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Embodiment of IOT based Smart Home Security System

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Abstract: This paper reflects on the IoT base Smart home System as well as home security System. We built a very low-cost smart home operated by Android application wirelessly inside the home and also from anywhere in the world using GSM system. We decorated our project with (i) smart electrical monitoring system where user can operate wirelessly their light, fan, TV, freeze etc. inside the house even anywhere in the world (ii) smart Security system where user can maintain the security system using application even he/she can get any type security alert living anywhere in the world. (iii)Smart gardening system using android application and GSM system which is also operated using the blessing of IoT.
Keywords: Android application, GSM (global system for communication), IoT (internet of things), Radar, Smart Home, Smart Security, Water Tank;

I. INTRODUCTION

IoT (Internet of things) is one of the most demotic worlds in the recent world. IoT refers to a network connecting many physical devices, smart phone, home appliances and other electronics item join with sensors, software and even mobile application. This networks facilities with transferring data one end to another wirelessly. It's known to all, in 1999, Kevin Ashton first indicated term of IoT in a presentation on RFID. After then, this word became popular day by day. IoTs have involves in any type of wireless communication in the recent world. Every embedded device can easily be operated wirelessly anywhere and anytime throughout the world. IoT promises makes human life easier, safe, comfortable and elevated.

Smart home provides significant features in modern world.

This system turns human more satisfied. Last few decades it was quite impossible to think a home which is controlled automatically without waiting the owner's commands.

But todays, it's possible through the smart home.

Smart home system pledges us safe living space, improved security, lenient, less power consumption and environmentally friendly.

II. REVIEW LITERATURE

This research ensues the references paper. In paper [1], the authors developed a smart home system using Bluetooth and cell phone only. But this includes Bluetooth as well as GSM system. In paper [2] the authors designed a Smart objects detection using the core concept of IoT. The authors of paper [3] designed a home automation with only wireless medium Bluetooth. But this research basically based on IoT. In paper [4], the authors developed a smart home using Mobile IP-based system. But we focus IoT technology in every sector of our projects.

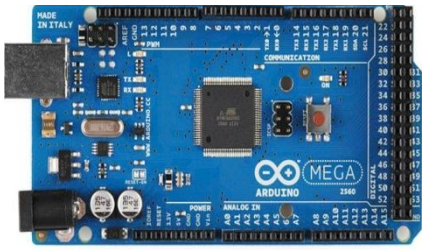
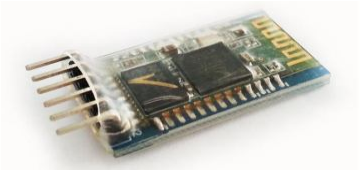
Again, in the paper [5], the authors of this article developed a system or more commonly a Smart home using mobile IP architecture. This system is an IoT technology and they also do the Internet conception. But in this project, we develop an IoT system besides a strong and improvement security system.

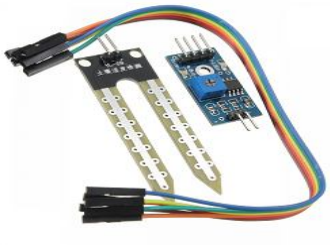
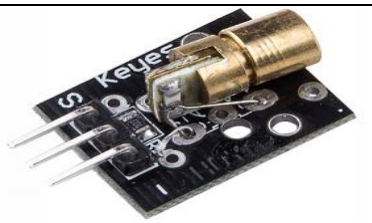
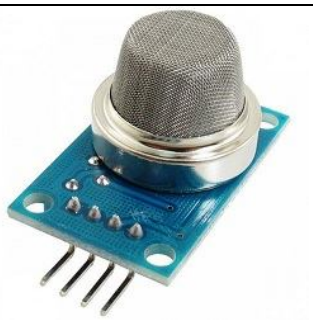
The authors in [6] develop a security system and Smart based on android. Again, they use internet to control the system from outside of the house. But in this research, mainly focus on the low cost IoT using system as well as smart home protection. In paper [7], the authors amplified developed Bluetooth based smart home system.

In paper [8], the authors, revealed a SMS based system using GSM system. In this research we basically exhibit all possible wireless communications.

The author in paper [9], developed android application based Smart Home using IoT technology. The author didn't mention strong security ideas. But we displayed as mentioned earlier.

III.REQUIREMENTS

Name of the Materials	Description	Related Pictures
Arduino Mega	This a board of microcontroller named ATmega2560 containing 16 analog inputs, 54 digital pins, 4 UARTs, power jack, USB connection port, one ICSP and 16 MHz crystal oscillator	
HC-06 Bluetooth Module	This Bluetooth module use to communicate wirelessly. It has mainly 4 pins VCC, GND, RX, TX	
SIM800C Mini GSM/GPRS module	This module can be used in making call, realized voice call and SMS. It can also reliable for GPRS data transmission. Performed in DC voltage, having auto power ON, controlled via TTL or RS232.	
3x3 Keyboard	This keyboard has 12 buttons for operation and arranged in 3x4 grid. It's very flexible to use, easy and thin. Required 7 pins to connect with microcontroller.	
LDR 5mm Photo Resistor	Light dependent Resistor or simply LDR produced output through the intensity of light.	
LCD1602 with Blue backlight	This LCD has blue backlight, required 5V DC supply, high contrast with wide viewing angle, can display 2-lines with 16 characters.	
HC-SR04 Ultrasonic Sonar Sensor	This sensor has ability to measure distance in the range of 2 cm to 400 cm or 1 inch to 3 Ft. from obstacle. This sensor is independent of sunlight and object's color. It has 4 pin VCC, GND, Trig, Echo.	

