Arduino Based Smart Automation System using PIR Sensor

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Abstract— In this paper the aim is to use arduino and PIR sensor for smart home automation system. This paper presents design and implementation concepts for a smart home automation system based on Arduino Uno microcontroller as central controllers. In this project the studieshave been donefor all technologies which are used for implementation for smart home automation. In this dissertation, Arduino microcontroller is the pivotal part. we have also used PIR (Passive infrared) sensor to detect the presence of person within certain range, it is designed to bring intelligence to both objects and spaces, such as smart homes and buildings, and can help automate processes and controls. Smart homes allow you to have greater control of your energy use, all while automating things like adjusting temperature, turning on and off lights, opening and closing window treatments, and adjusting irrigation based on the weather. This dissertation is made so that electricity will be saved to some extent by using Arduino microcontroller. Thus in quickly the main desire of the freeride is to save electricity, time and maintain in functioning of home automation system smoothly.

Keywords— Arduino, PIR Sensor, LED

I. INTRODUCTION

Home automation has become more beneficial due to its safety and security. In these day and age, home automation has become more advance and precise to appear in the slightest degree the house appliances. Home automation system become energy efficient and highly approachable smart home technique. It involves basic feature to want care of the user satisfaction and luxury. Home automation could also be a singular system which is ready to manage and make communication between nearly all aspects of your house. Home automation could even be a term want to clarify the working together of all household amenities and appliances. *[1]* as an example, a centrally microcontroller panel can have the aptitude to manage everything from heating and overall electrical appliances. Home automation can include controlling aspects of our home remotely through a computer or any mobile equipment, programming electronics devices to conditions or scenario or centralizing the control of a diffusion of appliances to a minimum of one centre. It's essential that the various controllable appliances be interconnected and communication with one another. *[2]* the foremost purpose of home automation is to manage or monitor signals from different appliances or basic services. The concept of "Home Automation" has been breathing for several years. "Smart Home", "Intelligent Home" are terms that followed and has been introduced the concept of networking appliance within the house. Home Automation Systems includes centralized control and distance status monitoring of lighting, security system, and other appliances and systems within a house. HASs enables energy efficiency, improves the security systems, and therefore the comfort and easy users. within the present emerging market, HASs is gaining popularity and has

