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Wireless Home Automation System Using IOT and Node MCU Learning

Dr. A. S. Shanthi[1], R. Sivaranjani[2], S. Iyyapan[3], N. Veeramani[4], A. William James[5]
[1, 2, 3, 4, 5]*Department of Computer Science and Engineering, Tamilnadu College of Engineering, Coimbatore, Tamilnadu, India*

Abstract: ***The Internet of Things commonly known as IOT (Internet of Things), refers to any device that can be connected to Internet and further controlled using it. Home Automation Systems(HAS) involves the control and automation of lighting, ventilation, security. A wireless home automation system is developed in way that a different set of tasks are performed automatically. This system allows one to wirelessly control lights, fans, air conditioners, television sets, security cameras, etc.***

I. INTRODUCTION

Homes of the 21st century will become more and more selfcontrolled and automated due to thecomfort it provides, especially when employed in a private home. A home automation system isa means that allow users to control electric appliances of varying kind. Many existing, well- established home automation systems are based on wired communication. This does not pose a problem until the system is planned well in advance and installed during the physical construction of the building. But for already existing buildings the implementation cost goes veryhigh. In contrast, Wireless systems can be of great help for automation systems. With the advancement of wireless technologies such as Wi-Fi, cloud networks in the recent past, wireless systems are used every day and everywhere. In recent years, wireless systems like Wi-Fi have become more and more common in home networking. Also in home and building automation systems, the use of wireless technologies gives several advantages that could not be achieved using a wired network only. Reduced installation costs: First and foremost, installation costs are significantly reduced since no cabling is necessary. Wired solutions require cabling, where material as well as the professional laying of cables (e.g. into walls) is expensive. System scalability and easy extension: Deploying a wireless network is especially advantageous when, due to new or changed requirements, extension of the network is necessary. In wired installations, inwhich cabling extension is tedious. This makes wireless installations a seminal investment.

Aesthetical benefits: Apart from covering a larger area, this attribute helps to full aesthetical requirements as well. Examples include representative buildings with all-glass architecture and historical buildings where design or conservatory reasons do not allow laying of cables. Integration of mobile devices: With wireless networks, associating mobile devices such as PDAs and Smartphones with the automation system becomes possible everywhere and at any time, as a device's exact physical location is no longer crucial for a connection. IOT (Internet of Things) is a collection of devices that can be connected to Internet and further controlled using it. Home Automation industry is growing rapidly, this is fulfilled by the need to provide supporting systems for the elderly and the disabled, especially those who live alone. Coupled with this, the world population is confirmed to be getting older. Home automation systems must comply with the household standards and convenience of usage. This paper is based on the design and implementation of a flexible, secured, low-cost, advanced home control and monitoring system. Home security includes services like gas leakage, fire extinguishing and trespasser protection. If any unauthorized person tries to enter the home, the system sends an SMS to the authorized phone number. The system has sensors. When the gas sensor finds anomaly, the system starts alarm through buzzer and the kitchen exhaust fan turns on automatically. Again, when the fire sensor finds anomaly the system starts alarm through buzzer and an emergency pump turns on automatically.

II. LITERATURE SURVEY

1) Title - Smart Energy Efficient Home Automation System using IOTAUTHORS - R. K. Kodali and S. Yerroju

This paper presents a step-by-step procedure of a smart home automation controller. It uses IOT to convert home appliances to smart and intelligent devices, with the help of design control. An energy efficient system is designed that accesses the smart home remotely using IOT connectivity. The proposed system mainly requires, Node MCU as the microcontroller unit, IFTTT to interpret voice commands, Adafruit a library that supports MQTT acts as an MQTT broker and Arduino IDE to code the microcontroller. This multimodal system uses Google Assistant along with a web based application to control the smart home. The smart home is implemented with main controller unit that is connected with the 24-hour available Wi-Finetwork.

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To ensure, that the Wi-Fi connection do not turn off, the main controller is programmed to establish automatic connection with the available network and connected to the auto powerbackup.

2) *Title - IOT Based Smart Security and Home AutomationAUTHORS - Ravi Kodali, Ravi Kishore*

