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DEVELOPMENT OF A BLUETOOTH-ENABLED SMART HOME SYSTEM USING ANDROID PLATFORM

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Abstract: Home automation systems are designed to enhance comfort, efficiency, and control within residential environments by integrating technology that allows appliances and devices to operate automatically. With the growing accessibility and technological advancement of smartphones, particularly those running on the Android operating system, mobile devices now offer a convenient and cost-effective platform for implementing home automation. This study presents the design and implementation of a low-cost prototype for a Bluetooth-based home automation system controlled via an Android smartphone.

The proposed system enables users to control various home appliances remotely from within their home using a custom-developed Android application. By leveraging Bluetooth communication, the Android device sends commands to a microcontroller interfaced with the home appliances through a serial connection. The user interface of the mobile application is intuitive, offering real-time switching and monitoring functions. The prototype was developed with affordability and simplicity in mind, making it suitable for users with minimal technical knowledge and limited budgets.

The effectiveness of the system was evaluated based on response time, reliability of communication, and ease of use. The results indicate that Bluetooth offers a stable and responsive connection within typical home environments. This system also eliminates the need for separate remote controls, as smartphones are typically within the user's reach at all times, thereby enhancing convenience.

The paper concludes by discussing potential enhancements such as voice command integration, extended range through Wi-Fi connectivity, and added security features for a more robust and scalable smart home experience. Overall, the project demonstrates that integrating Android smartphones with Bluetooth technology offers a practical and economical solution for home automation.

Keywords: Android cell phone, Smart home, Home Automation, Bluetooth module

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I. Introduction

In recent years the popularity of home automation has been increasing due to higher affordability and simplicity by connecting through smart phone [1]. With the continuous growth of mobile devices in its prominence and functionality the demand for advanced ubiquitous mobile applications in people's daily lives is continuously growing [2]. Exploitation web services is the most open and Inter operable way of providing remote service access or entitle applications to communicate with each other. Home appliances consist of many devices Inter connected different ways. Sensor modules communicate between a

Measured sensor value and Actuators with communicating simple data storage units (I/O or a command). They basically communicate with an interface board attached Bluetooth through the PC. The device attached Bluetooth can be controlled both manually via the local switches and remotely via the Bluetooth. The controller interface sup ports the browsing; the detection of network devices, context structures, and the user can interact with individual devices on the Bluetooth home network. The hardware interface is used to approach a local home automation network from a standard desktop PC with attached hardware for device modules and Bluetooth module. The Home Automation concept has existed for many years. The terms Smart Home, Intelligent Home pursued and has been used to introduce the concept of networking appliances and devices in the house. In this home automation system range of the Bluetooth is work 12 meter. And used microcontroller (8051) family.

Based on the study of different HAS projects done by developers, microcontroller is implemented in wireless HAS. In this system we use many devices. Home automation system based on microcontroller. A home automation system (HAS) provides the integration among all the electrical and electronic devices in a house. The techniques used in home automation systems include controlling of electronic and electrical devices, such as