attracted the interests of the various users. Mainly being, within the present day, end users especially elderly and disabled, although hugely benefited, aren't seen to simply accept the system due to the complexity and price factors. Automation is the most frequently spelled term in the field of electronics. The hunger for automation brought many revolutions in the existing technologies. These had greater importance than any other technologies due to its user-friendly nature. These can be used as a replacement of the existing switches in home which produces sparks and also results in fire accidents in few situations. Considering the advantages of Wi-Fi an advanced automation system was developed to control the appliances in the house.
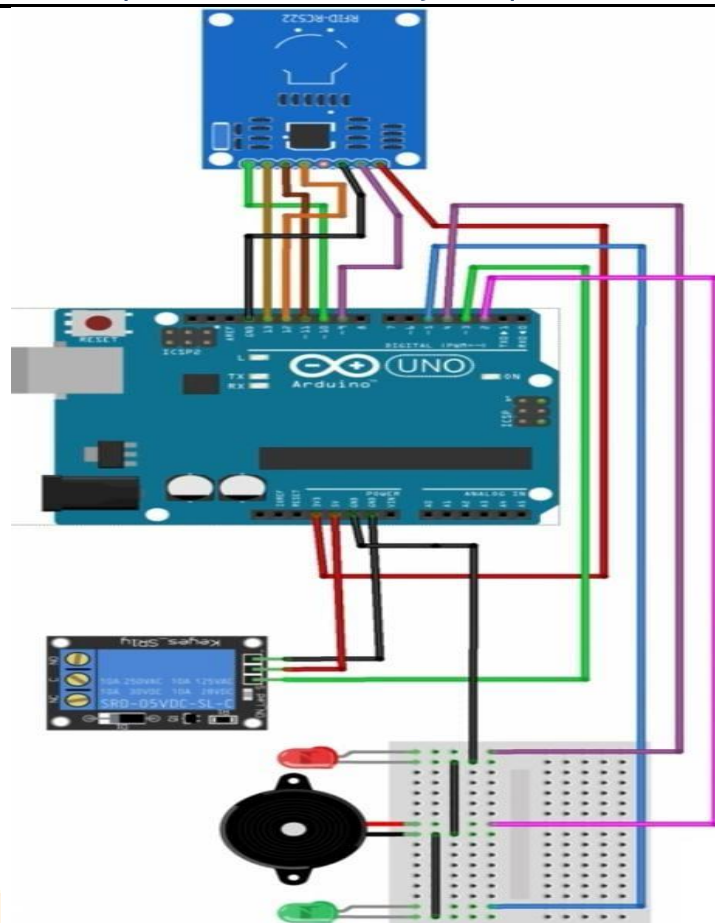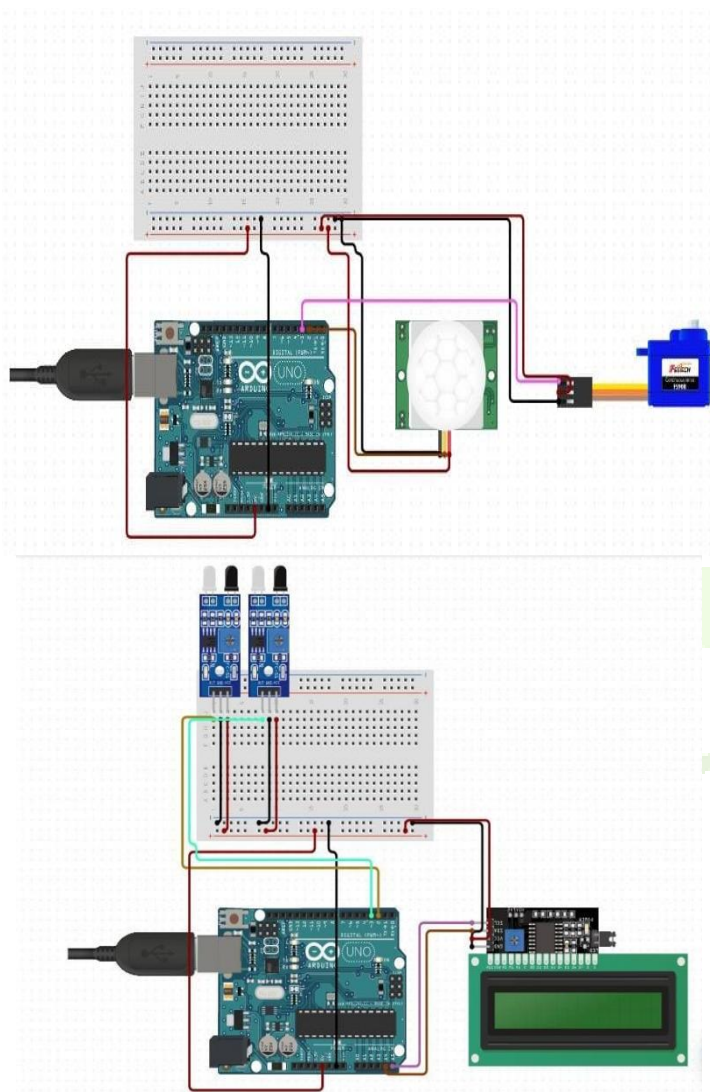

SMART HOME (Fig. 1)

