SMART AND LOW-COST HOME AUTOMATION SYSTEM USING IoT

Vishal Srivastava, Prabhat Mishra, Shreyan Bhattacharya
Department of Computer Science & Technology
SRM Institute of Science & Technology, Chennai, India.

ABSTRACT

In this paper a minimal effort, solid and easy to understand remote-controlled home mechanization framework is exhibited utilizing Node MCU (ESP8266), Bluetooth module, Relay board, bread board, breadboard control provider and jumper links, ultrasonic sensor, soil dampness sensor, cell phone. In order to operate the appliances through verbal commands, a link is setup between NodeMCU and the smartphone through IFTTT (if this then that) using Arduino IDE. Proposed framework is a universally useful home computerization framework which can be effectively actualized in existing home at a very lower cost. The proposed home mechanization framework has a greater number of highlights than customary home computerization frameworks, for example, a ultrasonic sensor which can be utilized for water level identification and soil dampness sensor utilized for programmed plant water system framework. All the controlling activities can be performed either through a cell phone application or by simply giving commands to the google assistant. This project of home automation system is applied and experimented on hardware and exact and expected results were observed.
Keyword- Node MCU, Bluetooth module, Relay board, sensors and smartphone application.

I. INTRODUCTION

Home automation is the marvel of lessening human work by using information developments and control structure. Because of the ceaseless and quick increment of advancements, the utilization of cellphone can remotely control the home machines. A computerized gadget can work with ease and compelling outcomes with most reduced mistake rate. Home robotization framework is a significant issue for home machine organizations and specialists. In early days, home automation frameworks were utilized in labor sparing machines yet these days its primary goal is to encourage older and impaired individuals to play out their day by day schedule undertakings and control the home apparatuses remotely. In remote based home automation framework, every innovation has their very own upsides and downsides. A WIFI based remote home automation framework can be executed with an ease and it is anything but difficult to introduce in a current home. An assessment work showed that Bluetooth systems are snappier than remote and GSM structures. Bluetooth advancement has ability to transmit data at a higher speed, consecutively up to 3 Mbps inside a physical extent of 10m to 100m dependent upon the kind of Bluetooth device. The proposed strategy exhibits the plan and execution of a strong, ease and easy to use home automation framework utilizing WIFI innovation.

Fig.1 Concept of Smart Home

The structure of proposed technique depends on NodeMCU, Bluetooth module, Relay board, sensors and cell phone application. A NodeMCU is interfaced with Bluetooth module and home machines are associated with NodeMCU by means of hand-off. Wireless application is used for consecutive correspondence among mobile phone and Bluetooth module which is moreover connected with the board. The Proposed strategy has capacity to remotely control every one of the apparatuses, and furthermore screens the sensors. The Proposed system has ability to remotely control all of the home apparatuses, and besides screens the sensors. Nowadays by far most of customary home automation structures are proposed for more seasoned, injured people or for a particular explanation. The proposed method isn't only fitting for more established and disabled people, but also gives a comprehensively valuable home automation system, which can be successfully executed in existing home. A ultrasonic sensor is used for water level acknowledgment and soil moisture sensor is used for modified water framework structure to give greater effortlessness and workplaces to customers.

II. LITERATURE SURVEY

Different remote-controlled home automation frameworks have been contemplated. An exploration work [1] gives full usefulness to remotely control home machines by means of remote correspondence between the Arduino BT and phone and Bluetooth innovation. At first Arduino BT board was associated with home machine and was accordingly constrained by a Symbian OS mobile phone application through a cell phone. Symbian OS mobile phone can just help the python language contents and this framework neglected to help Java based applications, these days for the most part cell phones applications are created in Java. Additionally, another examination introduced home computerized framework utilizing Bluetooth and android application. Be that as it may, this framework was not doable to control in excess of 4 home machines, as it was structured uniquely for 4 lights [2].