A. *Block Diagram*

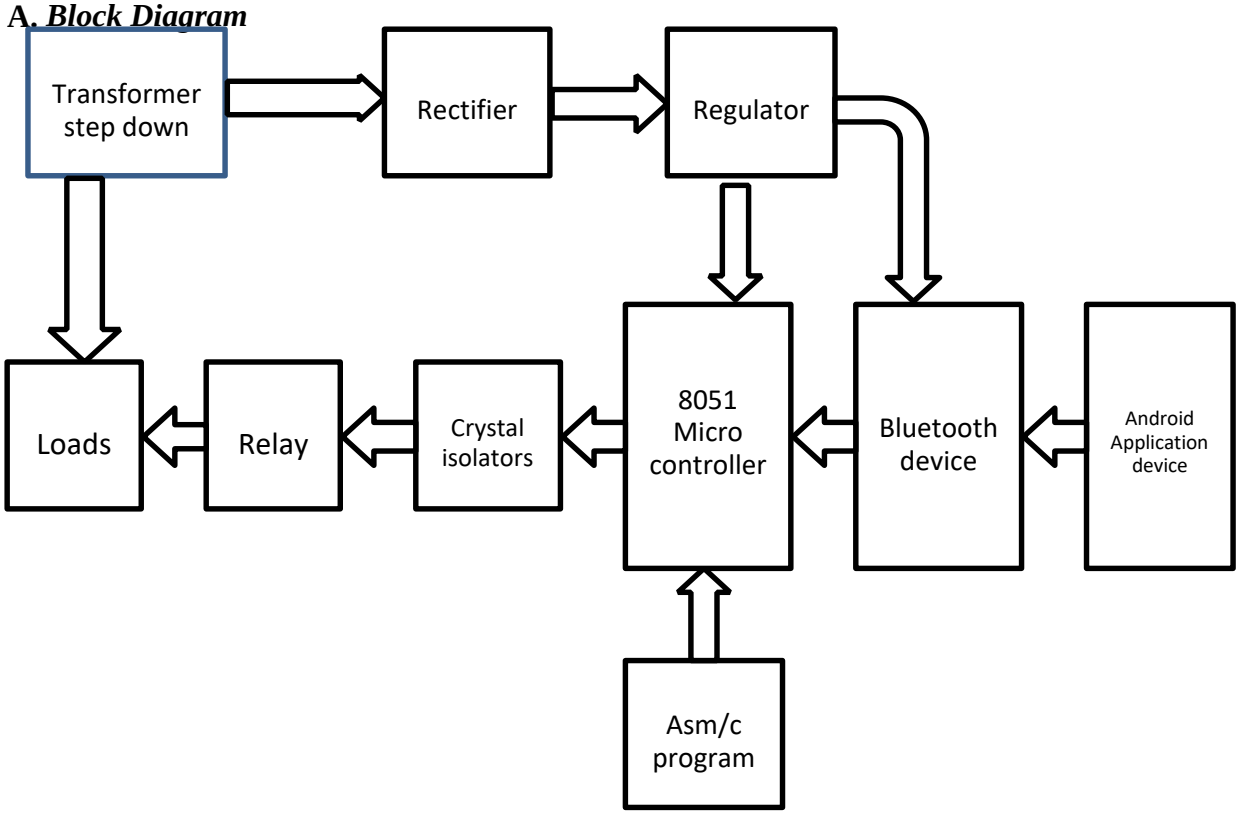

Fig: 1 Block Diagram

home entertainment systems, security systems, air conditioners, pure watering systems, etc. In this paper, a low cost wireless controlled smart home system for controlling and monitoring the home environment is presented.

II. System Design

For design a home automation system mainly required of block diagram and technology which are used in HAS system. The temperature and humidity level can be measured using the sensors that are connected to the main control board. The indication from the sensors reminds the user to turn on/off the fan or air conditioner in the house. The on/off status of home appliances. This HAS based on the Bluetooth and controlled by android mobile application.

B. *Bluetooth Module*

The Bluetooth module allows us to wirelessly transmit and receive data. The Bluetooth module that we are using for our project is HC-05. The module that we are using is based on the Bluetooth V2.0 protocol and is having a range of 10 meters operating at frequency of 2.4GHz radio transceiver and baseband. It has the footprint as small as 12.7mm*27mm. Asynchronous: 2.1Mbps (Max) / 160 kbps. Security features: Authentication and encryption. Support profiles: Bluetooth serial port (master & slave).

The Bluetooth Trans receiver HC-05 Breakout is the latest Bluetooth wireless serial cable! This version of the popular Bluetooth uses the HC-05/HC-06 module. These modems work as a serial (RX/TX) pipe. Any serial stream from 9600 to 115200bps can be passed seamlessly from our computer to our target. In this Bluetooth module taking 6 pin module.

Fig: 2 Bluetooth Module

C. *Android Application*

Android is a software stack for mobile devices that include an operating system, middleware and key applications. The Android provides the tools on the Android platform using the Java programming language. By providing an open development framework, Android offers developers the ability to build extremely rich and innovative applications. Developers have full access to the same framework APIs used by the core applications. Android includes a set of C/C++ libraries used by various components of the Android system.

Requirement for application install in mobile.

- Application install in only android mobiles.
- Mobile Bluetooth connected from to the Bluetooth module HC-05 from the system setting of the mobile.
- Open the app into the mobile and here connect application from to the HC-05. Now given signal into the app and get output by the kit.