II. PROPOSED METHOD

There aren't any users who don't want to feature more features over the prevailing system which provides more elasticity and runs with some general applications sort of a smart phone. Our system is intended in such the way that abstains from the drawbacks of the present system. The developed method gives more security, comfort, and adaptability. The aim of our proposed method is to style and to implement an occasional cost and open-source home automation that's able to lead most of the house and sustain the

house automation system. To use wireless reliable technology to interconnect many modules to the server of the house automation system, as a result, the proposed system gives more flexibility. this technique will reduce the expansion cost; will augment the elasticity of advancement. Through PIR (Passive Infrared Sensor) sensor we can detect the movement of animal/human in a requirement range. After the detection the door will open in an angle of 180 degree by using of servo motor. There will be a delay timing of 2-3 sec after an object entered through the door. Here we have used a RFID (Radio Frequency Identification) lock on the second door. This solenoid lock is been used to allow the user to easily lock and unlock the door. It will contain a RFID reader/writer and a magnetic door lock for simple use. The user will need an RFID tag to be able to lock and unlock the door. The IR (Infrared Sensor) is used here to count the number of people enters and leaves.
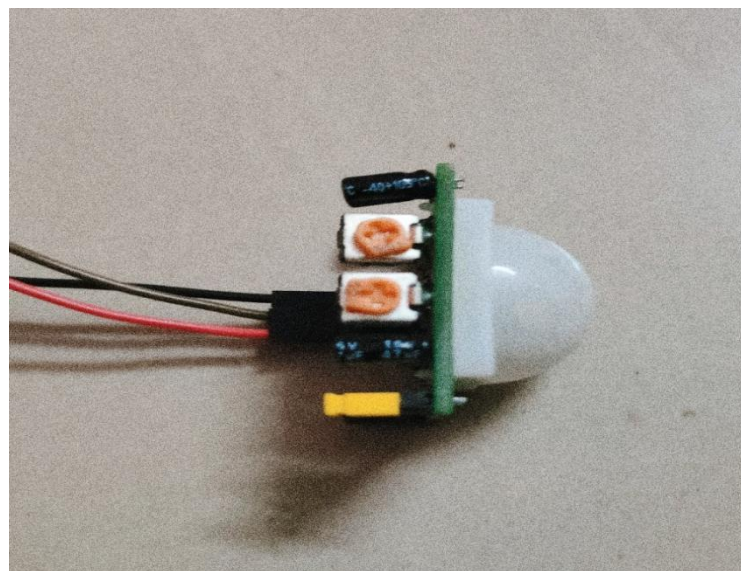
III. SCHEMATIC DIAGRAM OF THE PROPOSED SYSTEM

schematic diagram (fig.2)
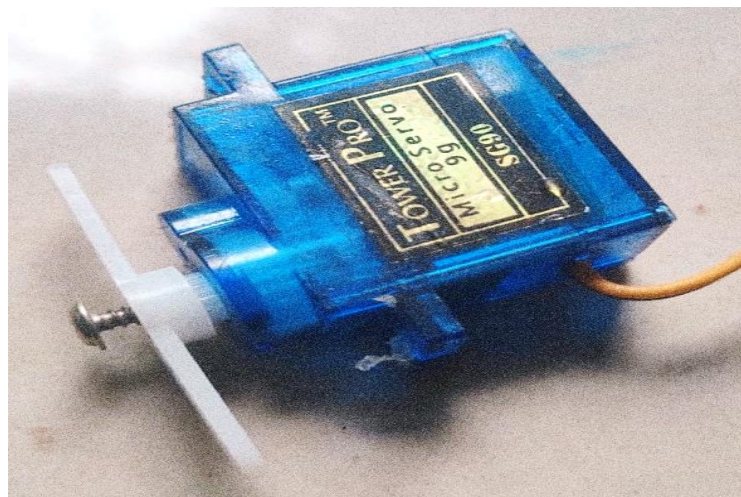
IV. COMPONENTS USED

A. *PIR SENSOR :-* A passive infrared (PIR) sensor (Fig. 2) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They're most frequently utilized in PIR-based motion detectors. PIR sensors are commonly utilized in security alarms and automatic lighting applications. PIR sensors detect general movement, but don't give information as to who or what moved. For that purpose, an imaging IR sensor is required. PIR sensors are commonly called simply "PIR" or sometimes "PID" for "passive infrared detector." The term passive refers to the fact that PIR devices don't radiate energy for detection purposes. They work entirely by detecting infrared (radiant heat) emitted by or reflected from objects. Through PIR (Passive Infrared Sensor) sensor we can detect the movement of animal/human in a requirement range.

