

Smart Home Automation & Security System

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ABSTRACT: Day by day the usage of electrical energy is increasing in India. Now we have to save the electrical energy whenever the persons are absent in the home. There is increasing demand for electrical energy in homes, where appliances react automatically to changing environmental conditions and might be simply controlled through one common device. This project presents an attainable answer whereby the user controls devices by using their only mobile phone, where control is communicated to the 8051 Microcontroller from a mobile phone through its Bluetooth interface. There are many technologies used for smart home automation. Currently, GSM, Bluetooth technology. In this project, we have used an 8051 microcontroller for controlling the entire process of this project. The Bluetooth module can be employed for controlling the home appliances wirelessly. Home appliances will be turned ON and OFF when the user will touch button in Bluetooth mobile application on the cell phone. We can use any Bluetooth application which will send character through Bluetooth. Through this project, we have tried to show the real model of the house and also control all appliances as a result of which power is saved to some extent. Automation is the use of management systems and data technologies to cut back the requirement for human work in the manufacturing. Automation plays an increasingly important role within the world economy and in daily expertise. In this project, we do not only implement automation of home but also home security systems with various sensors and GSM. The status of home appliances are also displayed on LCD.

KEYWORDS: Bluetooth, 8051 Microcontroller, GSM, Sensors, LCD.

I. INTRODUCTION

The smart home automation system is also called a home intelligent system. In the modern development of smart cities in urban areas, everything is automation. The main aim of any development in technology is the ease of human life. In-home automation system controlling the home appliances without using of conventional switches. In-home automation systems all appliances are controlled by the Android mobile App. An Automated home sometimes is also called a smart home. In present days everywhere using wireless technology. Because wired technology is old and complicated. The wireless technology has more impact on human life in a positive manner.

Generally, wireless technologies are GSM, Bluetooth, and the internet (Wi-Fi). Each technology has its advantages and disadvantages. In this project, we are using Bluetooth as wireless technology, because it has more accuracy and high reliability when compared to GSM and Wi-Fi. The Range of Bluetooth is 10m to 100m the range can also be increased by piconet architecture. The frequency used by the Bluetooth is 2.4GHz. The speed of Bluetooth is 3Mbps. This project also implementing a home security system. When human beings are not available in the home it will send security messages to the owner of the house.

II. EXISTING METHOD

Home automation is a combination of automation technologies and computer science. High affordability and connectivity through smartphones has increased the popularity of home automation in recent years. The life quality of the elderly and disabled can be improved by using home automation. Bluetooth is one of the techniques used in the home automation network to control and monitor home appliances. Home automation consists of electronic programmable controls for home appliances using wired communication. A smart home controller connects the entire house in a home automation system. This acts as a centralized control of household systems, such as Fan and TV. With this centralized control unit, a person does not need to leave the home to turn on/off home appliances, which is convenient for users. Home automation is designed to introduce convenience and efficiency to a home. People living with physical handicaps may rely on the features of a home automation system to accomplish mundane tasks that might otherwise be difficult or impossible. But the problem is unable to secure the home from theft. In-home lockers we can

place a lot of valuable things. if nobody is in the home anybody can easily enter the home. And there is a chance of theft.

III. PROPOSED METHOD

This project is primarily concerned with the home automation system...The home automation system is implanting with Bluetooth for interaction between the android mobile application and the appliances under the control of the system. In this project, we used an 8051 (AT89S52) microcontroller for controlling the entire process of this project. The Bluetooth module can be employed for controlling the home appliances wirelessly. Home appliances will be turned ON and OFF when the user will touch button in Bluetooth mobile application on the cell phone. when the user touches the 'Fan On' button in the Bluetooth controller app then the microcontroller receives '1' via Bluetooth module and then controller Switch 'On' the Fan by using relay driver and relay. And when the user touches the 'Fan Off' button in the Bluetooth controller app then the microcontroller receives '0' via Bluetooth module and then controller Switch 'Off' the Fan by using relay driver and relay. In this project, we also provide locker security, door security system with GSM.