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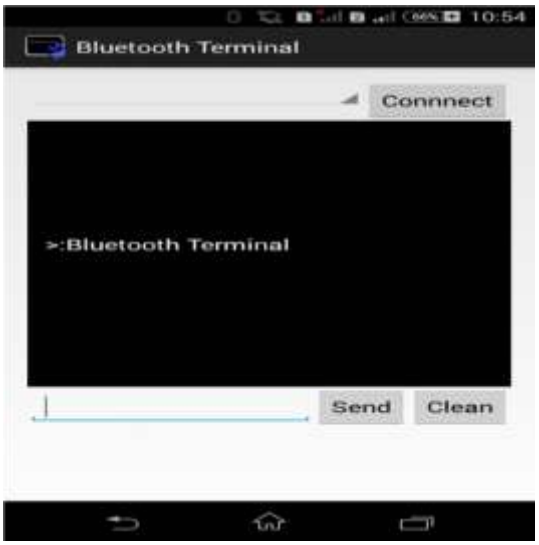

Fig: 3 Screenshot of App

D. *Working*

We are developing an Android application which can be installed on Smart phones having Android version 2.1 (Éclair) and above. After installing the application on the smart phones the user will access the system in the following way:

- User logs in to the system with the authentication id and credentials that is being coded in the program.
- The system will search for the discoverable Bluetooth devices.
- The system will pair the discovered Bluetooth device with the control board.
- Once the pairing is done, the user will send signals for controlling the home appliances (ON/OFF).
- The system will receive signals from the user and forward them to the appliances in the form of electrical signals.
- The appliances will get either turn ON or turn OFF, and will provide a notification to the user.
- After completing the operations, the user can terminate the connections by logging out of the system.

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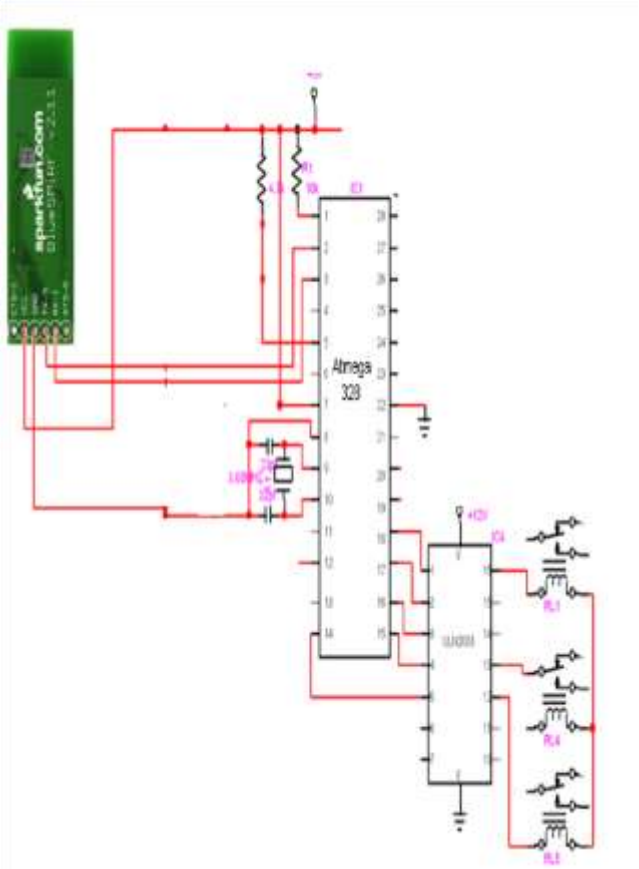

Fig: 4 Circuit Diagram

The connection between the hardware's can be done in the following manner:

- The Bluetooth module will be installed in the Arduino board with the help of bread board and the controlling code for Bluetooth module will be written in the Arduino IDE.
- The Relay board will also be installed in the Arduino with the help of bread board and will act like a switch for controlling the appliances.
- An android application is developed for the users to interact with the system to control the home appliances with the help of Smart phones.

III. Benefits

- Home appliances can be controlled remotely.
- HAS is helpful for disabled persons.
- No need for internet connection.
- Saving time.
- Saving money.
- Easy to assemble home appliances.
- No risk of electric shock.

IV. Future Scopes

- Voice commands can be implemented so that the persons without hands can also operate this system.
- Sophisticated electrical appliances can be controlled. For example: Microwaves, Air conditioning temperature, etc.

- The system can be used in home, small offices to the big malls

V. Conclusion

This is an ongoing project. Our prime objective is to assist handicapped/old aged people. This paper gives basic idea of how to control various home appliances and provide a security using Smart phone. This project is based on Android. So the overall implementation cost is very cheap and it is affordable by a common person. Looking at the current scenario we have chosen Android platform so that most of the people can get benefit. We have discussed a simple prototype in this paper but in future it can be expanded to many other areas.

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