Soil Moisture Sensor	This module can measure the moisture of the soil. Produced high voltage output when soil is dry otherwise low. Mainly it has 4 pin VCC, GND, a Digital pin and an Analog pin.	
Laser Module	This module responsible to produced LASER. Required 5V operating voltage. I can be compatible with arduino and having digital output.	
MQ9 Combustible Gas sensor module	Made of MQ9, this is one of the cheapest semiconductor sensor. It can detect Carbon Monoxide in the range of 10-1000ppm and combustible gas detection range 100-10000ppm. Required 5V DC supply. Operating temperature 10-100 °C.	
HC-SR501 PIR motion Sensor	This module can detect any type of motion around itself. Thus, produce digital output.	
6-9V Mini Water Pump	This pump consumed 6-9V for operation. The water flow rate of this pump is 0.5L per minute.	
LED & DC Motor	Some LED & DC Motor are also used in this research.	

IV. SYSTEM DESIGN

We basically divided our projects in three main sections. Firstly, we built a Smart Home. Secondly, we designed the home security system as this very important for a smart home. Finally, we planned to enrich the outfit of the Home by creating a smart garden. Here, we give the description of this features.

A. Smart Home Automation

This is significant success for us to build a home where user can operate all the electrical items through android application. In last few decades it's impossible to think a smart electronics system. But we built a platform where user can maintain all his/her desires smartly.

In our smart home, all the electrical component is controlled through Android application. We developed an android application to operate the user wishes wirelessly. We use Bluetooth HC-06 module to transfer data from mobile application. Bluetooth module connected with Arduino mega board. The Arduino receives the data from Bluetooth module. After receiving the data, Arduino command to electrical components which items should be ON or OFF.

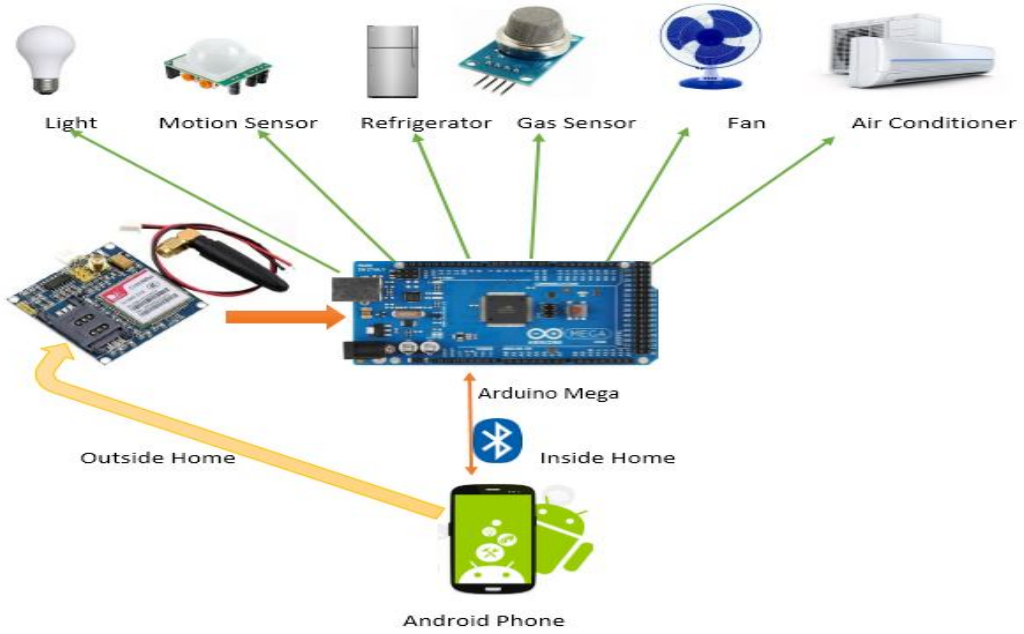


Fig. 1 Block Diagram of Smart Home System

Utilizing the same operation, we can control all electrical component such as fan, light, TV, refrigerator, air-condition etc. We can also do the same by the blessing of IoT when the authority of the house is outside of the home even anywhere in the world. Through SMS user has ability to send a code based on perspective electrical component of the house. When the GSM/GPRS module receives the code, it transmits the code as data to the Arduino mega board and Arduino has bound to do what the user said.

