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Home Automation using Smart Technology

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Abstract*: It has been two centuries but still we are using buttons to control electrical devices. In the recent years, automation plays a major role in our Daily life. Home automation involves the control and automation of home electrical appliances like light, fan, AC etc. The main aim of this project is providing user-friendly interface to interact with home appliances. There has been an advanced technique in the Automation due to the improved voice detection and gesture moment through wireless technologies, along with that Auto Sensing technology to monitor the persons inside the room. These systems are supposed to be implemented in the existing infrastructure of any home without any kind of changes in the extant connections. Home automation reduces the human involvement, energy efficiency and time saving. This technology is most suitable for aged and physically struggled people have difficulty in surviving one to one place.
***Keywords*: Arduino, Infrared Sensors, Voice commands, Gesture commands, Bluetooth Module, Android App.**

I. INTRODUCTION

Initially the thought of smart home automation was an idea, later this proposal was developed into a project. For decades, the improvement in science that leads to an expansion of home automation. In a fully automated home have a feature called immortality. As the days go on the humans have died out but, once we install the smart home it lasts for years. Just because of this smart home automation, we are living ten years ahead in smart technology. Actually, we are enjoying this smart home automation from the past 100-years in a different format like water heaters, clothes dryers, sewing machines, etc.,. Combining all these things and arranged in a specified room we call it as a Smart home. Let's take a small snap shot of smart home automation and its growth rate in technology that helps us to enjoy this sophisticated life and to know where it is today. The great useful things that are done earlier are the stepping stones to build this smart home automation technology.

The main usage of this home automation is of two purposes: security and to lead a luxury life. In the progress of last two decades, as home automation has become adoptable and user friendly moreover it becomes inexpensive that can affordable everyone in the market. The performance of the external loads are observed on the visual display unit that may be of our smart phone or tablet. This process can be achieved with using different technologies like Zigbee, Internet Of Things(IOT), Wi-Fi, Bluetooth, Universal Power-line Bus(UPB), etc.,

This paper gives the information about the simple home automation system that consists of controller unit and external loads (home appliances). This home appliances communicate with controller unit through a wireless device called a Bluetooth android based smart phone. These operations are displayed in our smart phone. Module II briefly discuss about existing approaches and in module III, the proposed system is explained. The results and analysis are observed in module IV.

II. EXISTING WORK

Utpal V. Solanki and Nilesh H. Desai[2011] designed a Hand gesture based remote control for home appliances. These hand gesture moments are recognised with infrared vision using Blobscanner. This Hand gesture moments are satisfied with a Image processing technique and Microcontroller development board, Arduino Atmega328 from ATMEL. This Processor is operated at frequency of 16MHz. 115,200 bauds/second data rate is useful for communication. In this an LED light beam is used to help the IR sensors placed in front of the camera to recognize the gesture commands of the user. Some predefined gesture commands are loaded into the software based on that TV may turn ON/OFF operation is performed.

Sonali Sen, Shamik Chakrabarty, Raghav Toshniwal, Ankita Bhaumik[2015] sketch the Design of an Intelligent Voice Controlled Home Automation System. In this the main controlling unit consisting of Arduino Uno and Bluetooth module, which commands the devices to switching ON/OFF based on Bluetooth input signal. It is designed for wireless serial connection setup having the data rate of 3Mbps and operated at the frequency of 2.4GHz. It has a Slave Baud rate of 9600. The Arduino Uno is comes under ATmega328p microcontroller board. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analogue inputs, a USB connection, a power jack and a reset button. The Arduino have the flexibility of power supply, either we use USB cable or AC to DC adapter.

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Sukhen Das, Sanjoy Ganguly, Souvik Ghosh, Rishiraj Sarker and Debaparna Sengupta[2016] developed A Bluetooth Based Sophisticated Home Automation System Using Smartphone. For wireless communication purpose we use Bluetooth Module to control the external loads with the support of Arduino Uno. Once the connection is established, the Bluetooth module have the capability to exchange the data based on given inputs. The Bluetooth module contains of 6 pins that can be operated in two modes: Master and Slave. If the Bluetooth module is set to Master Mode, it can initiate the connection with other Bluetooth devices. If the module is set to Slave mode, it cannot initiate the connection with other Bluetooth devices.

