wireless communication. The proposed Smart Home Automation System is designed to provide lighting The Bluetooth module range is limited to up to 30feet. Overall, the system provides the user with a centralized control through his mobile device via a Bluetooth connection.

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