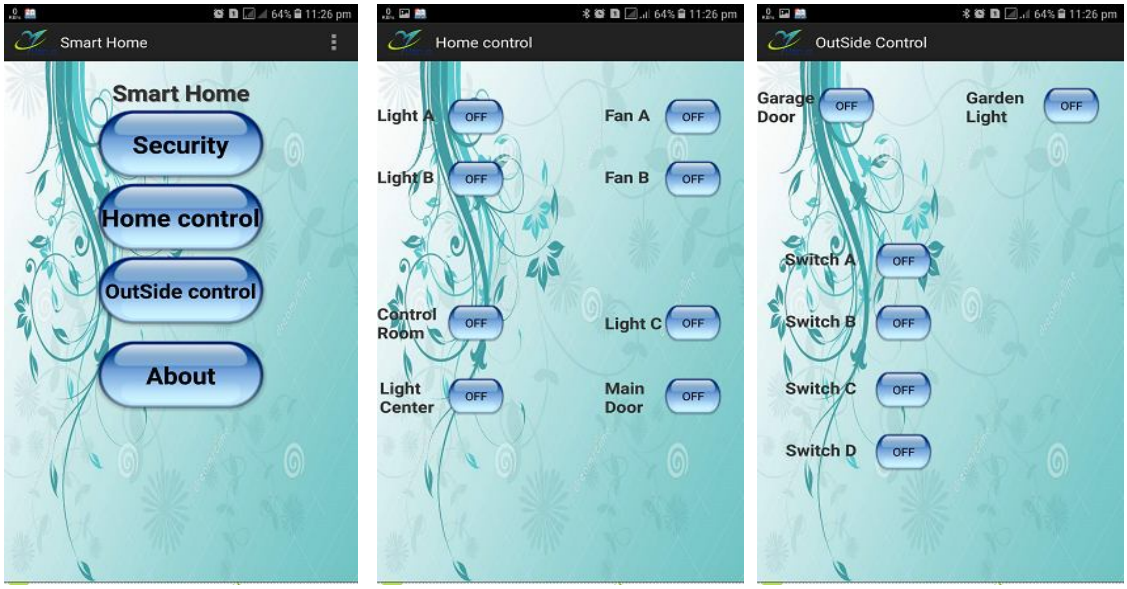


Fig. 2. Background of Application for controlling Smart Home

To take the response from Arduino perspective components should be ON or OFF. We have also some additional features required for smart home. First one is PIR motion sensor. This sensor can detect any type of human presence. So, we use this sensor for opening the door automatically inside the house.

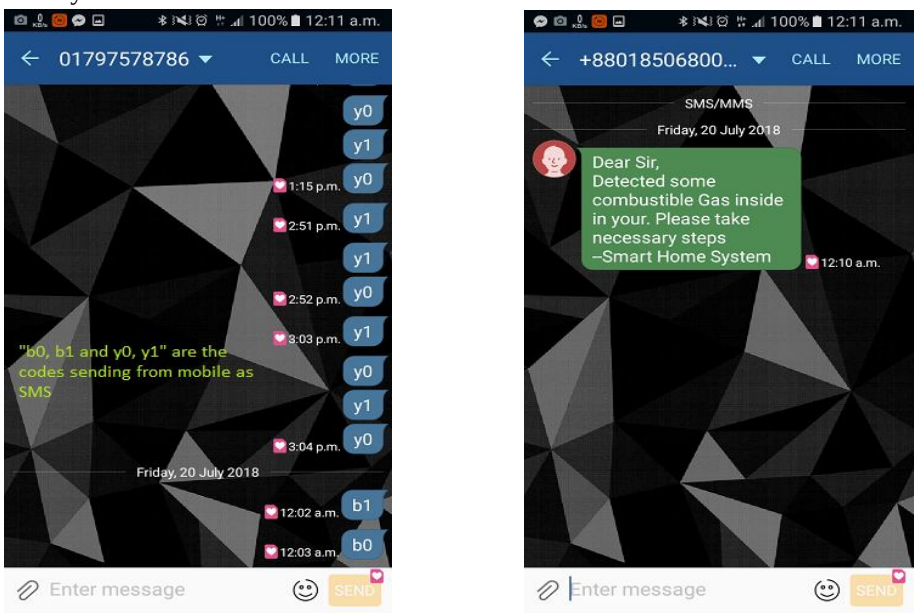


Fig. 3 Controlling Smart Home using SMS and Fire Alarm Notification

Second one is MQ9 Gas sensor. This sensor has ability to detect any type of combustible Gas inside the house. When it finds something inflammable, it's produced a message which is transmitted from GSM module to user mobile phone.