Dr.Pramod Sharma, Preeti Verma, Km. Bhoomika, Ravi Kumar, Saurabh Baghel[2017] created the Home Automation Using IR (Infrared) Sensor and Arduino-Nano Single Board Microcontroller. In this the main controlling and monitoring unit is Arduino-nano with the help of IR sensors it can accepts and decodes the received signal to switching the devices turning ON/OFF. The IR transmitting module sends the coded infrared signal to the IR receiving module which is linked to the Arduino-nano. Then the Arduino compares the received code with the already stored code in it and then decodes it. Based on the received signal relevant switching operations(ON/OFF) can be done.

III. PROPOSED SYSTEM

The present proposed project is providing user-friendly interface to interact with our home appliances. This home automation project needs to communicate the electrical loads based on Bluetooth input signal. The reason for going to this system is improved capability of multi tasking as well as low cost and very close to real time implementation. The block diagram of proposed system is shown in Figure 1. Along with Arduino, the major components involved are the IR(Infrared) sensor.

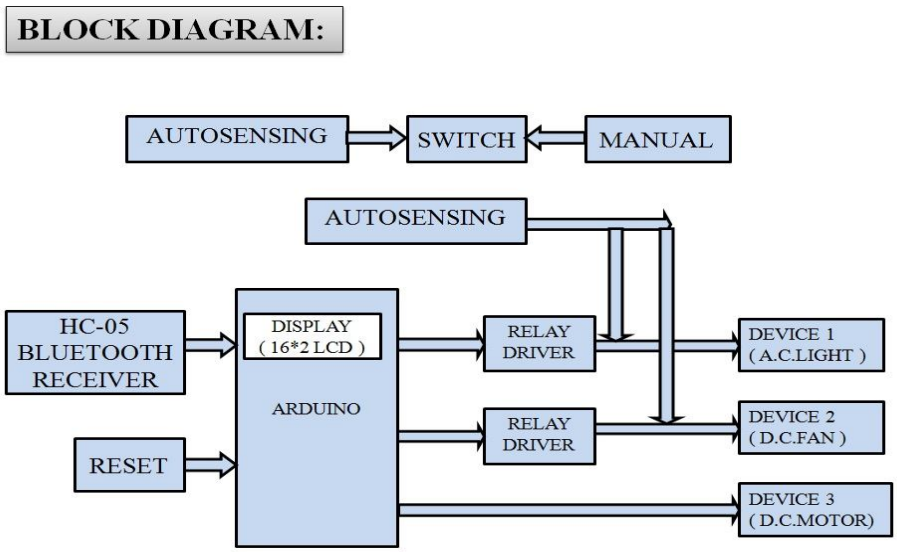

Figure 1.Smart Home Automation system.

A.Features of Arduino

Arduino board is handy for beginners for constructing electronic projects. Mainly it consists of physically development board and software to upload the code into it. The excellent feature in Arduino is, it does not use an extra kit to dump the code into the development board. We just need a USB cable to communicate from our PC to development board. The programming language used in this Aduino is quite similar to C language, it is very convenient to any user.