PIR Sensor (Fig. 3)

B. *SERVO MOTOR :-* The servo motor is the motor used for servo system. The so-called servo system is a control system that acts according to the instructions. It can compare the actual state of the system with the corresponding state of the instructions, and use the comparison result for

further control. Servo motors include direct current motors (with brush and brushless) and alternating current motors (synchronous and asynchronous). The function of the servo motor is to convert the control signal of the controller into the rotational angular displacement or angular velocity of the motor output shaft. Servo motor is used to drive the joints. Generally, servo motors used in robots should have the following characteristics: fast response speed, high starting torque, wide speed range, etc. When used in a collaborative robot, the servo motor should have the characteristics of small size, lightweight, and hollow structure to achieve safe human–robot collaboration. After the detection the door will open in an angle of 180 degree by using of servo motor. There will be a delay timing of 2-3 sec after an object entered through the door. Servo motor is to convert the control signal of the controller into the rotational angular displacement or angular velocity of the motor output shaft.
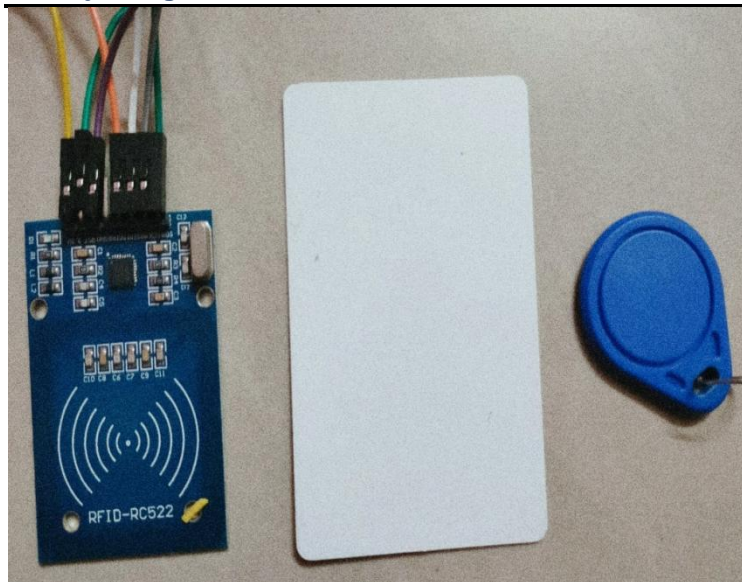

Servo Motor (Fig. 4)

C. *ARDUINO UNO :-* To control and monitor the home appliances remotely can be referred to as home automation. To demonstrate how we can control multiple appliances using the Arduino Uno with wireless technology we have considered two AC powered bulbs as two appliances. This system is super-cost effective and can give the user, the ability to control any electronic device without even spending for a remote control. In this project we have used arduino uno in order to send signal to PIR sensor to detect the objects. We require Arduino uno in this project because, in order to to control and monitor the home appliances remotely can be referred to as home automation. To demonstrate how we can control multiple appliances using the Arduino Uno with wireless technology we have considered two AC powered bulbs as two appliances. t has a large library of pre-written code: Arduino has a large library of pre-written code called the Arduino library. Basically, this simplifies common tasks and makes it easy to interact with sensors and other devices connected to the board.
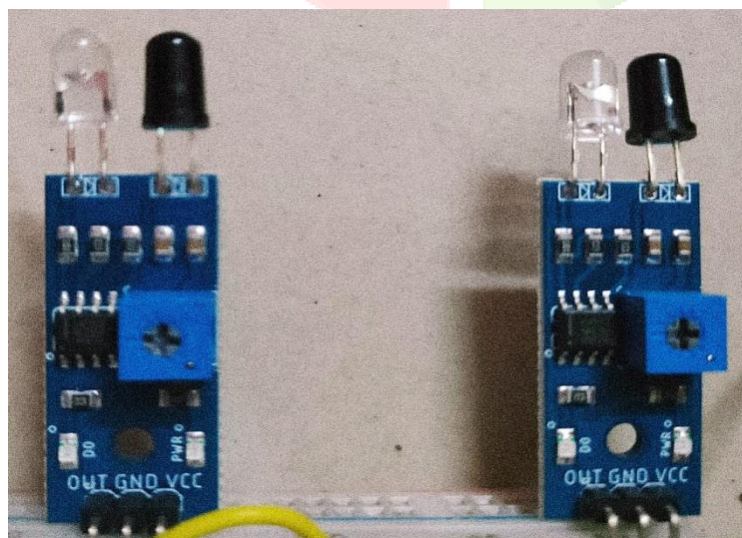