III A. **Block Diagram:** The Block diagram of the project is shown in Fig.1

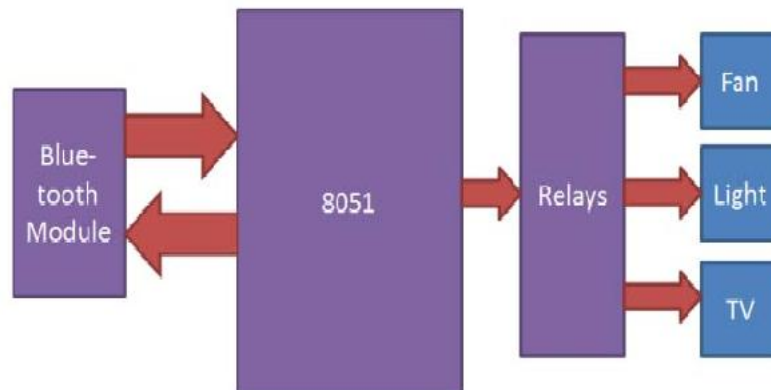


Fig.1: Block Diagram of the home automation system

III B. Overview of the home automation system:

In this project, we have used an 8051 microcontroller for controlling the whole process of this project. And a Bluetooth module is used for controlling the home appliances wirelessly. Home appliances will be turned ON and OFF when the user will touch button in the Bluetooth mobile app in Android mobile phone. To run this project, first, we need to download the Bluetooth app form Google play store. We can use any Bluetooth app that can send data using Bluetooth. After installing the App, you need to open it and then search the Bluetooth device and select the HC-05 Bluetooth device. when we touch any button in the Bluetooth controller app then the Android phone sends a value to the Bluetooth module, after receiving this value, the Bluetooth module sends the received value to the microcontroller and then microcontroller reads it and compare it with a predefined value. If any match has occurred then the microcontroller performs the relative operation. The same operation will be performed each time when button pressed.

III.C Installing the Bluetooth App :

To run this project, first, we need to download the Bluetooth app form Google play store. We can use any Bluetooth app that can send data using Bluetooth. Here in this project, we have used the Bluetooth controller app. Download and install the Bluetooth Controller.

- ❖ Turned ON mobile Bluetooth.
- ❖ Now open Bluetooth controller app
- ❖ Press scan
- ❖ Select the desired Bluetooth device (Bluetooth Module HC-05).
- ❖ Now set keys by pressing set buttons on the screen

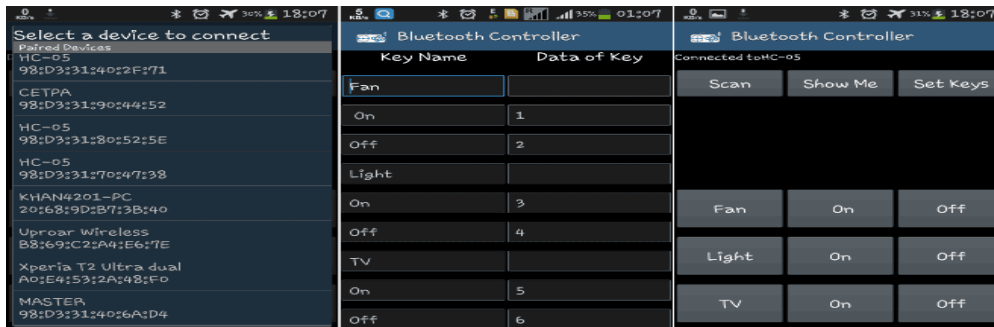


Fig. 2. Mobile Android App configuration

IV. HARDWARE DESCRIPTION

IV.A. An 8051 Microcontroller:

The selection of microcontrollers depends on speed, memory on-chip, number of pins and interrupts. The main selection depends on the application demands this microcontroller. In this project, we are executing with 8051 microcontroller. The 8051 is the first microcontroller of the MCS-51 family introduced by Intel Corporation at the end of the 1970s. The 8051 family with its many enhanced members enjoys the largest market share, estimated to be about 40%, among the various microcontrollers. 8051 microcontroller is 8 bit specifies the size of the data bus. 8-bit microcontroller means 8-bit data can travel on the data bus or we can read write and process 8-bit data.

