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IoT Based Approach for Load Controlling and Smart Home Security Systems

Dr. D K Shedge[4], Pradnya Jadhav[2], Shantanu Jagtap[3], Arbaz Naddaf[4]
Dept. of ENTC, AISSMS IOIT, PUNE

Abstract: Appliance load monitoring in smart homes has been gaining importance due to its significant advantages in achieving an energy efficient smart grid.
The methods to manage such processes can be classified into hardware-based methods, including intrusive load monitoring (ILM) and software-based methods referring to non-intrusive load monitoring (NILM). ILM is based on low-end meter devices attached to home appliances in opposition to NILM techniques, where only a single point of sensing is needed. Although ILM solutions can be relatively expensive, they provide higher efficiency and reliability than NILMs. Moreover, future solutions are expected to be hybrid, combining the benefits of NILM along with individual power measurement by smart plugs and smart appliances. This paper proposes a novel ILM approach for load monitoring that aims to develop an activity recognition system based on IoT architecture. The proposed IoT architecture consists of the appliances layer, perception layer, communication network layer, middleware layer, and application layer.
The main function of the appliance recognition module is to label sensor data and allow the implementation of different home applications.
***Keywords*:** Smart Homes , Home Security, Load Controlling .

I. INTRODUCTION

"Smart Homes" refers to the automatic and electronic control of household features, activities, and appliances. The utilities and features of our home can be easily controlled via Internet. There are three main elements of a home automation system: sensors, controllers, and actuators.

Having day to day developing technology is a proud moment to the whole world. The foremost aim of the technology is to increase the efficiency and to decrease the effort. In this trending world, Internet of Things is being given extreme importance. In that, Automation, leads to have less effort and much efficiency. By using IoT, we are successful in controlling the appliances in various areas, in which one of them is to control the home automation by using Node Microcontroller. We can also use other boards like raspberry pi, beagle bone etc.,

A. Literature Survey

Some studies related to smart home systems, among others, were conducted by M. Aluh Ashari [8], who conducted a study of "IoT Based Smart Home Systems Using NodeMCU"". In that study, several home electronic devices such as home power plugs were controlled via smartphones. Another smart home study was conducted by Delebarre, C., et al regarding Wireless Low Cost CO 2 Monitoring System Design and Evaluation Using Non Dispersive Infrared Sensor [3]. Smart home study was conducted by Rajes Khana regarding the Design of an Internet-Based Home Security System with the Android Platform [9]. In this research a miniature house was built with a home security monitoring system with a PIR sensor to detect the presence of moving objects, an MQ-2 sensor to detect the presence of a gas leak and to control several devices related to a home security system such as lights and door lock solenoids to lock door. Monitoring and control is done through an application on an android device that is connected to the arduino UNO server and microcontroller.

Firdaus, et al conducted research on "CO monitoring and early detection of LPG gas leaks in housing using WSN (wireless sensor network)"

[5]. In this study CO gasses sensors and LPG gas sensors are monitored at several points (nodes). This means that sensors are monitored simultaneously. WSN is able to work well as long as the node receives radio waves emiition, the data received by the receiver matches the data sent by the transmitter. The GUI display monitoring system was designed using Visual Basic.

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B. SH Environment

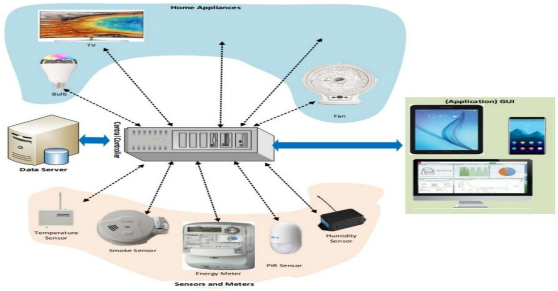

FIGURE 1. SH environment.

1) The diagram above depicts about the Smart Homes(SH).
2) In the IoT based approach we have added the relay drivers which play as a role of load monitoring .
3) The next part which we have seen is the dimmer which controls the speed of appliances above 5V.
4) And the last part is of Flame sensor, gas sensor and humidity sensor , which will add security to the house.

II. FLOWCHART

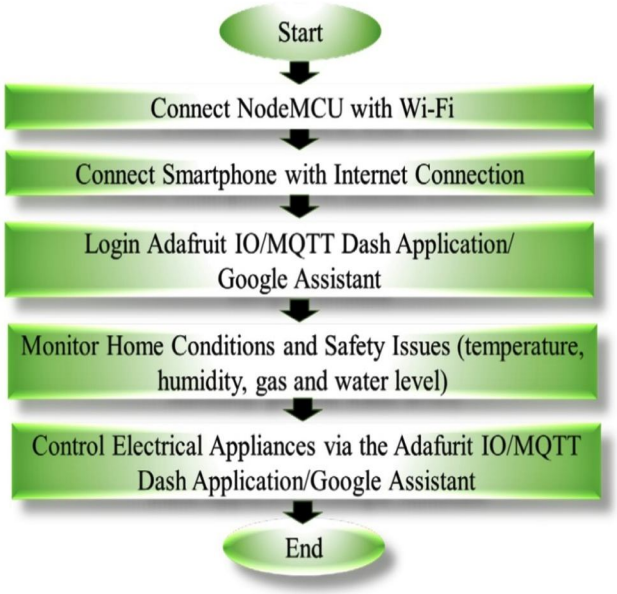

FIGURE 12. Flowchart of system operation.

