

# Bluetooth Based Home Automation using Arduino

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Abstract— The word automation is automatic control of operating devices with minimal or reduced human efforts. Influence of wireless technology is growing day by day. In today's world, wireless technology doing significant role in the automation. It means automation makes technology free from human interruption. Home automation is one of the technology emerging these days. To make it more effective and efficient, cost is reduced by low cost communication technology like Bluetooth, Wi-Fi. Bluetooth is wireless technology to use in home automation. It is no operational cost technique, common in use and working in range up to 100 meters. Bluetooth which is mainly used for data exchange, add new features to smartphones. With help of android application we are able to connect and control household appliances and provide security to handicapped, old people. The idea of paper is to control home appliances like lights, fan. It also provides home security and emergency alerts to be activated. It is possible to save energy by auto off lights at night time. Smoke detector can detect smoke or gas leak condition, causing alerts to user on their smartphone. Our home automation works smartly by providing increased quality of life, and comforts to users. Technology is a never ending process. To be able to design a product using the current technology that will be beneficial to the lives of others is a huge contribution to the community. This paper presents the design and implementation of a low cost but yet flexible and secure cell phone based home automation system. The design is based on a stand alone Arduino BT board and the home appliances are connected to the input/ output ports of this board via relays. The communication between the cell phone and the Arduino BT board is wireless. This system is designed to be low cost and scalable allowing variety of devices to be controlled with minimum changes to its core. Password protection is being used to only allow authorised users from accessing the appliances at home.

**Key words:** Bluetooth Wireless Technology, Smartphones, Home Automation System, Arduino Uno, Android, Bluetooth Module, Temperature Sensor, Smoke Detection

## I. INTRODUCTION

Home automation is the usage of information technology and computer for controlling home appliances and various other devices. It can be simple control of a light bulb to a complex network based on computer or microcontroller which can have varying levels of automation and intelligence. It means that one can control devices from any corner of the world. The term can be used for isolated programmable devices, like thermostats and sprinkler systems, but it more specifically explains or focuses on places or homes where almost everything like lights, devices, electrical outlets, heating and cooling systems can be controlled over a network. Study of applications of IT (information technology) to create intelligent home topography is known as Domotics. It can be used in home security systems which include the alarm

system, and all of the smoke detectors, doors, windows, locks, surveillance cameras and any other sensors which are linked to it. Gas leak, fire alarm, carbon monoxide, or water leaks can also be included as detection systems. It is prominently used for reasons of security, ease, and energy efficiency. Its popularity recently has recently increased because of much higher affordability and simplicity through tablet connectivity and Smartphone. The idea about the "Internet of Things" is the recent hot topic of debate under HAS.

Home Automation Systems can be implemented by two ways i.e. Wired or Wireless Technology. Wired HAS (Home Automation Systems): In a wired HAS structure's existing electrical wiring and cable are used to connect all the devices. The signal is carried by the electrical wires, so they are called as power line systems. These types of systems are said to be unsuccessful in large homes and areas as the signal gets weaken travelling through long stretches of wire so phase couplers are required to maintain strong transmission which increases the cost of the system.

Automation is a technique, method, or system of operating or controlling a process by electronic devices with reducing human involvement to a minimum. The fundamental of building an automation system for an office or home is increasing day-by-day with numerous benefits. Industrialist and researchers are working to build efficient and affordability automatic systems to monitor and control different machines like lights, fans, AC based on the requirement. Automation makes not only an efficient but also an economical use of the electricity and water and reduces much of the wastage. Automation is another important application of wireless technologies like Bluetooth. It is the monitoring of the energy consumption and the Controlling the environment in buildings, schools, offices and museums by using different types of sensors that control lights, temperature. To make it more operative and efficient, cost is reduced by low cost communication technology like Bluetooth.

Bluetooth is nice technology to use in home automation. This technology allows to the users instantaneous connections of voice and information between several devices in real time. The way of transmission used assures protection against interferences and safety in the sending of information in arrange up to 100 meters. Building upon this theme; we propose a home automation system based on Bluetooth technology available in Android smartphones.

Implemented design are considering few issues for smart home automation. They are: Easy setup, Easy to control and monitor, Low cost and efficient communication. Our paper presents Bluetooth based centrally controlled home automation system using smartphones and Arduino Uno board. Such a system will enable users to have control over lights, fan in his home with Bluetooth. All that the user needs

is an Android smartphone, which is present in almost everybody's hand nowadays, and a control circuit. The control circuit consists of an Arduino Uno microcontroller, which processes the user commands and controls the switching of devices. The connection between the microcontroller and the smartphone is established via Bluetooth, a widespread wireless technology used for sharing data. This application also focuses on smoke detection and temperature sensing by providing security to application against unauthorized user.