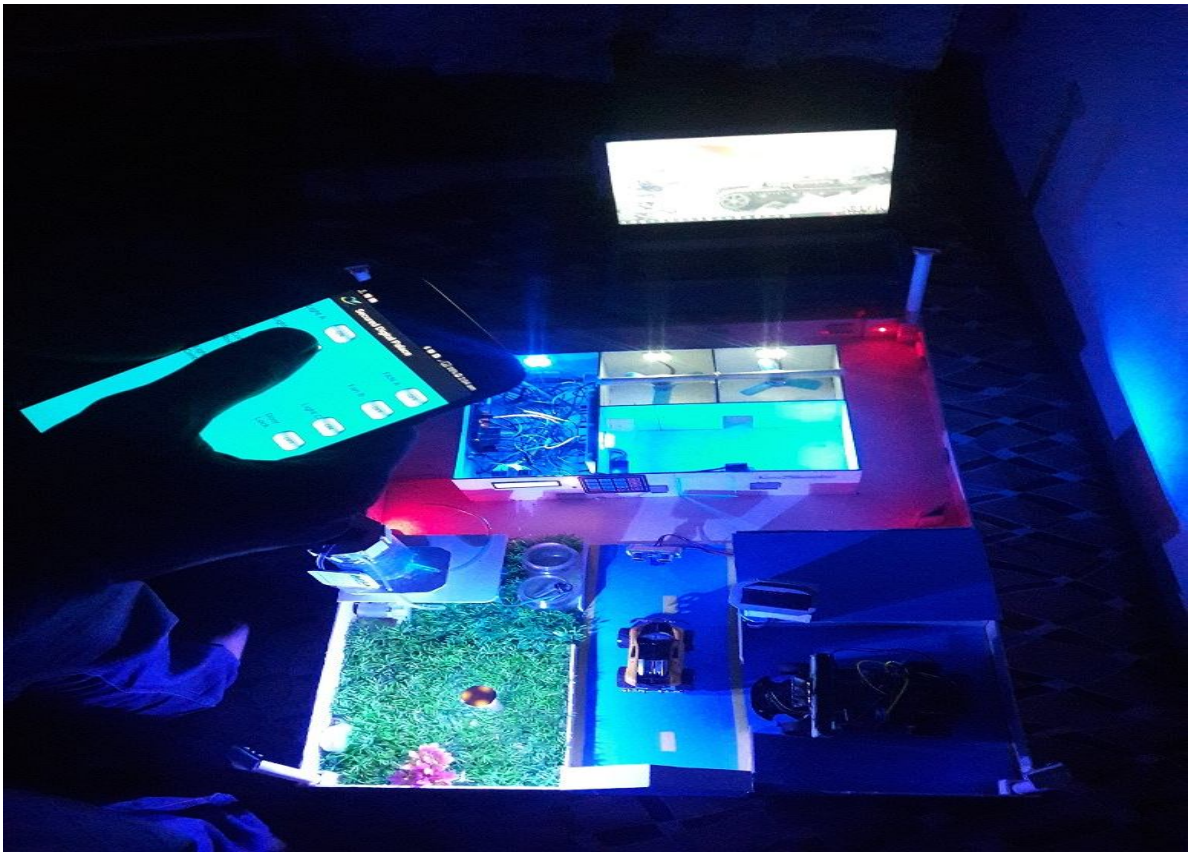


Fig. 4 User control Smart home through Android application

B. Smart Security System

The terms of security mean the condition of being free from fear. In our recent world every person has dreamed a beautiful house, can be controlled through the easiest way. Besides, they also think what the security of the house will be and how much the cost of the security system. According to this motive, we introduced a low cost and impervious security system with our smart home.

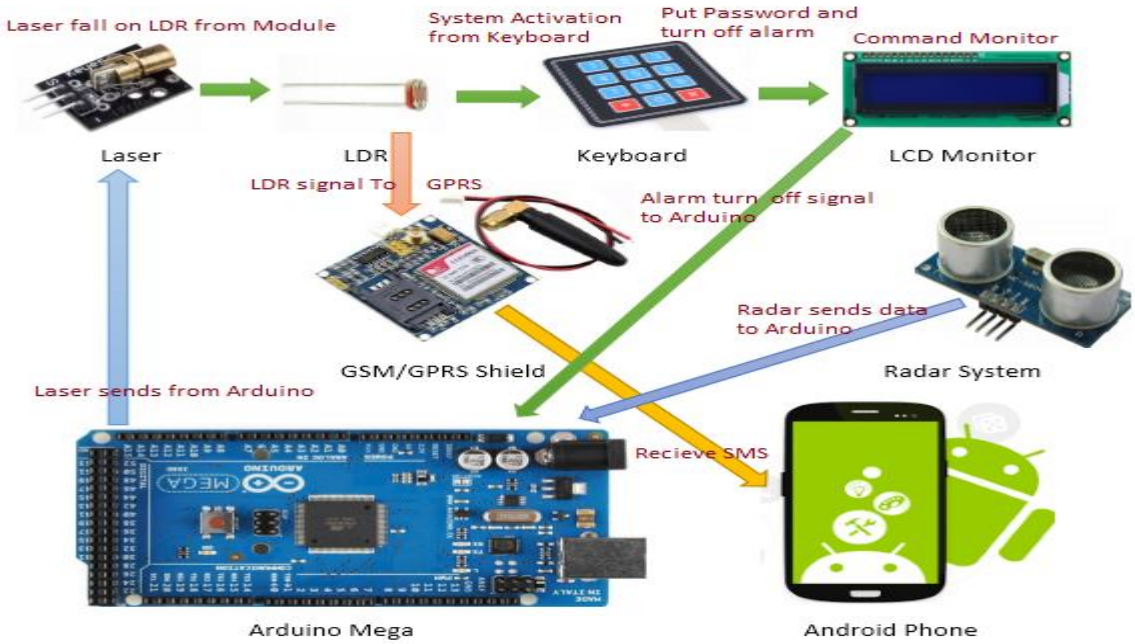
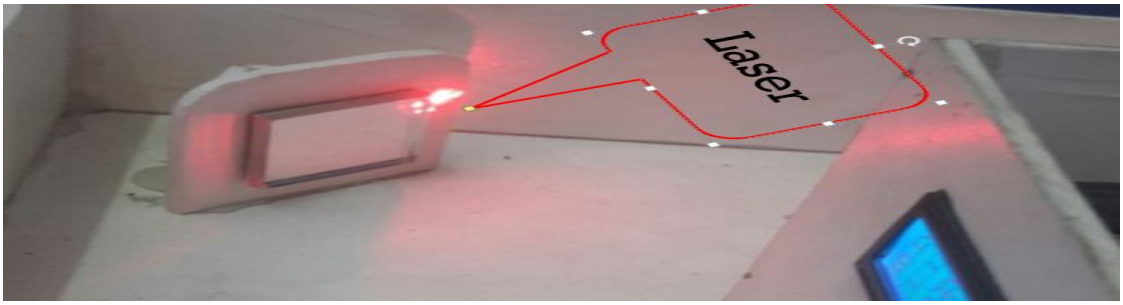