Arduino Uno (Fig. 5)

D. *RFID LOCK :-* The RFID Door Lock is a lock that is simple to install and allows the user to easily lock and unlock doors. It will contain a RFID reader/writer and a magnetic door lock for simple use. All the user will need is an RFID tag to be able to unlock and lock the door. A LED will be used to let the user know when the door is in fact locked. The components included in the module are small and compact. Additionally, the door lock is simple and easy to install. It does not require the consumer to disassemble the door or doorframe as the door lock are merely attachments. This is also leaves the consumer with the option of using their original lock and key if they so choose. All in all, this RFID door lock should be a simple and cost effective upgrade to the average consumer's security and convenience. In this project this solenoid lock (fig. 6) is been used to allow the user to easily lock and unlock the door. It will contain a RFID reader/writer and a magnetic door lock for simple use. The user will need an RFID tag to be able to lock and unlock the door. We require RFID lock in this project because, An RFID door lock is a type of electronic lock that you access using credentials like key fobs or key cards that are powered by RFID technology. RFID (radio frequency identification) technology uses electromagnetic fields to enable communication between two devices: tags and readers. It can be used in many applications such as access control, security, asset tracking, people tracking, etc. You have seen the RFID Door Lock system in Hotels, offices, and many other places where you just have to place the card near RFID reader for a second and the door will be opened.