Wireless Home Automation Systems: RF (Radio frequency) signals are being used under Wireless Home Automation System. This type of system is very useful in large buildings and businesses. Repetition of signal to upto 3 other wireless devices is there when a wireless device receives a signal. As a result, it travels to a larger distance before fading away. This system is typically referred to as a mesh network. Following are the various devices available in the market for facilitate communication between two devices:-

- 1) Bluetooth Modules: The operating frequency for Bluetooth is between 2400 and 2483.5 MHz, or 2402 and 2480 MHz including guard bands 2 MHz wide at the bottom end and 3.5 MHz wide at the top. They usually range from 0-100 meters. XBee Modules: Xbee modules have different operating frequencies and range depending upon the series being chosen. It varies from 0 to 10 km.
- 2) GSM: GSM have operating frequency in the range of 380.2-1989 MHz.

## II. PROPOSED SYSTEM

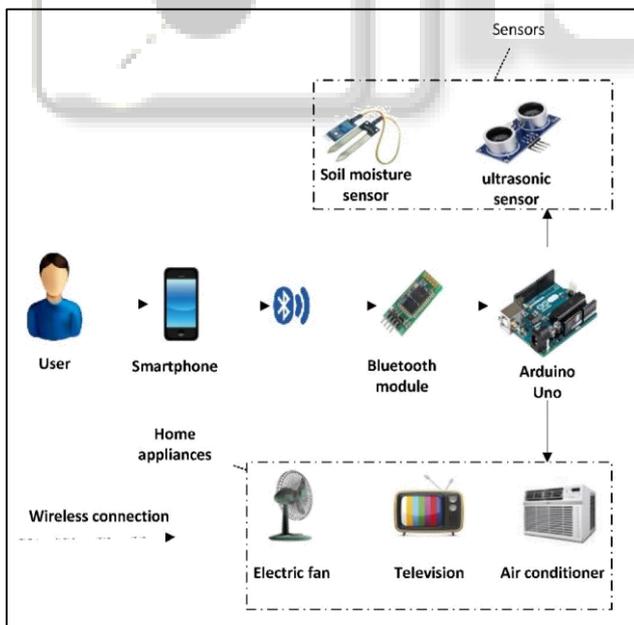


Fig. 1: Block Diagram of Bluetooth Based Home Automation Using Arduino

- 1) Micro controller Device – It is the device through which application interacts with home appliances.
- 2) USB Connector - It is the hardware port in the kit through which the USB device is attached to the embedded kit.
- 3) Embedded Device - It consists of individual embedded kits along with respective home appliance.

In this project we are implementing ARM9 Wince6.0 based device control with the help of blue tooth. For this one ARM9 is required in the transmitter section. In the receiver section two devices are interfaced to microcontroller with Bluetooth module. User responsibility is to develop one application with the help of Bluetooth. In the receiver side Bluetooth module is interfaced to the controller to transceive the data from the ARM9 processor. Based on that data microcontroller will decide the devices operation like on/off the devices and lock/unlock the door

Only “logic1” is count and that will generate voltage otherwise there is no counting and voltage generate as well. If all piezo are pressed simultaneously and accurately and also the “logic1” is count then one pulse is generated from the output pin of voltage regulator that pulse is further passing from the microcontrollers pin “P1.7” and it will count otherwise its unable to count.

The four combinational piezo plate are capable to generate maximum 12volt voltage. The voltage generating process is totally depend up on the piezoelectric sensors. The 24C64A memory will stores the data and it use SDA pin to write that data from memory and result is shows on the LCD the microcontroller pins DB0-DB7. The microcontroller READ the data from memory WRITE pin showing the data on LCD. The foot step on LCD and the voltage range is showing on LCD and the voltage range is showing on the multimeter.

Piezoelectric material converts pressure into electrical energy. The pressure can be either from weight of moving vehicles or from the weight of people walking on it. The produced output is in the variable form .so bridge circuit is used to convert variable voltage into linear voltage. An AC filter is used to filter out this output voltage and it is stored in rechargeable battery. Two possible connections were tested-parallel and series connections for producing 12v output. Inverter is connected to battery and battery connection provide AC load. The voltage produce across the time can be displayed on LCD

The piezoelectric material converts the pressure, stress applied to the material into electrical energy. The source of stress is from the weight of the people stepping on the stairs. As the output voltage from a single piezo-film was extremely low, thus combination of few piezoelectric is used. Two types' possible connections can be done parallel connections and series connections. The output of the piezoelectric material is not a regulated one, so variable to linear voltage converter circuit rectifier is used. Ac ripple neutralizer is the circuit used to reduce the ripples from the piezoelectric output. The AC ripple neutralizer consists of rectifier and ripple filter. Again AC ripples are filtered out using ripple.