In another examination work [3] a review of various home robotization frameworks is available. Creators featured the preferences and drawbacks of various advancements, for example, Bluetooth, GSM, and EnOcean. The Bluetooth based home automation frameworks are minimal effort and furthermore has the disservice of limiting the client to get to the apparatus inside the scope of Bluetooth organize. In [4] the creator proposed an engineering for separating logical data by investigating the information gained from different sensors and give setting mindful administrations. In [5] the creator gave arrangement of controlling some home machines, vitality utilization and levels of gas chamber utilizing different sensors.in [6] the creator portrayed how to control and screen home apparatuses utilizing android application over web. There are number of business home automation frameworks accessible in advertise. Be that as it may, these are intended for constrained use and inside a
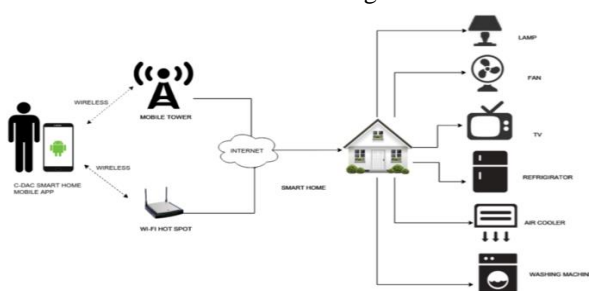
restricted territory. Accordingly, this creator takes care of this issue to control the apparatus from both home and remotely.

III. SYSTEM ARCHITECTURE

The system contains two standard parts hardware and programming. The gear part involves mobile phone, NodeMCU (ESP8266), Bluetooth module, Relay board, bread board, breadboard control supplier and jumper joins, ultrasonic sensor, soil clamminess sensor. Programming part involves Arduino (IDE) and Bluetooth terminal wireless application, which is used for remote correspondence among mobile phone and the board. Ultrasonic sensor and soil clamminess sensor are moreover used in this procedure to give more straightforwardness and workplaces to the customers. Figure.1 outlines the proposed home mechanization system and the stream graph is depicted in Figure.2

A. HARDWARE ARCHITECTURE

The applied home computerization framework comprises of basically three parts, cell phone, NodeMCU and Relay board. Smartphone is used to communicate with NodeMCU with WIFI and Bluetooth.
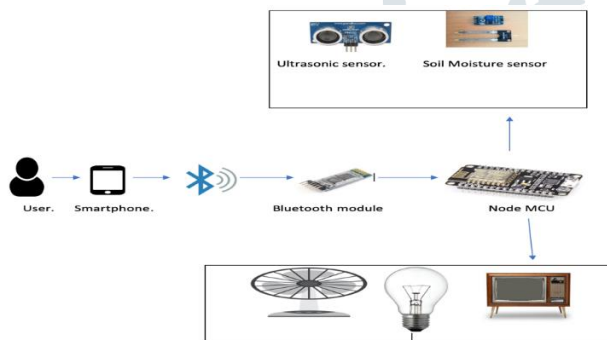

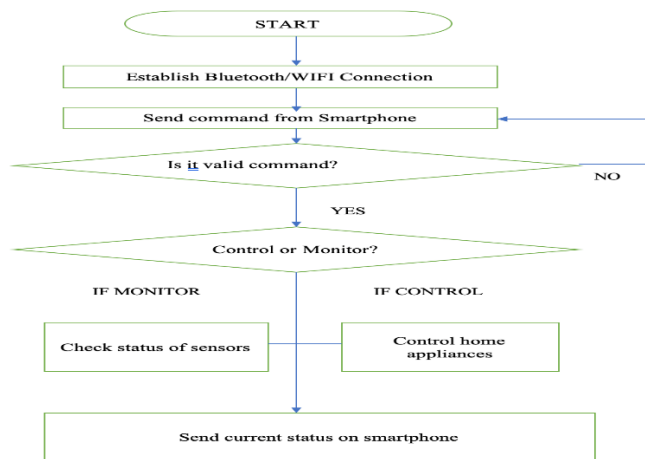**Fig. 2. Block Diagram of Proposed System**

Fig.3. Flowchart of The System

IV. DETAILS OF THE MODULES
A. NODE MCU

NodeMCU is an open source firmware and advancement pack that serves to model or manufacture IoT item. NodeMCU gives access to the GPIO (General Purpose Input/Output).
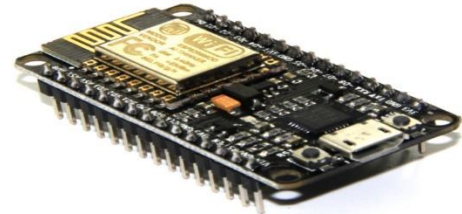