The above flowchart provides us an idea about the working of the IoT based load controlling .
The working of the system is explained in the given 5 steps.

- STEP 1 – we have to connect the NodeMCU with our existing wi-fi.
- STEP 2 – The next step is to connect it with the device
- STEP 3- After this we have to login to the aurdino Software.
- STEP 4- Now we have to monitor the sensors on Blynk software.
- STEP 5- Now we can control our system with help of Blynk software.

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III. SYSTEM DESIGN AND WORKING

Working of our project is as follows:

- There is a Node MCU board which plays a crucial role in the setup, all the other components are programmed through Node MCU.
- We will be providing Node MCU which also has WiFi module .This module has a range of 300m
- There is a relay driver IC ULN2003 which will be acting on/off switches for all the external components that we will be connecting.
- After this we will be coding our MCU board using proteus and the setup will be ready to be tested. By using Blynk as a cloud platform the user will be able to control all the home appliances from remote location .
- Flame Sensors,Gas Sensors, Data Loggers are linked to MCU unit with a suitable algorithm for smart security service.
- For dimming purpose which is another application for home security, we use application of leading edge dimming where we use triac controls which act as high speed switching.
- The cloud platform can make it one of the best application of IOT as it currently is an enabling technology of Internet Of Things.

A. Proposed Architecture

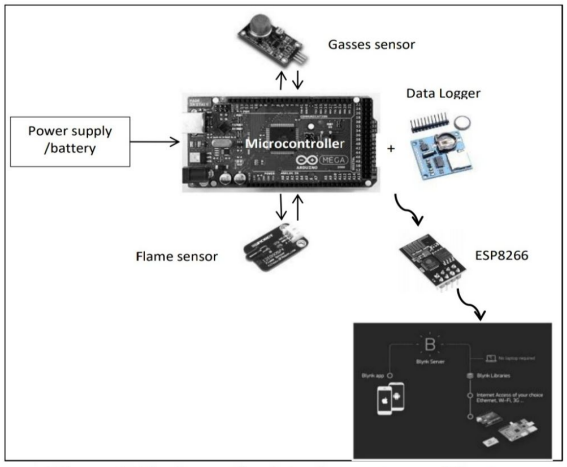
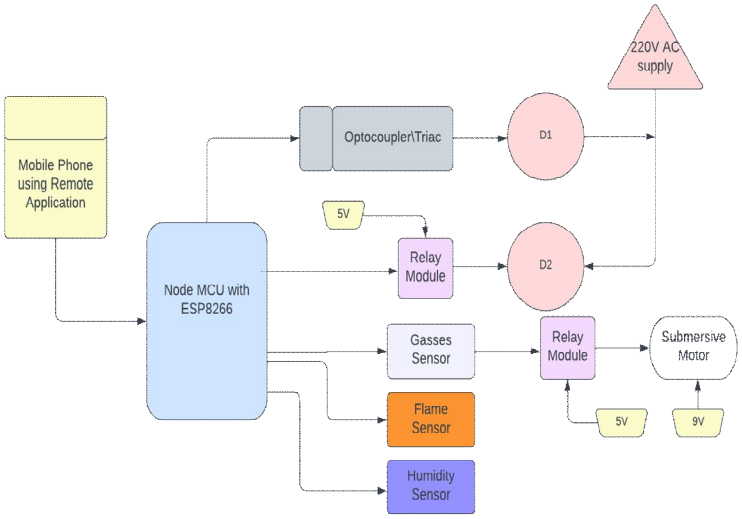


Figure 1. The home fire detection system architecture

The above architecture gives us a specified idea of how the Interaction between the microcontroller and the sensors are is done where MCU unit plays efficient role in connecting the appliances through a WiFi module ESP8266. This wiFi module is interconnected with our Mobile through a wifi hotspot or an IP address depending on how the coding is done.

B. Block Diagram



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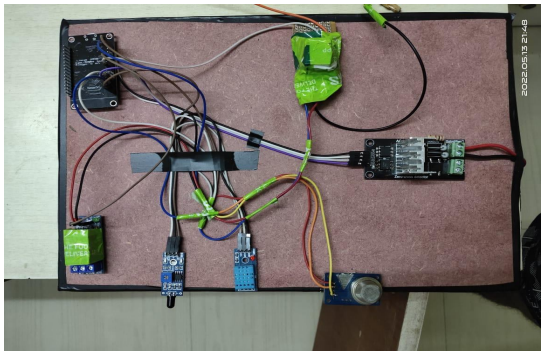
IV. BLYNK SOFTWARE

Blynk is one of the server service platforms which is used to support the Internet of Things based projects. Such platforms are used in an Android and iOS mobile user environments. The Blynk application can be downloaded through Google play store. It supports a variety of hardware for controlling which are used for the Internet of Things based project. Blynk is a digital dashboard with graphical interface facilities for making projects simpler. It was created with the aim of remote control and hardware monitoring using internet or intranet data communication (LAN network). Blynk's ability to store data and display data visually using numbers, colors or graphics makes it easier for beginners to use in making projects of the Internet of Things. As shown in Figure 6 there are three main components of Blynk : Blynk Apps, Blynk Cloud Server and Blynk Library [4].