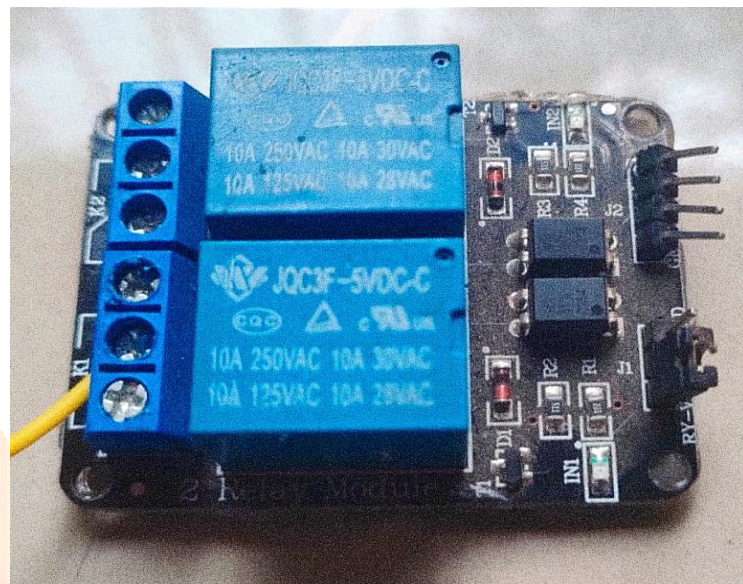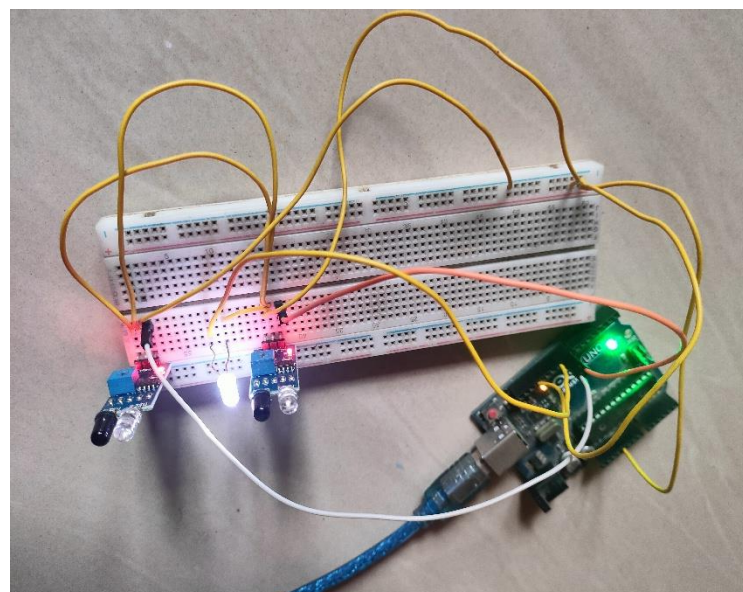while they are separated. Relay is used when we want to use a low voltage circuit to turn ON and OFF the device which required high voltage for its operation. For example, 5V supply connected to the relay is sufficient to drive the bulb operated on 230V AC mains. Relays are available in various configurations of operating voltages like 6V, 9V, 12V, 24V and so on. Relay is divided into two parts, one is input and other is output. Input side is nothing but a coil which generate magnetic field when small input voltage is given to it. Relay having three contactors: Normally closed (NC), Normally opened (NO) and common (COM). By using the proper combinations of the contactors electrical appliances may turn ON or OFF. Home automation relays are trigger devices that will activate another appliance. This could be a light fixture or a garage door. You can use smart home automation relay modules in many different situations to make your home more interconnected.
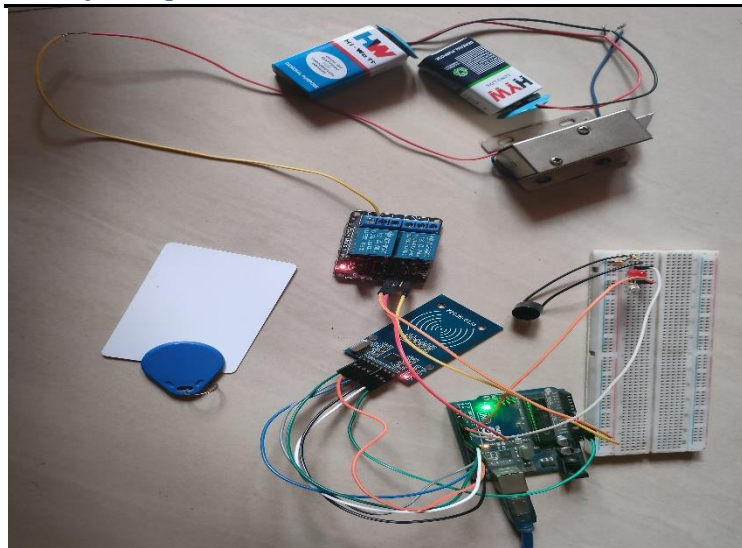

RFID Lock (Fig. 6)

E. *IR SENSOR :-* The IR sensor emits and receives infrared rays in order to detect the object near it. Usually, in the infrared spectrum, all objects radiate some form of thermal radiation which is not detected by human eyes but an IR sensor can detect it. This project counts the number of obstacles that pass in front of the IR sensor in one direction only. The value of the total counts or the count number is displayed on a 16×2 LCD display module. The module has an emitter which is an IR LED and a detector which is an IR photodiode. The IR sensor that we are using in this project is an active IR sensor. Whenever it detects an object inside its range the output generated by it is high otherwise the output is low. You can also adjust the range of the sensor by rotating the inbuilt trim pot. The count is zero initially and then incremented by one whenever something passes in front of it. The IR (Infrared Sensor) is used here to count the number of people enters and leaves. Connect the 5-volts pin of the Arduino with the VCC pin of the IR sensor and also with the LCD display module. Attach the GND pin of the Arduino to the GND pin of the IR sensor and also with the LCD display module. We require IR sensor in this project because, an IR sensor can measure the heat of an object along with the detection of motion. Passive IR sensors measure only infrared radiation, rather than emitting it. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. The IR sensor emits and receives infrared rays in order to detect the object near it.