Fig. 5 System architecture of Smart Security system

In Fig. (6) we use laser shield which is attached with the sensor of LDR. The security is being activated by pressing button of Keypad "A". After the activation, the laser shield and Radar become active. When someone wants to take unofficial access, Radar can easily detect the unofficial movement in the house and notify the authority by producing alarm tone. When the strangers cross the Laser shield, all the lights in boundary of the house automatically turn ON. Again, alarm system should turn on, continuously transmit SMS from GPRS/GSM module until the alarm system is deactivated. There's only one way to deactivate the alarm system, this is "Password" which can be easily changeable.



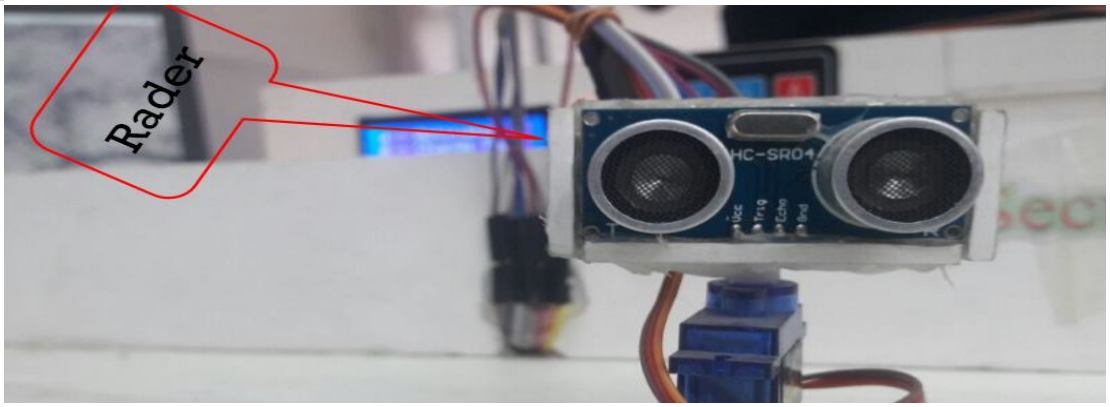


Fig. 6 Developed structure of Smart Security System

C. Smart Gardening System

This is our enhancement features. In our society, when people build a house, they think about decoration of the house. Almost every people have interest to make a garden in front of their house. But when they think about cost effect and time required for gardening, they quit their interest. We mainly focus this topic in our research.