V. TEST RESULT

The basic software model of Home security with smart access controls based on IOT is developed. Interfacing with Arduiono and cloud computing is used for storing and processing of data. Design and simulation of the product is done and printed. The Hardware Interfacing of appliance and coding is completed. After the completion of connection of all the components with MCU unit as well as to the server, the data is sent to the server for monitoring the system. By connecting the mobile hotspot password with the given address of server, we can see the information on Blynk Software. Blynk gives information of all the appliances connected in house and current state of components, also it will show the present temperature at home and will notify us of any threats.



VI. CONCLUSION

The paper gives an overview about monitoring of load along with the security notification and smart switching which was managed with the help of IOT technology. It specifies various technologies used for executing the project. As every class of society has the right to secure their home considering this the project was made pocket friendly for everyone. The paper also gives an overview about the future scope of the project. In future home automation will be widely used.

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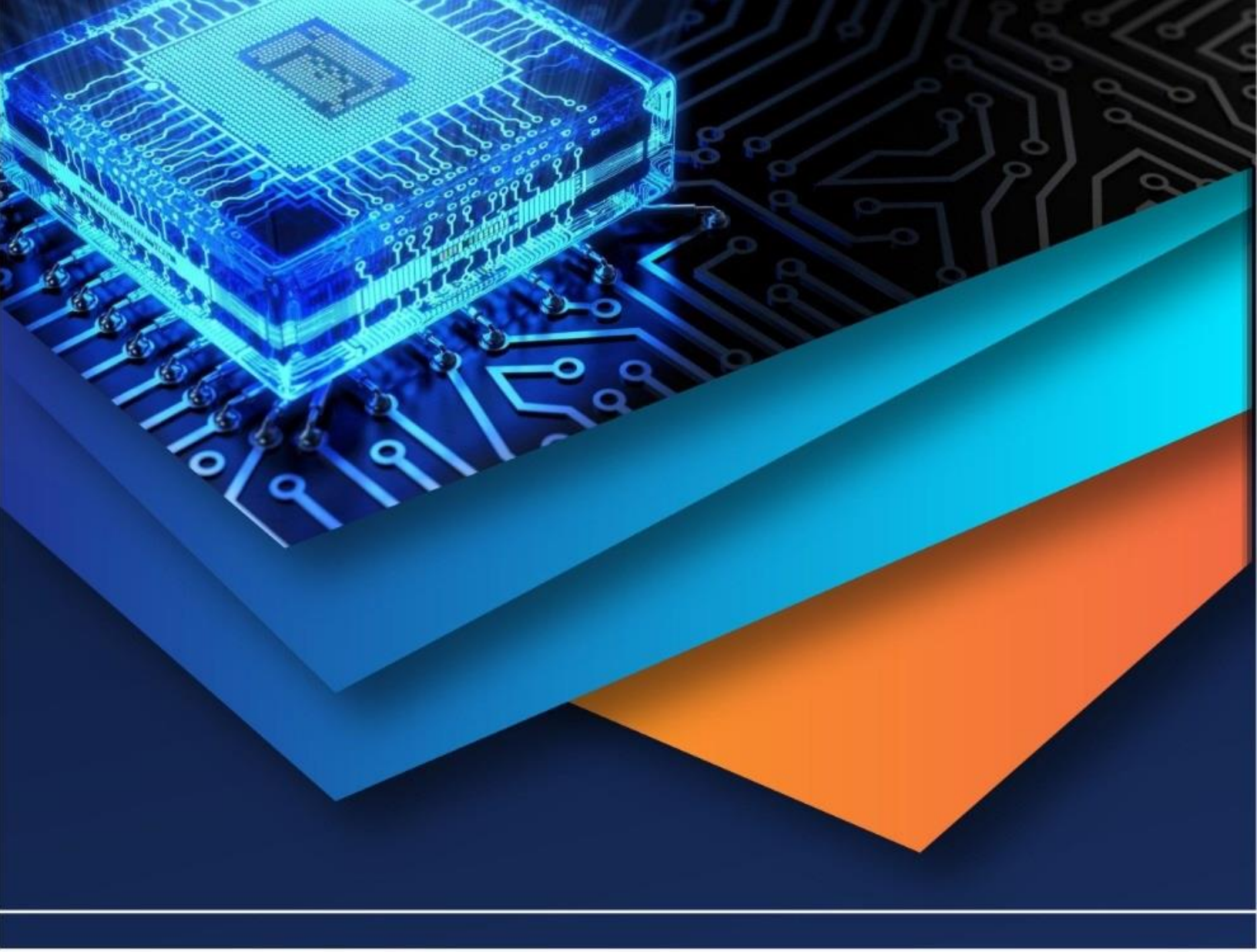

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