The adaptable nature of Arduino have an another extra feature is power supply. Arduino requires 100mA is supplied at 5v to turn ON the device. Majorly, We can power-up the Arduino in two ways:

1) By using USB cable from Personal computer (PC), 5v is enough to turn ON the Arduino that is supplied by PC
2) Use AC to DC adapter plugged into the barrel connector, in that we get 7v-12v power supply. In-order to restrict this supply to 5v is done by voltage regulator that is built in Arduino board. Whereas coming to the pins of Arduino is dividing into sections
3) The area covered analogue pins is from A0 to A5 (6 pins).These pins are used to read the analogue signal that should be converted into digital signal
4) power pins are 5v,3.3v,Gnd,Vin and Res

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5) Digital pins are of (0 to 13) 14 pins that can read digital input signal and generate digital output signal. In that 6 pins are Pulse-Width Modulation(PWM) used to simulate analogue output pins.
6) Reset button is used to restart the Arduino board, if any code is loaded into that board.
7) Tx and Rx buttons are used to transmit and receive the bits. The information exchanged in the form of serial communication.
8) Integrated circuit (IC) is the brain of the Arduino designed by ATMEL company.

B. Other Major Components

In addition to the above described major components in the board, Infrared sensor, Bluetooth module along with Relay driver are incorporated to perform the desired task as mentioned below.

IR sensors are used to detect the persons motion from entry to exit and vice-versa. Based on this moments the devices (loads) switching can be done. IR(infrared) operating range is of 300GHz - 430THz and it's wavelength is of 700nanometers - 1mm.

Bluetooth Module HC-05 is used to communicate the external loads without wires. It is a Serial Port Protocol having the enhanced Data Rate is of 3Mbps and it's Operating Range 2.4GHz. The power supply requirements are of 3.3V to 5V. It is having IEEE Standard 802.15. It is a 6 pin module consisting of TX, RX, GND, VCC, State and Enable.

The power supply requirements for LCD display is 5v. It's display dimensions format are of 16*2 characters. LCD display having 16 pins, each pin having significant function. In that 16 pins: 8 pins are data pins (DB0-DB7), 2 pins are power supply pins VCC and GND, for adjust the brightness we use Vo pin. In the purpose of Register select use RS pin.

Transistor is used as a switch to ON and OFF the external Loads with the help of relay drivers. Relay drivers are used for controlling the loads from getting low power supply from Arduino board.

C. Working of the Proposed System

The present system is mainly focused on current sophisticated technologies. In this we use Android app for controlling home appliances in two modes: Voice commands and Gesture commands. If we select voice command, based on that speech command the respective switching operation is performed.

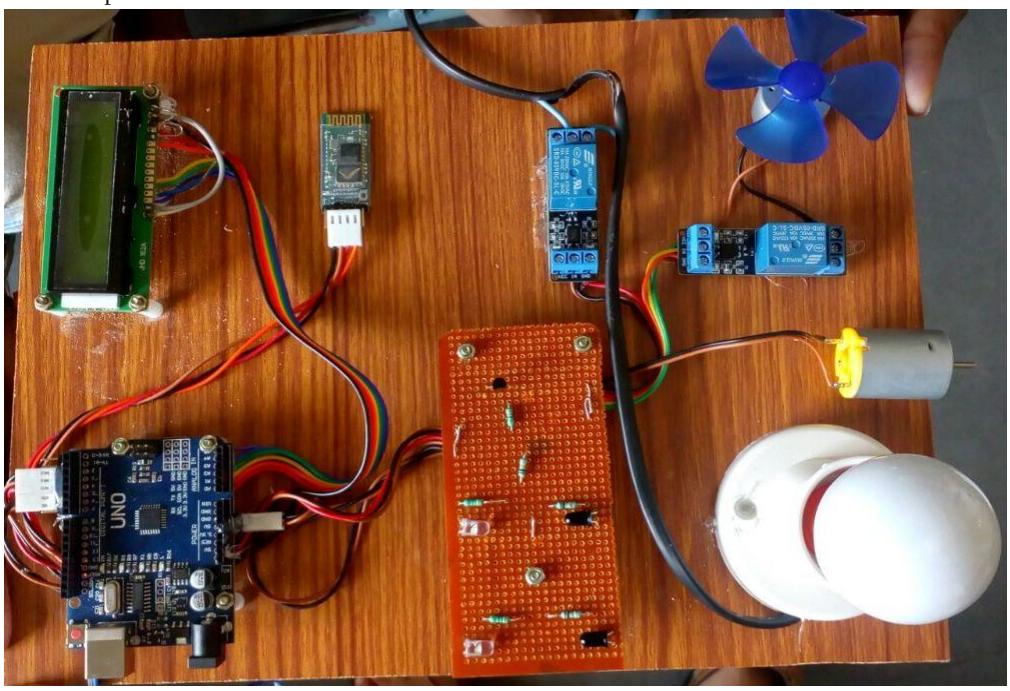

Figure 2.Smart Home Automation Kit.

