

# Home Automation System using Multifunctional Bluetooth Configurations and Sensors

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**Abstract:** *Now a day, technology can complete their affordability together with human being. That's why the multifunctional Bluetooth configurations and sensors in home automation are objectifying to enhance user experience and energy efficiency by enabling seamless communication between smart devices. It serves as a reliable communication backbone, allowing for real time data exchange and control. Home automation highlights the potential for creating intelligent, adaptive homes that respond to occupant's needs and environmental conditions, contributing to a more sustainable and convenient living experience. Home automations include various sensors, Bluetooth module, 5V relay module and jumper wires, adapter to create a proper model which is efficient for human purposes as more accessible and beneficial.*

**Keywords:** Automation, Arduino NANO, UNO, MAC Address, RX, TX, PWM output.

## I. INTRODUCTION

Within some years, our smart technologies gave us integration into our daily lives. It transferred traditional homes into delightful and intelligent living spaces. That's why development in Home automation System is faithful with sensors and Bluetooth configurations who give our daily life an overall comfort, security and energy efficiency of households.

In the Home Automation System, a wireless communicating protocol which is configured with Bluetooth Technology is to enable connectivity between various devices. This communication system is so efficiently effort able for any kind of home environment to facilitate the diversity between smart devices.

Here also the sensors serve as the system's body organs and collecting the real-time data in our home environment. This system integrates Home Automation technology to detect motion temperature humidity and lights. By parameter zing, it can change the environment, optimizing the use of energy and enhance the security.

By energy efficiency system configuration, it can accommodate smart devices, appliances and by using smart thermostats, lighting system and remotely controlled automotive technologies. It also can secure by their advance features in which includes Bluetooth-enabled door locks, surveillance cameras and motion sensors. User can get real-time alert, monitors their home remotely and get an access to see through the visitors by Bluetooth authentication.

Based on their performances and daily routines, user-friendly interface in mobile applications and voice-activated assistants provide some specific controls over their smart home devices for allowing user for configuration and customization automation settings.

## II. WORKING PRINCIPLE

In our paper, we use power supply, Arduino UNO, 5V Relay module, Bluetooth HC-05 and mobile application. After uploading the programming Arduino UNO, we will give them external power supply. Due to that all functions of equipment's are on. By using mobile applications, we can activate our home automation system by using HC05 Bluetooth module. By configuring the Bluetooth module, an Arduino can translate with the 5V relay module and then the Home Automation System can successfully run.

We are using Bluetooth wireless technology in this system to which has a distance range from 10-15 meters and bandwidth of frequency 2.45GHz. For any kind of application related purposes, we are using a serial communicational Bluetooth HC-05 module for interfacing the microcontroller and the physical MAC address by which they can identify android based application from our mobile device for controlling the external arduino device. While communicating with a HC-05 Bluetooth device and an android based smart phone, terminals are tend to transmit and receives

information by passing them options immediately. At that time, our priority option can give a message to arduino from Bluetooth and going to react as per the mobile device command. While receiving the command from the device, it is giving a sound that's confirm their receiving process is completed. Here also, the sensors are used by which commanding the device automatically and executing the operation without using any kind of commanding devices. Relay module is used to operate those operations which we are commanding from our android devices.