Fig.4 Diagram of NodeMCU

B. BLUETOOTH DEVICE

This device is utilized for remote correspondence among NodeMCU and cell phone. HC-06 is a slave gadget and it can work at control 3.6 to 6 volts. It has 6 pins. For sequential correspondence associate TXD stick of Bluetooth module HC-06 with RX (stick 0) of NodeMCU and RXD stick with TX(pin1) of NodeMCU. Association outline of NodeMCU and Bluetooth module is shown in fig.
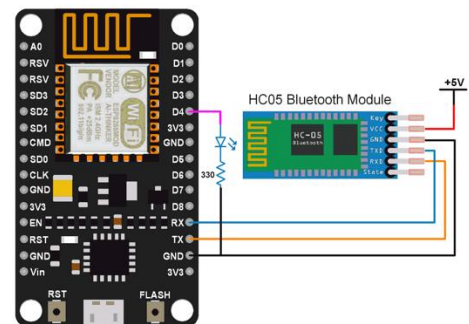

Fig 5. Bluetooth Module

C. ULTRASONIC SENSOR

The ultrasonic sensor HC-SR04 has a transmitter and recipient for transmitting and getting information. It utilizes sonar to figure the good ways from a physical article. It has a phenomenal scope of items recognition from 2cm to 400cm with high precision. The ultrasonic sensors ascertain the physical article's separation by sending ultrasonic wave and after that recognizes its appearance wave. The working guideline of ultrasonic sensor is shown in Fig.4.
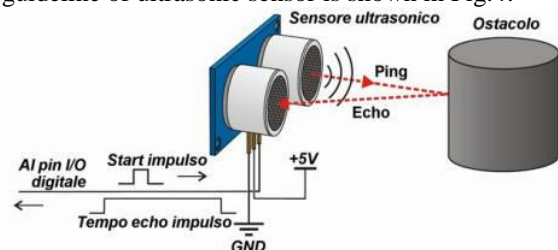

Fig.6 WORKING OF US SENSOR

Ping is an ultrasonic wave which are transmitted at the speed of 340m/s and Echo is received back , which is used to choose the detachment or the distance of water level from the plate. The ultrasonic sensor HC-SR04 parameter assurance with their limitations.

In the applied work ultrasonic sensor is used to check the amount of water present in the tank. It measures the partition of water level from the most noteworthy purpose of water tank. It measure the partition of water level from the most noteworthy purpose of water tank and gives its report on wireless application using Bluetooth development. First time , a floating plate is used to construct the accuracy of water level distinguishing proof and it achieved best results over standard water level marker. A dead band is in like manner familiar with normally switch off the water siphon when tank gets filled.

D. SOIL DAMPNESS SENSOR

Soil dampness sensor is utilized to measure the amount of moisture present inside the soil. Soil dampness sensor consists of three pins GND , VCC and analog(A0). To connect it with NodeMCU, GND stick ought to be associated with ground, VCC with 5 volts and (A0) with simple information stick of the board. In this system soil dampness sensor is utilized for smart and automatic irrigation framework and it likewise transmit the estimation result of the substance to cell phone, client will have the option to operate the estimation of water level from his cell phone application and further he will have the option to turn ON and OFF water supply for water system.

V. IMPLEMENTAION DETAILS
A. ARDUINO IDE

IDE is abbreviated as integrated Development Environment Entire programming for this system is done using Arduino IDE tool. Baud rate is initially set to 9600 bits for each sec for sequential correspondence between the board and cell phone. Arduino IDE command " Accessible()" is utilized to get information sequentially from cell phone and "println()" command is utilized to transmit information sequentially from NodeMCU to cell phone. The code to get information sequential from cell phone is demonstrated as follows.

```
Int state;
        If(available() > 0)
{
        }
```

The current condition of the appliance is checked using the state variable. In order to operate this appliance, digitalwire is used so as to interact with it. The IDE code used is depicted below.

```
If (state=='0')
  {
        println("FAN ON");
        digitalWrite (FAN, HIGH);
}

If(state=='1')
{
      println("FAN OFF");
      digitalWrite (FAN, LOW);
}
```

Similarly, to control more number of appliances the state variable is compared and checked in different conditions.

B. BLUETOOTH APPLICATION

A cell phone application by the name Bluetooth (BT) Simple terminal is utilized for remote correspondence among cell phones and NodeMCU. It has capacity to deliver ASCII information sequentially from cell phone to the board utilizing Bluetooth device. As per proposed technique clients will have the option to control greatest 18 machines and sensors utilizing this application.