Similarly, if we switch on to Gesture mode some predefined gesture moments are uploaded into development board based on that external loads can operated. The communication media between android app and Arduino is Bluetooth module sends the information wirelessly. Moreover, Autosensing is used to Turn on the devices. In Infrared (IR) sensors plays a key role for detecting the motion of the persons from inside to outside of the room and vice-versa. If a person enters into the room, automatically the devices switches ON. Whereas, if the person exit from the room it automatically switches OFF there is no need of human

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intervention while controlling the devices. These operations are performed by the IR sensors. These three modes are operated only one after another not worked at a time.

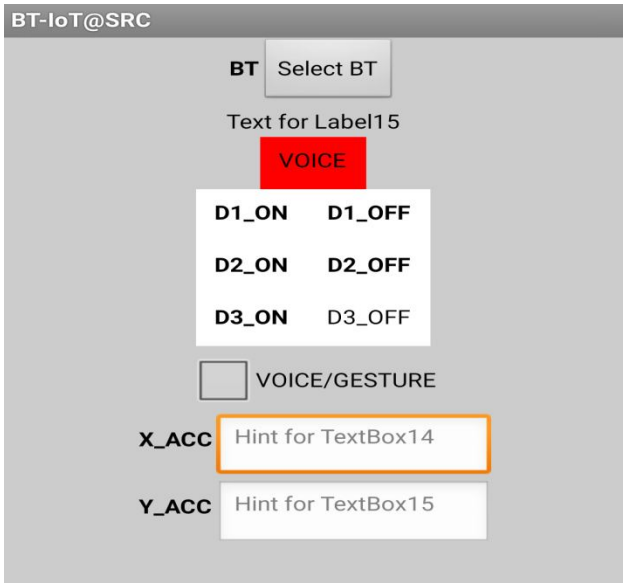

Figure 3.Smart Home Automation Android app.

In the manual mode, we use Bluetooth android app to control the external loads. Initially when we switch on the app Bluetooth pairing is mandatory with the Bluetooth module present in the hardware kit to Smart phone. This app is operated at three modes:

1) Touch the buttons to control the devices. If we touch the D1_ON button immediately electric bulb will ON. Similarly, if we touch D1_OFF button electric bulb goes to OFF state. Repeat the same functions for rest of the external devices.

2) Using the voice commands to control the devices. If we click voice button the microphone is waiting to recognize the voice commands. If you want to turn ON the bulb we speak the command BULB ON in front of the microphone. Likewise, for turning OFF the bulb give the command like BULB OFF. Voice command is used to control all the three external loads.

3) Finally, Gesture command is used to control the Bulb and fan. These gesture commands are worked based on compass is in inside the smart phone. The gesture moments are depends on the X-Axis and Y-Axis, switching of devices should be done. For suppose, if we want to switch ON the fan we need to lift the smart phone UP and for turning OFF, keep the smart phone in DOWN direction.

IV. RESULTS AND CONCLUSIONS

The current work is very close to real world, it is capable of counting the number of persons inside the room and it should be displayed on LCD display. The main theme for adopting this autosensing technique is to reduce the usage of power consumption. Majorly the Bluetooth android app is most suitable for elderly and physically challenged person those who have difficulty in surviving one to one place. Based on these two themes we developed this work. There is a chance to extended the work by incorporating a GSM module on the system to enable the transmission of required data over longer distances. Using this GSM module to evaluate the status of the home appliances, when an person is out of his/her home.

