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### SMART HOME AUTOMATION SECURITY SYSTEM BASED ON IoT

Vikas kumar , Priyanka Mahala, Naveen kumar , Neh sharma , Parul Rathore

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#### ABSTRACT:

In today's world automation plays a very important role and this is a project is an automated way of controlling home appliance with least human efforts as well as self-control of system itself. The manual mode allows the user to connect with each appliance individually with in the network in automated mode. The security system takes action as the user is expected to be busy it will allow the user to have a look at the intruder. Internet of Things is a growing network of everyday object—from industrial machine to consumer goods that can share information and complete tasks while you are busy with other activities. Wireless Home Automation system(WHAS) using IoT is a system that uses computers or mobile devices to control basic home functions and features automatically through internet from anywhere around the world, an automated home is sometimes called a smart home. It is meant to save the electric power and human energy. The home automation system differs from other system by allowing the user to operate the system from anywhere around the world through internet connection.

**KEY WORDS:** Automation, Internet of Things(IoT), Wireless Home Automation System(WHAS)

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#### INTRODUCTION

With all the world's knowledge in our pockets, we are living in a world that is already smart. Recently, technological developments have given huge contributions to improve the quality of human life and welfare. These technologies can also be used to monitor and control the use of electrical energy and electronic devices at home with advancements of internet technologies. Internet Of Things is a concept where user can connect distinct physical objects and control their operations through internet to make life more flexible and efficient. The concept of smart home allows a user to connect and communicate with the surrounding conveniently without disturbing the user's comfort. Security is an important aspect or feature in the smart home. Home automation refers to control the home appliances by using computer technology. Computer Systems enables remote control of lighting through micro-controller or computer based networks with various degrees of intelligence and automation. Home automation provides security, energy efficiency and ease of use. Hence, it is adopted more. It also provides remote interface to home appliances to provide control and monitoring on a web browser. If user is far away from home, he can access and change status of appliances i.e. switches it on/off.

This paper focuses on the security of a home, energy production of the home , and energy efficiency of the home. Some security system in the house include fingerprint scanner, CCTV surveillance. Some energy sources are solar power, piezo electric generation. The main objective of home automation and security is to help handicapped and aged people that will enable them to control home appliances and alert them in critical situations.



*Figure 1. Smart house*

#### SYSTEM DESIGN

The main part of the system consists of a Microcontroller with an Ethernet module for controlling. This Ethernet module is connected to a Wi-Fi router which gives a static IP address to it so that it can use TCP/ IP based communication with other accessing devices connected to the same router. This module is connected to four appliances through relay devices to automatically turn on and off those devices. As the relay devices are current

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controlled device, current amplification is needed to support low current output of the microcontroller. Now that was a part which requires human control. To make this design more efficient an automatic system has been designed as well. For this automated system there is a temperature sensor which senses its immediate environment (i.e., a room) and indicates current temperature. Now this temperature is shown in the GUI output and microcontroller uses it to change the speed of a fan connected to it. As the temperature varies speed of the fan varies according to it. Then there is an IR sensor, which is connected to a door of room, senses the entry of a person. If any person enters the IR sensor changes its output state and triggers the microcontroller to put on the light of that room only. Now again when the person exits the room another IR sensor senses that and directs the controller to put off the light, increasing consumption efficiency as well as making things more fast and advanced. The security system is another important part of this automation and gives this design a little more edge. A PIR module is used for this purpose which senses any kind of intervention at the front gate to alert the user about an intruder.

### SYSTEM HARDWARE

The suggested Home Automation and Security system is composed of three main modules: nodemcu esp8266 as Web Server, Hardware Interface module and Human Interface which can be accessed from any PC or Wi-Fi enabled phone. In case of long distance communication without using wires, Wi-Fi router provides convenient and cost-effective way of communicating with our sensors and actuators from webpage. Data being gathered from sensors, such as PIR sensors, temperature sensors, IR transmitter and receiver is being processed on server and then disseminate with an attached Ethernet Shield using the TCP/IP protocol via Wi-Fi router.



*Figure 2. Hardware system*

### HARDWARE INTERFACE MODULE

This module is the heart of the proposed home automation and security system. It is made up of sensors and actuators.



*Figure 3. Nodemcu esp8266*

- A. Temperature Sensor: LM35 temperature sensor is used to measure the ambient temperature and it is active for all the time the system is on. It is used to display the room temperature to the user when the user

interface is refreshed. In the automated mode this sensed temperature is employed to control the speed of fan connected at the output pin.