### III. HARDWARE DESCRIPTION

#### A. Microcontroller 89s52

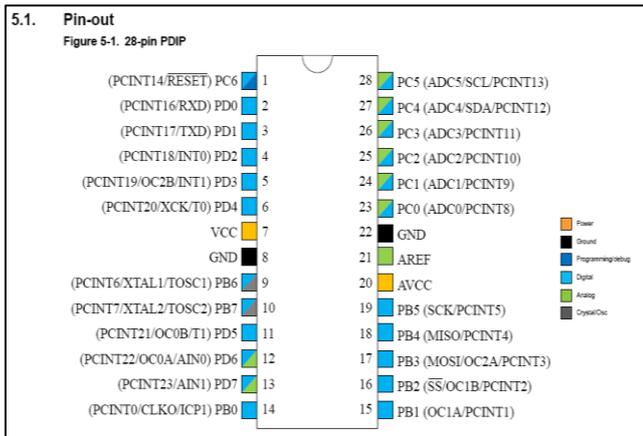


Fig. 2: Atmega328 pin diagram

ATmega-328 is basically an Advanced Virtual RISC (AVR) micro-controller. It supports the data up to eight (8) bits. ATmega-328 has 32KB internal builtin memory. This micro-controller has a lot of other characteristics. You should also have a look at Introduction to PIC16F877a (it's a PIC Microcontroller) and then compare functions of these two Microcontrollers.

ATmega 328 has 1KB Electrically Erasable Programmable Read Only Memory (EEPROM). This property shows if the electric supply supplied to the micro-controller is removed, even then it can store the data and can provide results after providing it with the electric supply. Moreover, ATmega-328 has 2KB Static Random Access Memory (SRAM). Other characteristics will be explained later. ATmega 328 has several different features which make it the most popular device in today's market. These features consist of advanced RISC architecture, good performance, low power consumption, real timer counter having separate oscillator, 6 PWM pins, programmable Serial USART, programming lock for software security, throughput up to 20 MIPS etc. ATmega-328 is mostly used in Arduino. The further details about ATmega 328 will be given later in this section.

#### B. Bluetooth Module

Bluetooth is a wireless technology standard for exchanging data over short distances [11] (using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz) from fixed and mobile devices, and building personal area networks (PANs). The Bluetooth module being used allows us to transmit and receive signals. It receives the text from the Android phone and transmits it to the serial port of the Arduino Uno. The Bluetooth module being used here is the HC-05 module, shown in fig. 3. It is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. The Bluetooth module HC-05 is a master/slave module [12]. By default the factory setting is slave. The Role of the module (Master or Slave) can be configured only by at commands. The slave modules cannot initiate a connection to another Bluetooth device, but can accept connections. Master module can initiate a connection to other devices.

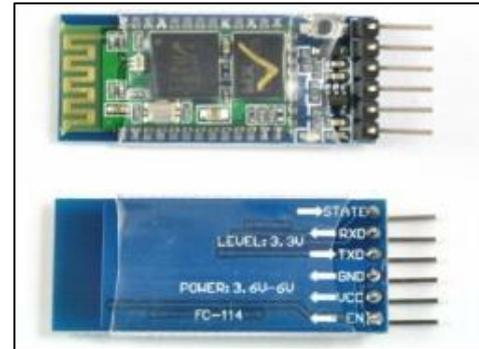


Fig. 3: Bluetooth HC-05 Module

### IV. ADVANTAGE

- Managing all of your home devices from one place.
- Flexibility for new devices and appliances.
- Maximizing home security.
- Remote control of home functions.
- Increased energy efficiency.

### V. FUTURE SCOPE

Home automation can be extended to controlling the devices like fans, lights, bulbs, T.V, etc. by monitoring the heartbeat of an individual. The heartbeat is being monitored continuously via heart beat sensor circuit. If suppose person forgets to switch of a device such as T.V,A.C etc. and falls asleep, then the proposed system is useful. Though there are various systems for home automation already available but none of them gives a provision like this. It will be helpful in saving energy and bringing down the annual cost of an individual's electricity bill thus helping both ways. The Heartbeat sensor circuit senses the heartbeat pulses tapped from the finger of the individual then it is wirelessly transmitted from one xbee module to another interfaced with the Arduino board for comparing the received value with the preset values of heartbeat. If it falls below the threshold (i.e. 60 bpm) then the relay which is continuously monitoring the state of the device will be triggered by a pulse from Arduino board to change the state of the devices.

### VI. RESULT

Graphical User Interface (GUI) Module The most important feature of our application is to hide several processes from the user while allowing some degree of interaction with the application. By using the GUI package, we were able to customize the application to include a variety of user interface elements such as text boxes, choice groups, alert messages, lists and command buttons. Figure 4 illustrates some designs for the graphical user interface.



## VII. CONCLUSION

Home automation using Bluetooth was discussed in this paper. In all techniques, researchers addressed control of device using Bluetooth and internet/wired. Researchers are used various type of microcontroller to control the appliances. Mostly people However, researcher not addressed if the person forgot to switch off the devices. Researchers need to address this problem also. Further, the work can be extended in following way. Monitor the person heart beat, when person sleep, heart rate drops to 45-55 bps.

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