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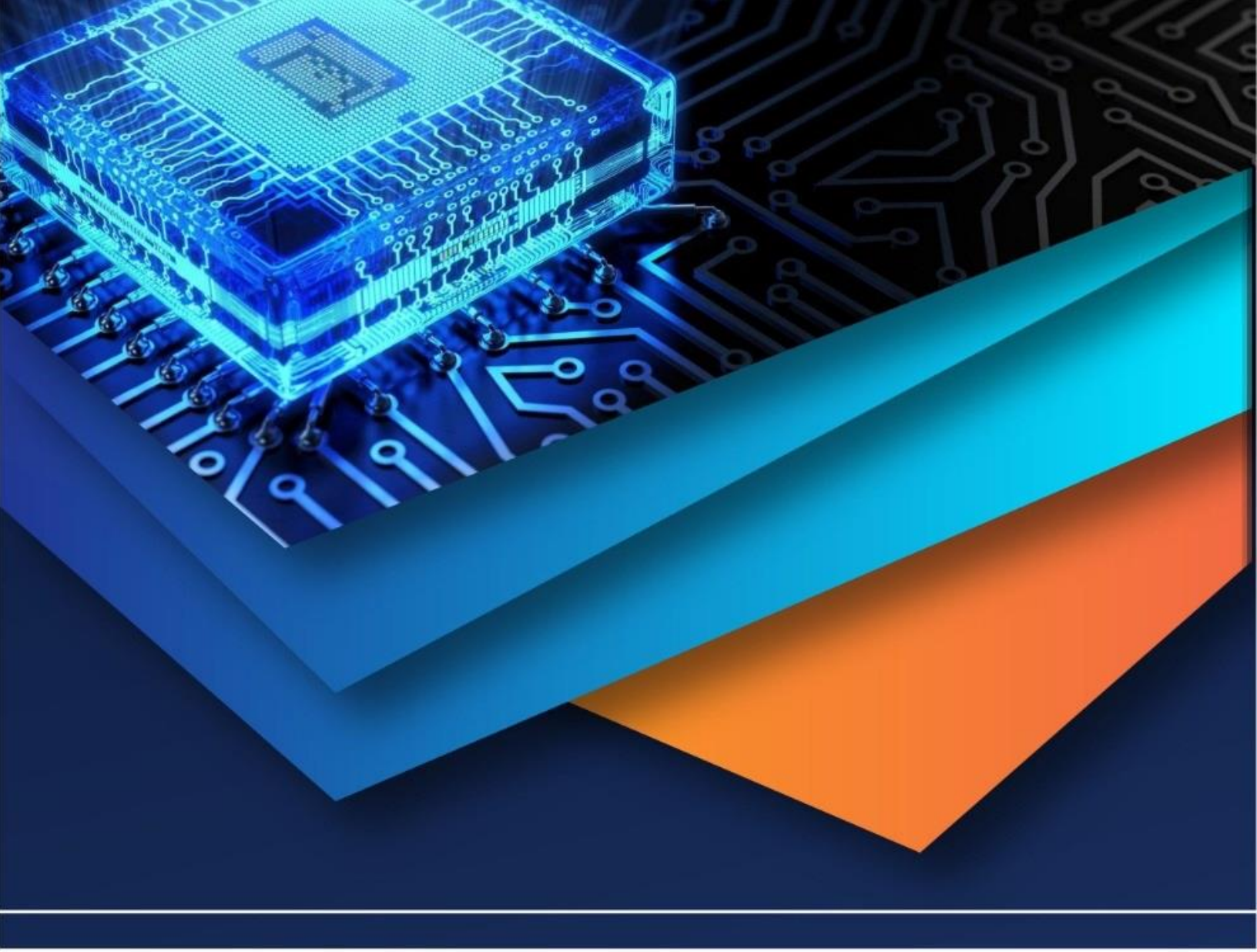

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