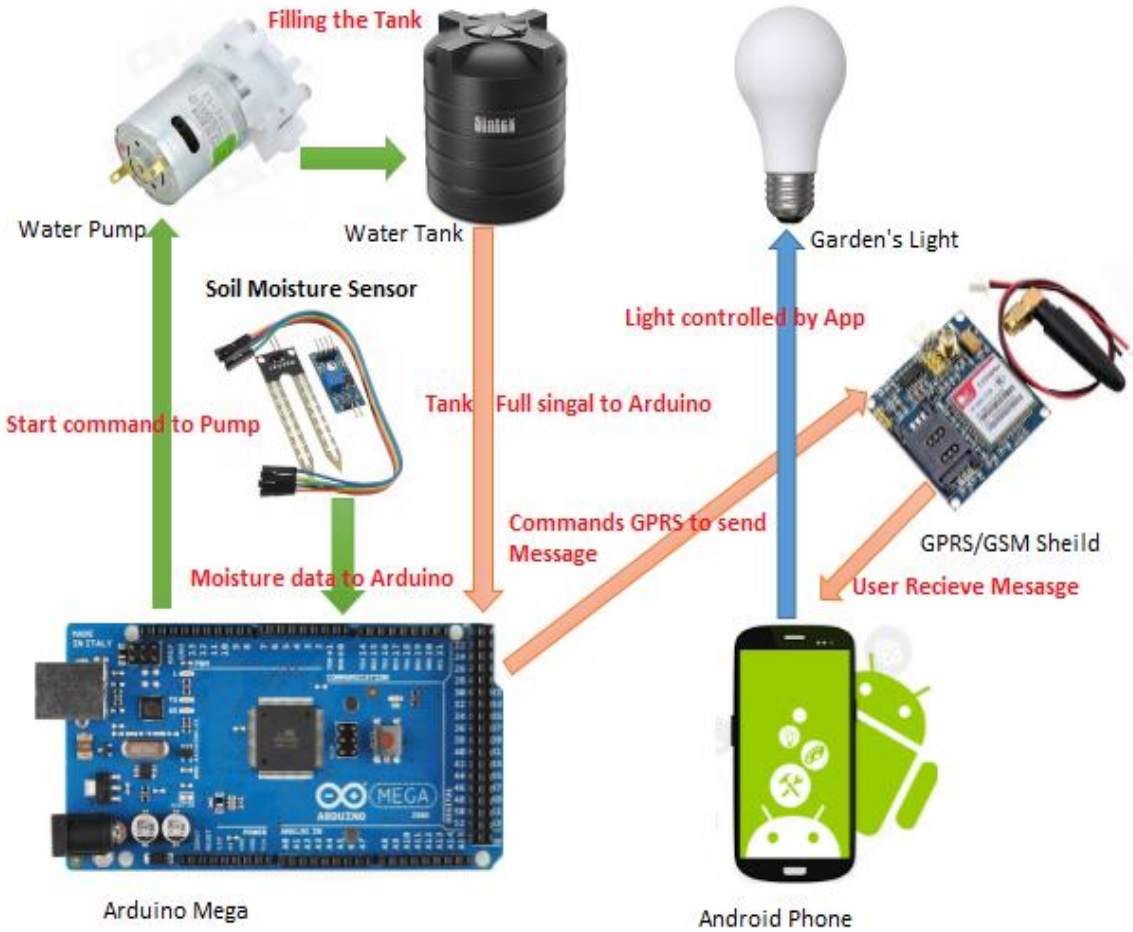


Fig. 7 System Architecture of Smart Gardening System

In Fig. (7) We control the garden through the smart phone. We can also control garden's light through the android application. Again, utilizing system, user can read the soil moisture of the garden. When the moisture of garden's soil become low, it produces a signal transmitted to Arduino mega and ensured that moisture level of the garden soil is low. Moreover, receiving the signal from moisture sensor, Arduino starts the water pump. The tank stores the water until the water level cross its highest capacity. In our project, we use four LED light to detect the water level of the tank such as 25%, 50%, 75% and up to 75%. When water level cross 75%, it generates a signal transmitted to Arduino mega and Arduino transmit a SMS through GPRS+GSM module to Alarm the user. Again, when the water level up to 75%, the water is automatically stopped.

Fig. 8. Reading soil moisture in the garden and IoT based water Tank

V. SENSOR DATA REPRESENTATION

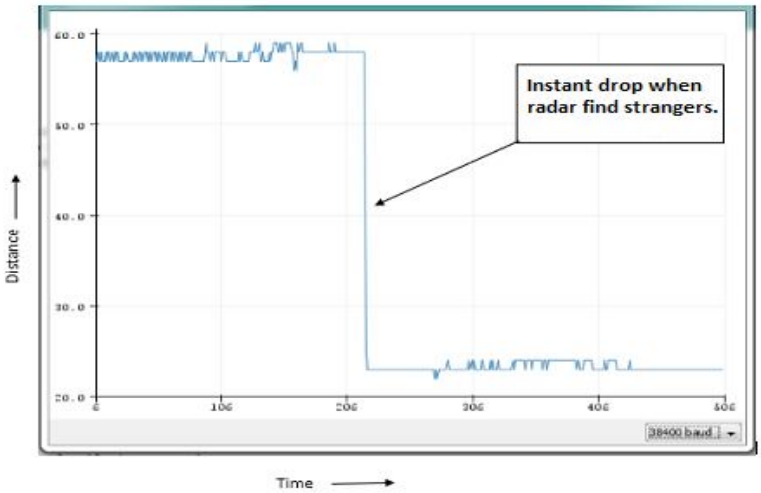
A. Ultra Sonic Sensor

As we that, ultrasonic sensor calculate distance by producing ultra sound. It measures distances in a range of minimum 2cm to maximum 4m using the following equation.