VI. RESULTS

The applied home computerization system is implemented utilizing Arduino IDE, NodeMCU, US sensor HC-SR04, soil dampness sensor, Bluetooth apparatus and cell phone. Soil dampness sensor point(A0) is associated with NodeMCU point (A0), Bluetooth Module TXD and RXD pins were associated with NodeMCU RX and TX pins individually, while pins of ultrasonic sensor were associated with NodeMCU pin 6 and 7 separately and their voltage pins were associated with 5V DC inventory. The home apparatuses like light, electric engine and fan were associated with NodeMCU advanced yield ports with the assistance of transfers. Transfers were utilized for 5V to 240v exchanging hardware. Fig shows the schematic of the applied home computerization system.
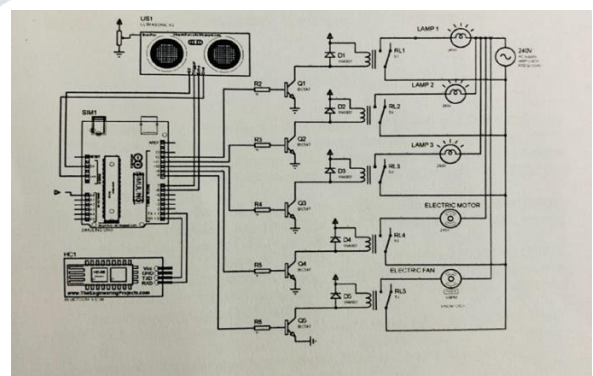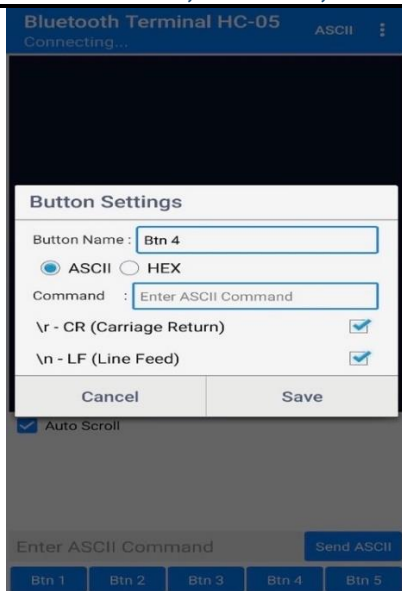

Fig. 7. Circuit Diagram Of The System

Bluetooth application was installed in cell phone and a remote association was set up among cell phone and NodeMCU. Secret phrase security was utilized for matching of cell phone with Bluetooth device to just permit approved user. The figure depicts the UI of the corresponding application.

Fig.9 Bluetooth Application

VII.   CONCLUSION

In this exploration work an ease and easy to understand plan for home computerization framework is exhibited. It has preferable execution over existing Bluetooth based ordinary home mechanization frameworks, it gives a general way to deal with home automation frameworks which isn't only appropriate for older and crippled individuals but is also additionally useful to lessen human work and spare vitality with the assistance of sensors. In this paper, ultrasonic sensor and coasting plates are utilized for water level detection. This proposed framework additionally can transmit the estimation reports of sensors on client cell phone application. In addition, cell phone application utilized in proposed framework has capacity to interact with 18 home apparatuses and sensors.

Proposed framework is just ready to control the appliances inside short range whenever associated utilizing Bluetooth module. In the event that the framework is associated utilizing WIFI module just as Using IFTTT, the appliances and the sensors can be worked and controlled from any place regardless of range.

For future research work it is prescribed to build the scope of Bluetooth gadget and interface more sensors and it ought to be an ease and easy to understand framework. Additionally, home computerization framework can be interfaced with biomedical (EMG) signals.

REFERENCES

[1]   Himanshu Singh, ”IOT based smart home automation system” 4th International conf. 2018

[2]Vikram .N , “A low cost home automation system using WIFI” IEEE 7th International Advance computing conference 2017

[3] B. Ratnayake.” Home automation system using XBee.” International journal of smart Home, Vol 9, April 2015

[4] Kumar Mandula, ramu parupali,” Voice operated Home automation system”, International conference on control ,2015

[5]   Himanshu Singh,” Iot based Home Automation system using Sensor Node”, International conference on recent Advances in Information technology,2018

[6]   Siva   Nagendra   Reddy,   “Smart   home computerization system using Bluetooth module “, international conference ICCICCT , 2016