- B. Relay: This unit is responsible for actual control of load. It consists of a 6VDC-240VAC relay and protection diode to protect against counter electromotive force (CEMF). Relay is used to switch power the power socket and is controlled via the Arduino. The appliances connected to the socket can be controlled from the user interface and the status can also be monitored.
- C. PIR Sensor: Passive Infrared sensor is an electronic sensing device that senses infrared (IR) light emitted from entities in its field of view and used to detect motion in its range. It is activated only in the security mode to detect any unwanted motion at the entrance. If any unwanted movement is detected, then it will signal the microcontroller to take necessary steps.
- D. IR Sensor: It will be activated in the automated mode to detect person entering or coming out of the room and set a counter based on that. If the counter show, there is a person inside it will light up the room automatically and turn on the AC depending upon the temperature reading
- E. Alarm: It will only be activated in the security mode when some intruder is detected by the PIR motion sensor.
- F. NodeMCU: It is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module.  
The term "NodeMCU" by default refers to the firmware rather than the dev kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson, and spiffs.

## HUMAN INTERFACE

This is the thing that the user sees while using it. A customized HTML web page is designed and embedded in the microcontroller program. The webpage consists of several control buttons as required by user, to control the devices connected to the server, to control the mode of working and to display the present status of the Home Automation system. This provides a graphical user interface for controlling the instruments at home from web enabled devices through server real IP.

## EXPLANATION

A micro controller can be used to set up a network which connects the devices.

- A. Identifying and utilizing the wireless communication devices for input in the system for the home security
- B. Designing and developing program for the security system, identifying and utilizing wireless communication devices for input in mobile for security system as for the security purpose and alertness we utilize certain input devices
  - 1. Capturing the video clips
  - 2. Sound recording for the identification
  - 3. Mobile alerts
  - 4. Utilizing internet for transferring information
  - 5. Communicating the electronic devices with the user
  - 6. Fingerprint identification locks

A camera (which will work 24\*7) facing outside is placed near the outdoor which starts the security system If there is a change detected. A fingerprint scanner is attached to the gate which when used starts the security system. The door locks can be opened with only the allowed finger prints. There will be two cameras inside the house such that they have two different views on the door which with the help of image processing will Email the Images to the Owner. The floor of the house will consist of piezoelectric generator which will produce electricity when applied pressure this electricity can be used when the input devices are out of power supply. The user can then forward the evidence captured by the cameras when needed. The camera also feed live to the owner through a software which allows the owner to contact directly to the emergency services.

## RESULT

After successful connection to the server, if user is far away from home, he can access and change status of appliances i.e. switches it on/off. It could be useful for old aged/especially able people as appliances can be controlled by merely a touch. By using the technology of Internet of Things, the examination and execution of Home Automation have get additional average. The proposed data can be analyzed anytime and anywhere.

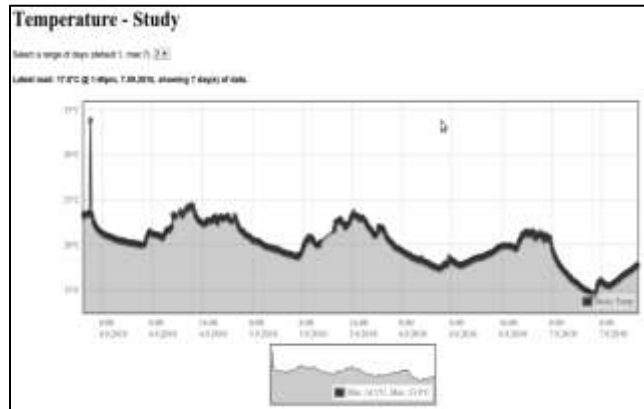


Figure 4. Temperature curve using IoT

## CONCLUSION

In the proposed design, a Wireless automated home control with security features is presented. This design is very simple in nature. Node MSU esp8266 microcontroller is the central part of the design where the server program for controlling is burned. Thus all the controlling is done by it. For the web application the Html part is provided inside the program thus it doesn't require any other application to be developed for different gadgets. The security mode is very invulnerable where nobody can access the system without deactivating the security system from the activating device. The automated mode makes life easier for users by complete automation of necessary appliances without any human effort. The application of the system could be:

1. In case of lighting control, it is possible to conserve energy in both residential and commercial applications by automatically controlling intensity of light depending on the presence of anyone inside the room.
2. It is also possible to control the system using voice commands using Android.

It is safe because there is no chance of getting electric shock.

## FUTURE WORK

Using this system as framework, the system can be expanded to include various other options which could include home security feature like capturing the photo of a person moving around the house and storing it onto the cloud. This will reduce the data storage than using the CCTV camera which will record all the time and stores it. The system can be expanded for energy monitoring, or weather stations. This kind of a system with respective changes can be implemented in the hospitals for disable people or in industries where human invasion is impossible or dangerous, and it can also be implemented for environmental monitoring.

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