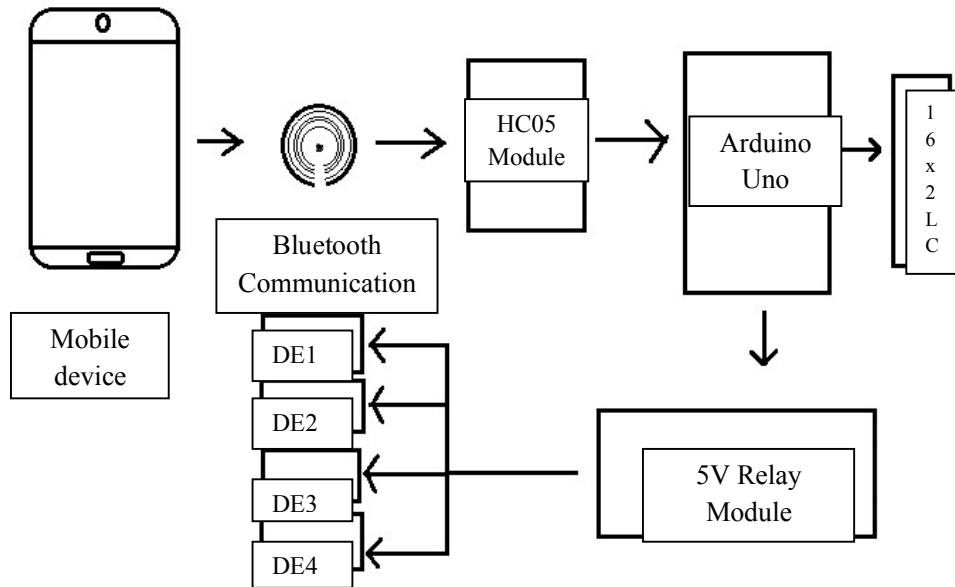


Fig. 1. BLOCK DIAGRAM

### III. COMPONENTS

#### Arduino UNO R3:

The Arduino Uno is an open-source micro controller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is similar to the Arduino Nano and Leonardo.

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino board, or other microcontrollers. The ATmega328 provides UART TIL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The 16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, an INF file is required. Arduino Software (IDE) includes a serial monitor which allows simple textual data to be sent to and from the board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer but serial communication on pins 0 and 1. A Software Serial library allows serial communication on any of the Uno's digital pins.

#### HC 05 Bluetooth:

It is used for many applications like wireless headset, game controllers, wireless mouse, wireless keyboard and many more consumer applications. It has range up to <100m which depends upon transmitter and receiver, atmosphere, geographic & urban conditions. It is IEEE 802.15.1 standardized protocol, through which one can build wireless Personal Area Network (PAN). It uses frequency-hopping spread spectrum (FHSS) radio technology to send data over

air. It uses serial communication to communicate with devices. It communicates with microcontroller using serial port (USART).

#### **5V Relay Module:**

A 5V relay module is an electronic device designed to control high-power devices using a low-voltage signal. It operates on a 5V DC power supply and comes in single or multi-channel configurations.

The module typically has normally opened (NO), normally closed (NC), or both contacts. Activation is achieved by applying a 5V signal to the control input, and an onboard LED often indicates relay status. Some modules include a protection diode to prevent voltage spikes. Widely used in automation, robotics, and various electronic projects, these compact modules are designed for easy integration with mounting holes provided.

#### **Servo Mini:**

A servo mini is an electric motor designed to operate on a 5V DC power supply. It is commonly used in electronic projects, robotics, and small-scale applications.

These motors are compact, lightweight, and suitable for low-power applications. They come in various sizes and types, including brushed and brushless motors. The direction and speed of the motor can be controlled by adjusting the voltage and polarity of the applied power. Due to their low voltage requirement, 5V DC motors are often compatible with microcontrollers like Arduino or Raspberry Pi, making them popular choices for hobbyist and educational projects.

#### **Raindrop Sensor:**

A rain sensor is a device used to detect the presence of rain or precipitation. It typically works by measuring changes in conductivity, capacitance, or optical properties caused by the raindrops.

When rain is detected, the sensor sends a signal to a controller or a connected system, triggering actions such as activating windshield wipers, closing windows, or turning off irrigation systems. Rain sensors are commonly used in automotive applications, home automation, and weather monitoring systems to enhance safety and efficiency. They offer a simple and effective way to automate responses to changing weather conditions.

#### **Ultrasonic Sensor:**

An ultrasonic sensor is a device that uses ultrasonic sound waves to measure distance or detect the presence of objects. It typically consists of a transmitter and a receiver.

The transmitter emits ultrasonic pulses, and the receiver detects the echoes reflected off nearby objects. By measuring the time taken for the sound waves to travel to the object and back, the sensor can calculate the distance. Ultrasonic sensors are widely used in robotics, automation, and proximity detection applications. They offer non-contact distance measurement, are versatile, and can operate in various environmental conditions.

#### **9V DC Power Supply Adapter:**

An adapter or adaptor is a device that converts attributes of one electrical device or system to those of an otherwise incompatible device or system. Some modify power or signal attributes, while others merely adapt the physical form of one connector to another.

An AC-to-DC power supply adapts electricity from household mains voltage (either 120- or 230-volts AC) to low-voltage DC suitable for powering consumer electronics. Small, detached power supplies for consumer electronics are called AC adapters, or variously power bricks, wall warts, or chargers.

#### **Jumper Wires:**

A jump wire (also known as jumper, jumper wire, DuPont wire) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them simply "lined"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.

Individual jump wires are fitted by inserting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board, or a piece of test equipment.