$$D = (v * t)/2 \quad (1)$$

Where,

D = measuring distance
v = Velocity of Air
t = time required for an Echo



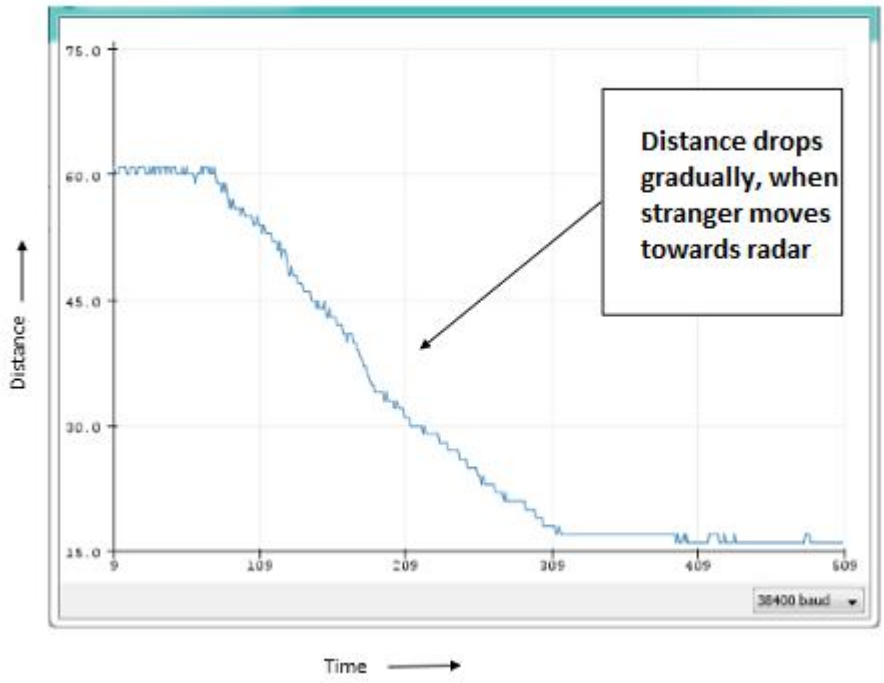
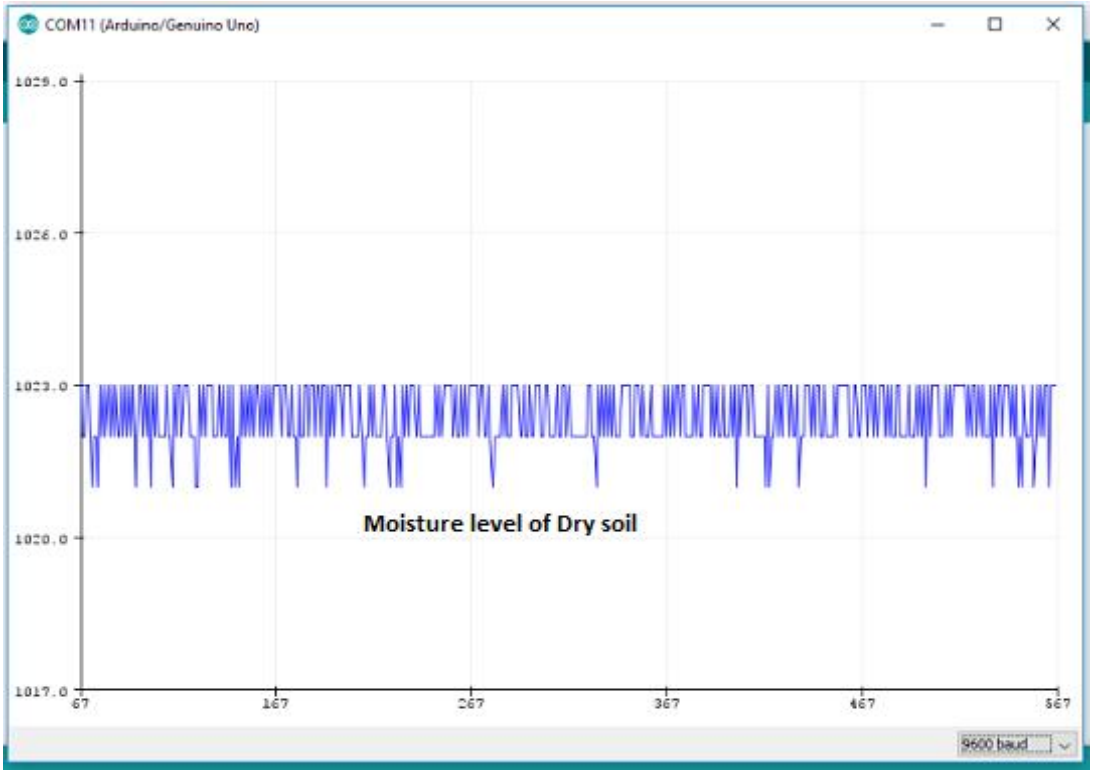


Fig. 9 Ultra sonic sensor data Graphical presentation

B. Moisture Sensor Data

In this sensor, graphical representation depends on the moisture of soils. When moisture level is low it produce downward curve. Again, when moisture level is high it produce upward slope.