Features:

- The 8051 architecture provides many functions (central processing unit (CPU), random access memory (RAM), read-only memory (ROM), input/output (I/O), interrupt logic, timer, etc.) in one package
- 8-bit arithmetic logic unit (ALU) and accumulator, 8-bit registers (one 16-bit register with special move instructions), 8-bit data bus and 2x16-bit address bus, program counter, data pointer, and related 8/11/16-bit operations; hence it is mainly an 8-bit microcontroller.
- Boolean processor with 17 instructions, 1-bit accumulator, 32 registers (4 bit-addressable 8-bit) and up to 144 special 1 bit-addressable RAM variables (18 bit-addressable 8-bit).
- Multiply, divide and compare instructions.
- 4 fast switchable register banks with 8 registers each (memory mapped).

IV.B Bluetooth HC-05

Here the communication interface between mobile phone and 8051 microcontroller, Bluetooth module (HC-05) is used. HC-05 is easy to use and it works the principle of serial port protocol and performs the operation at 1.8 V. Serial port Bluetooth module has a Bluetooth 2.0+EDR (enhanced data rate), 3Mbps modulation with complete 2.4GHz radio transceiver and baseband. Using Bluetooth profile and android platform architecture different type of Bluetooth applications can be developed. If the module is set to be in slave mode, it cannot initiate a connection to another Bluetooth devices rather than the intended smartphone, but can accept connections. When it is in master mode, the module can initiate a connection to other devices. The module contains 2 parts, the backplane, and the main Bluetooth board. The implemented system is designed to operate in slave mode. Thus the system can be connected to Arduino with a smartphone directly. Accordingly, the smartphone transmits the set of instructions to the 8051 through which the Microcontroller generates the set of output signals which, in turn, controls different devices via relay drivers.

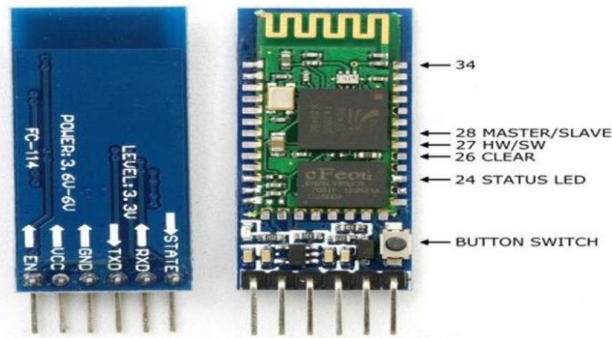


Fig. 3. HC-05 Bluetooth Module

IV.C Relays:

Relay is an electromagnetic Circuit which is used to isolate or separate two circuits electrically and connect magnetically through magnetic induction. One side of the electric circuit allows switching and current another one while they are completely separate. They are often used to interface an electronic circuit (working at low voltage) to an electrical circuit that works at very high voltage. A relay can work on a 5V DC voltage and able to switch to 230V AC mains circuit. A relay switch consists of two parts i) input and output. Ex.if any sensor gets input data that will send to the microcontroller that will process and gives this to electrical appliances like a bulb and Fan through the pin of controller and relay. Now the input section of the relay has a coil that generates a magnetic field when a because it receives small voltage from the pin of the microcontroller. This voltage is called the operating voltage. Commonly used relays are available in operating voltages like 6V, 9V, 12v, 24V, etc. The output section connects or disconnects mechanically and it consists of contactors. In a basic relay, there are three contactors: normally open (NO), normally closed (NC) and common (COM). At no input state, the COM is connected to NC. When the operating voltage is applied the relay coil gets energized and the COM changes contact to NO.