#### IV. CODE

```
#include <Servo.h>
const int buzzer = 13;
int servoPin = 3;
Servo Servo1;
void setup() {
  Serial.begin(9600);
  Servo1.attach(servoPin);
  pinMode(buzzer,OUTPUT);
}
void loop() {
  int sensorValue = analogRead(A0);
  Serial.println(sensorValue);
  if (sensorValue<900)
  {
    Serial.println("it is raining");
    digitalWrite(buzzer,HIGH);
    delay(1000);
    digitalWrite(buzzer,LOW);
    Servo1.write(170);
    delay(1000);
  }
  else
  {
    Servo1.write(0);
    delay(1000);
  }
  delay(1);
}
char Incoming_value = 0;
#include <Servo.h>
int servoPin = 3;
Servo Servo1;
const int TRIG_PIN = 6;
const int ECHO_PIN = 7;
const int DISTANCE_THRESHOLD = 5;
// variables will change:
float duration_us, distance_cm;
void setup() {
  Serial.begin (9600);
  Servo1.attach(servoPin);
  pinMode(8, OUTPUT);
  pinMode(9, OUTPUT);
  pinMode(10, OUTPUT);
  pinMode(11, OUTPUT);
  pinMode(12, OUTPUT);
```

```
pinMode(TRIG_PIN, OUTPUT);
pinMode(ECHO_PIN, INPUT);
}
void loop() {
digitalWrite(TRIG_PIN, HIGH);
delayMicroseconds(10);
digitalWrite(TRIG_PIN, LOW);
duration_us = pulseIn(ECHO_PIN, HIGH);
distance_cm = 0.017 * duration_us;
if(distance_cm < DISTANCE_THRESHOLD)
{
Servo1.write(180);
delay(2000);
}
else
Servo1.write(0);
delay(1000);
Serial.print("distance: ");
Serial.print(distance_cm);
Serial.println(" cm");
delay(500);
if (Serial.available()>0)
{
Incoming_value= Serial.read();
Serial.print(Incoming_value);
Serial.print("\n");
if (Incoming_value == '1')
digitalWrite(8,HIGH);
else if (Incoming_value == '0')
digitalWrite(8, LOW);
else if (Incoming_value == '2')
digitalWrite(9,HIGH);
else if (Incoming_value == '3')
digitalWrite(9, LOW);
else if (Incoming_value == '4')
digitalWrite(10,LOW);
else if (Incoming_value == '5')
digitalWrite(10,HIGH);
else if (Incoming_value == 'A')
digitalWrite(11,HIGH);
else if (Incoming_value == 'a')
digitalWrite(11,LOW);
else if (Incoming_value == 'b')
digitalWrite(12,LOW);
else if (Incoming_value == 'B')
digitalWrite(12,HIGH);
}
}
```

#### **V. APPLICATION**

The proposed model is used to handle the lighting of our home for energy efficiency and convenience by adjusting brightness and intensity of the light.

By using security cameras, sensors and alarms, we can control and monitor all the valuable things inside or outside of our house remotely.

To cover the plants, garden and clothes which are on the roof then by using raindrop sensor we can cover the roof with water proofing shed while it rains heavily outside. And while it stops, it can automatically uncover the shed by recognizing the sunlight.

This model also can connect household application such as lights, fans and refrigerators, ovens and washing machine by our mobile device.

#### **VI. FUTURE SCOPE**

This model can handle the security cameras, monitoring convenience things and enhancing power efficiency.

This model can also helps old age people by covering the roof at which they get some time to come on the roof and taking it while it's raining outside.

This home automation system consume less power contributes to resource conservation and cost savings.

If we are forgot to off something this model can also control by our mobile device by which we can consume energy.

By using IOT and AI-driven smart home application, we can anticipate further integration of smart devices, enhanced interoperability and developing innovative application to make home automation more accessible and beneficial for the users.

#### **VII. CONCLUSION**

Using this model we can conclude that it have a huge need for our beneficial lifestyle. We can efficiently saving our energy, improving our security concerns, highlighting vulnerable potential issues and the importance of careful implementation and user awareness. While advancing our technology for future purpose, we may have to address these challenges which will be crucial for maximizing the benefits of home automation. Home automation system with Bluetooth configuration and sensor is a useful device most of the time for old age people whose have a lack of accuracy for doing the work in the house. This system is relay helpful for those cases and benefits them and us at the rest of our life.

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