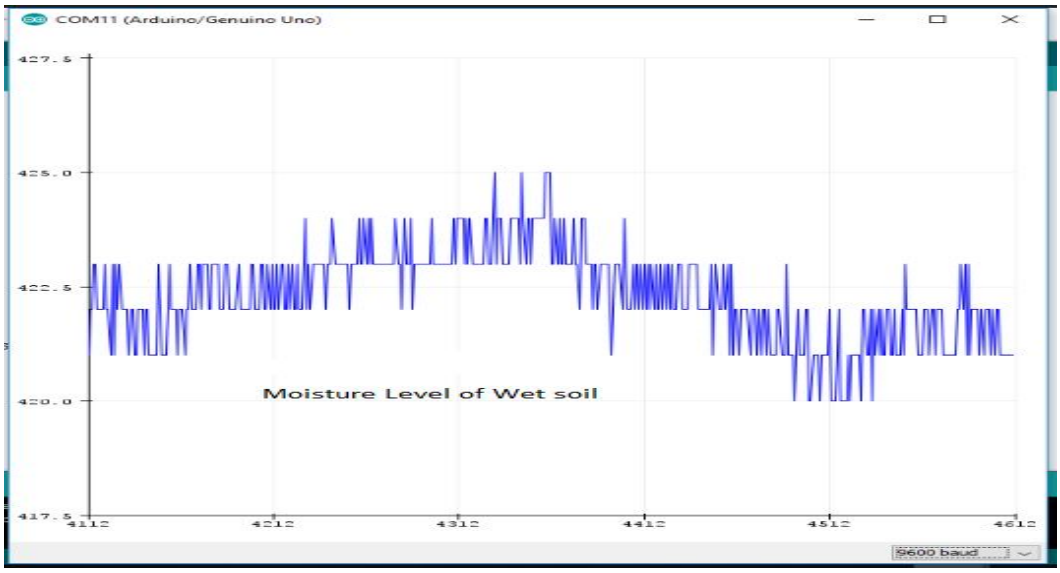


Fig. 10 Soil moisture sensor data Graphical presentation

VI. FUTURE SCOPE

In future, we will enlighten our project with internet communication. We want to build to a server where user can store all the data of smart house. Even he/she can control all the electrical component using this server as well as internet from anywhere in the world. Again, we will add other security system which will make our security stronger and flexible. We tasted this whole system in AC line, so, we believe that general people can easily use this system in their regular purpose. We dream, one day every house in our society will be a Smart Home.

VII. CONCLUSION

In this research we emphasize three problems in existing society. It was great pleasure to us to make a prototype like this. We designed it in our minds and developed as a prototype. It's also very effective for us to learn many knowledge's and ideas from this research. Moreover, through this project we want to go our future goal.

VIII. ACKNOWLEDGMENT

Special thanks to honourable Professor Dr. Motiur Rahman Sir. As he monitored every times in our project with his effective ideas, suggestion and encouraged us to develop this prototype. Again, this authors also wishes to thank the Department of computer Science and Engineering because of the magnificent support and love, which inflicts us more strength and encouragement.

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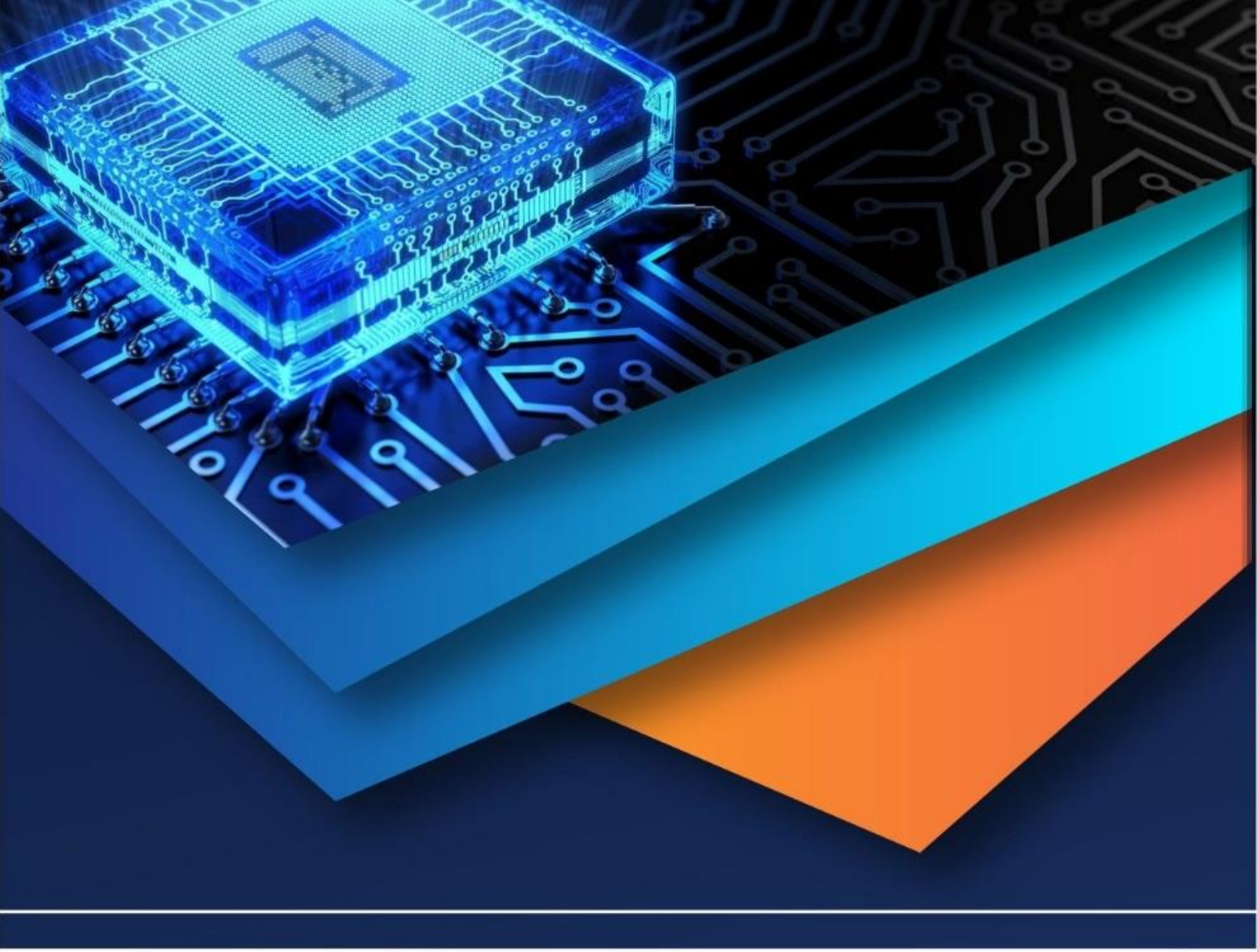

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