Fig. 4. Relay module

V. HOME SECURITY SYSTEM

In this project, we are implementing a home security system with various sensors. We place the touch sensor on the door of the house anybody touches the door this sensor senses this information and sends the message to the house owner. Whenever the persons are moving in front of the home frequently the PIR sensor detects and sends to 8051 microcontrollers. This 8051 microcontroller sends the message to the house owner with the help of GSM. We place a vibrating sensor on the locker of the home. When the thief trying to break the locker this vibration is detected by a vibrating sensor and sends this to the master microcontroller. Here master controller is 8051 microcontroller. This microcontroller sends a message to the house owner with GSM. The GSM module sends messages to the owner with the help of AT commands. The programmer predefined owner of the house number is written in the program along with AT commands. According to action takes place in the home the corresponding messages send to owner contact number.

V A. **Block Diagram:** The Block diagram of the home security system Fig.5

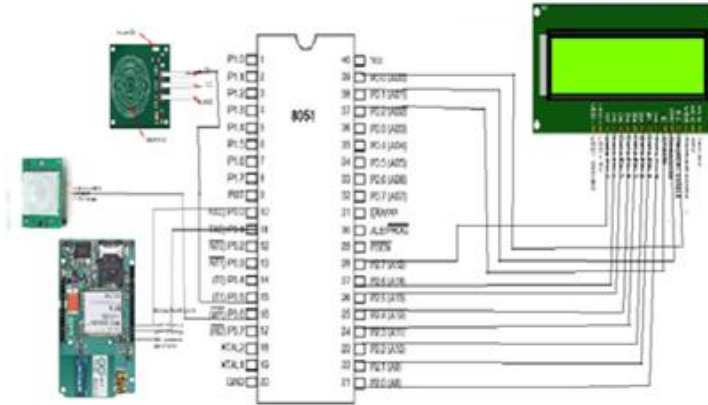


Fig. 5. Block Diagram of Home security system

V B: **Flow chart of the Project:** The flow chart of the project is shown in the Fig. 6

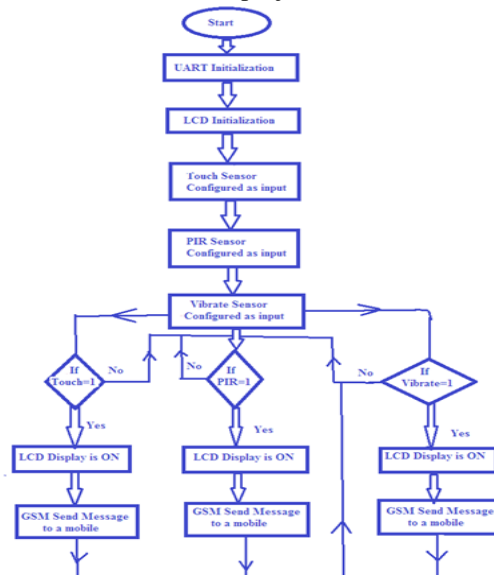


Fig.6: Flow chart of the home security system

VI. HARDWARE COMPONENT FOR HOME SECURITY SYSTEM

VI.A.PIR sensor: PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors. PIRs are made of a pyroelectric sensor (which you can see below as the round metal can with a rectangular crystal in the center), which can detect levels of infrared radiation. Everything emits some low-level radiation, and the hotter something is, the more radiation is emitted. The sensor in a motion detector is split into two halves. The reason for that is that we are looking to detect motion (change), not average IR levels. The two halves are wired up so that they cancel each other out. If one half sees more or less IR radiation than the other, the output will swing high or low.