IR Sensor (Fig. 7)

F. *DUAL CHANNEL RELAY MODULE* :- The dual-channel relay module can be used to switch mains powered loads from the pins of a microcontroller. Since there are two channels on the same board, two separate loads can be powered. This is useful for home automation. Relay is nothing but it is the electromagnetic switch. Relay allows one circuit to switch another circuit

Dual channel relay (Fig. 8)

V. RESULT

The Figure 9&10 shows the experimental testing of temperature and humidity sensor working prototype. Once the sensor detects any motion, Arduino will send a message via the serial port to say that a motion is detected. The PIR sense motion will delay for certain time to check if there is a new motion. If there is no motion detected, Arduino will send a new message saying that the motion has ended .Our proposed design is very useful in everywhere like offices, homes, schools, colleges, companies, shopping malls, and many other places. This system requires very low power consumption and has various advantages. As we know that, a PIR sensor can operate within a range of (7-10) meters, it can have various applications such as it can be used as motion tracking system, can be useful even at night times.

Prototype (Fig. 9)

Prototype (Fig. 10)

VI. CONCLUSION

It is substantiate from this project work that an individual control smart home automation system can be cheaply made from less exorbitant, locally available components and can be used to control numerous home appliances ranging from the security doors, the television to the air conditioning system and even the entire house lighting system. And having said that, the components required are so small and few that they can be packaged into a small inconspicuous container. Home Automation is creating new automation technologies for houses that will make them smart using internet-based technologies. These homes/houses that use home automation technologies are smart Homes. This field of home automation is rapidly emerging in technology making homes safer and better places to live.

VII. ACKNOWLEDGMENT

VIII. REFERENCES

[1] "Smart Energy Efficient Home Automation System using IOT", by Satyendra K. Vishwakarma, Prashant Upadhyaya, Babita Kumari, Arun Kumar Mishra.

[2] "IOT Based Smart Security and Home Automation", by Shardha Somani, Parikshit Solunke, Shaunak Oke, Parth Medhi, Prof. P. P. Laturkar.

[3] "Enhance Smart Home Automation System based on Internet of Things", by Tushar Churasia and Prashant Kumar Jain; in Proceedings of the Third International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC 2019) IEEE Xplore Part Number: CFP19OSVART; ISBN:978-1-
7281-4365-1

[4] "A Low-Cost Home Automation System Using Wi-Fi based Wireless Sensor Network Incorporating internet of Things", by Vikram.N, Harish.K.S, Nihaal.M.S, Raksha Umesh, Shetty Aashik Ashok Kumar; in 2017 IEEE 7th International Advance Computing Conference.

[5] "Micro Python for ESP8266 Development Workshop" by Agus Kurniawan in 2016

[6] "Programming with Micro python: Embedded Programming with Microcontrollers and Python" by Nicholas H. Tollervey in 2018; ISBN:978-1-491-97273-1

[7] Wikipedia: https://en.wikipedia.org/wiki/Home_automation

[8] Theory of IOT from Alexander S. Gillis, Technical Writer, and Editor, TechTarget:
https://internetofthingsagenda.techtarget.com/definition/Internet-of-ThingsIoT

[9] About Node MCU ESP8266-12E from LastMinuteEngineers.com: https://lastminuteengineers.com/esp8266-nodemcu-arduino-tutorial/

[10] Micro Python website: https://docs.micropython.org/en/latest