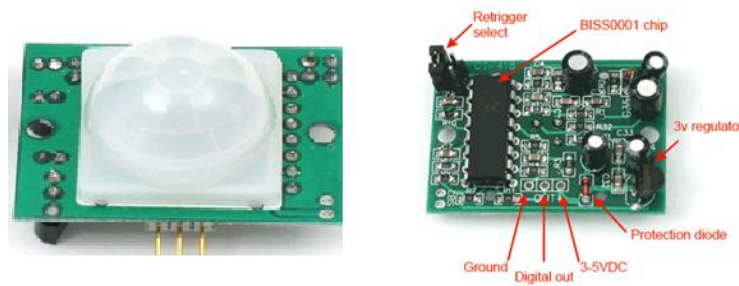


Fig.7.PIR sensor

In the detection area, the infrared radiation energy of the human body through the clothing is received by the lens of the detector and focused on the pyroelectric sensor. When the human body (intruder) moves in this surveillance mode, it enters a certain field of view in sequence and then walks out of the field of view. The pyroelectric sensor sees the moving human body for a while and then does not see it, so the human body The infrared radiation constantly changes the temperature of the pyroelectric material so that it outputs a corresponding signal, which is the alarm signal.

VI.B Vibration Sensor: The vibration sensor is also called a piezoelectric sensor. This sensor uses the piezoelectric effects while measuring the changes within acceleration, pressure, temperature, force otherwise strain by changing to an electrical charge. This sensor is also used for deciding fragrances within the air by immediately measuring capacitance as well as quality.



Fig.8.vibrate sensor

The working principle of the vibration sensor is a sensor that operates based on mechanical principles for detecting observed system vibrations. Whenever any force or pressure applies to this sensor, it converts this force into a voltage by the principle of the piezoelectric effect. This voltage is identified by the microcontroller and the process sends the message to a particular mobile number. The sensitivity of these sensors normally ranges from 10 mV/g to 100 mV/g, and there are lower and higher sensitivities are also accessible.

VI.C Touch Sensor: In the present scenario, touch sensors are also known as tactile sensors. The basic working principle of a touch sensor is that it detects a touch on physical contact. In simple words, you can understand that its working is the same as a simple switch or circuit. When any physical medium comes in contact with the touch surface. The internal circuit will be closed inside the sensor and current starts flowing. On the other hand, when this physical contact is broken or released, the circuit will be opened. Touch sensors are two kinds i)Resistive touch sensor ii)Capacitive touch sensor. In a resistive touch sensor whenever touch occurs the resistance of the circuit will change and send this data to the microcontroller. In the capacitive touch sensor and a physical touch occurs the capacitance of the sensor varied and touch detected by the microcontroller.

IV D. GSM Modem: GSM stands for Global System for Mobile communications. It is used for transmitting mobile data and voice services. This GSM modem can accept any SIM card just like a mobile phone with its unique phone number and used for sending and receiving SMS and MMS messages. SIM900 delivers GSM/GPRS 850/900/1800/1900MHz performance for voice, SMS, and Data in a small form reason and with low power consumption. It operates at 12 V DC



Fig.9.GSM module

IV E: Liquid Crystal Display: The Liquid Crystal Display (LCD) is a low power device (microwatts). Nowadays in most applications LCDs are using rather using LED displays because of its specifications like low power consumption, It has 16 pins.LCD not only writes the it also reads data because it internally has one microcontroller. if RS=1, it receives the data and displays on LCD. The LCD not only receives data it also receives commands. when RS=0, it receives commands like screen clear and blink cursor like that.

VII. RESULTS



Fig.10.Results of the project

VIII. CONCLUSION

It can be concluded that the objectives of this project were achieved,.We developed a low cost and high-reliability home automation system. Also, a user-friendly Android application as an alternative to the remote control unit of a home automation system has been established. In this project, we have shown the design and features of a Smart Home Automation and Security System. The system also connects with sensors, thus helping in detecting theft issues. The drawback of this system is the range of Bluetooth is less than 50 meters. In the future, the system could use more concepts of IoT so as make it more user friendly and increase the automation and security system. In the future, this can be implemented with camera and RFID scanning system

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