This paper focuses on a system that provides features of Home Automation relying on IOTto operate easily, in addition to that it includes a camera module and provides home security. The android application basically converts Smartphone into a remote for all home appliances. Security is achieved with motion sensors if movement is sensed at the entrance of the house; a notification is sent that contains a photo of house entrance in real time. This notification will be received by the owner of the house via internet such that app can trigger a notification. So owner can raise analarm in case of any intrusion or he/she can toggle the appliances like opening the door if the person is a guest. The system 9 uses Raspberry Pi, a small sized computer which acts as server for the system. The smart home consist two modules. Home automation that consists; fan light and door controller, and security module that consists; smoke sensor motion sensor and camera module. Raspberry Pi and Intel Galileo Gen 2. The communication between the User devices, Raspberry Pi and the Intel Galileo boards happens over a wireless network. The UDP protocol is deployed to facilitate the wireless communication of the nodes present in the home automation network. A Pi Cam and a USB Logitech camera attached to the rotating shaft of two different servo motor capture snapshots that are passed as inputs to the Machine Learning based models trained using dlib-C++ to detect the state of the operation of the appliances. The proposed method uses visual modality to automate the appliances, as privacy concerns may emerge while using the images from some specific places, as a counter to this issue, an SPDT switch is added to the Raspberry Pi which whenturned off ensures that even if the images are taken from the webcams, they are just passed as inputs to the machine learning models and are not displayed on the website when the users accessthe website on the server address obtained from Raspberry Pi.

3) *Title - A Dynamic Distributed Energy Management Algorithm of Home Sensor Network for Home Automation System. AUTHORS - Tui-Yi Yang; Chu-Sing Yang; Tien-Wen Sung*

This paper proposes an optimization of home power consumption based on PLC (Power Line Communication) for an easy to access home energy consumption. This also proposes a Zigbee and PLC based renewable energy gateway to monitor the energy generation of renewable energies. ACS and DDEM algorithm are proposed for the design of an intelligent distribution of power management system to make sure ongoing power supply of home networks. To provide efficient power management the power supply models of home sensor network are classified groups viz. main supply only, main supply and backup battery, rechargeable battery power and non-rechargeable battery power. Devices with particular features are assigned to these groups. It targets to establish real time processing scheme to address variable sensor network topologies.

III. ARCHITECTURE

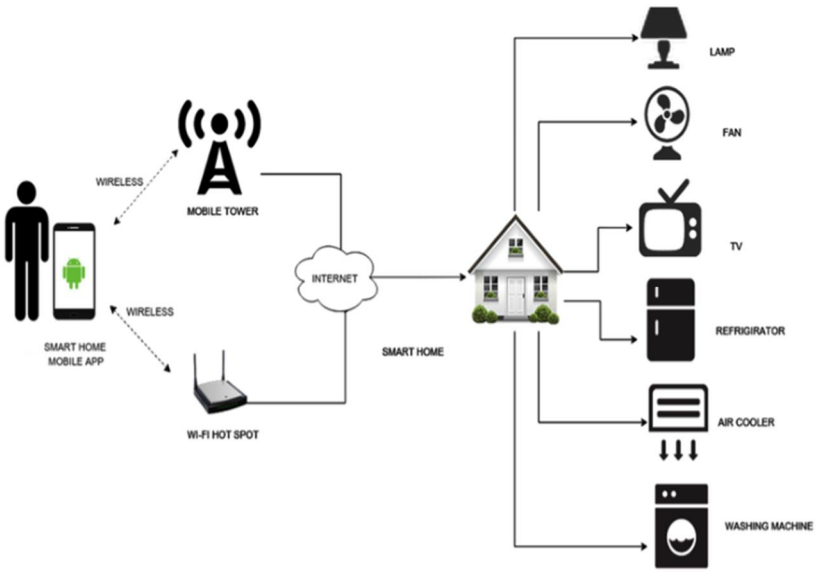


Fig 1. Modules framework

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IV. PROPOSED SYSTEM

Home Automation using Internet Of Things(IOT) refers to the automation wherein it allows theusers to control their devices using the Internet. In this proposed system, Arduino board is connected to NodeMCU Wi-Fi module in order to allow the devices to be controlled from anywhere in the world using the Internet. On the front end, we developed an Android app to pass signals to the NodeMCU circuit.

A. Hardware Components

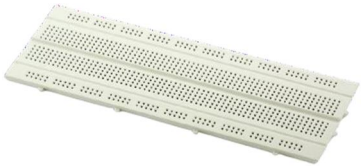
1) *Node MCU:* Node MCU is the microcontroller unit in the prototype. It has an in built Wi-Fi module (ESP8266) that establishes wireless remote switching of home appliances.



2) *Relay Module:* Relay module consists 4 individual relays physically connected between Node MCU and the home appliances. It takes signals form GPIO pins of Node MCU and accordingly connects or disconnects home appliances from the supply. They act as the switching device.



3) *Breadboard* - The breadboard is a white rectangular board with small embedded holes to insert electronic components. It is commonly used in electronics projects. We can also say that breadboard is a prototype that acts as a construction base of electronics.



4) *Security Lock* - Smart locks leverage IOT-enabled sensors to operate keyless entry devices that allow users to access doors remotely, through a smart phone or other internet- connected device.



5) *LIGHT* - Light are used in this prototype to replace real appliances. They indicate power being turned on and off to the appliances. In real time operation they would be replaced by actual home appliances.



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6) *FAN* - To use a fan with IOT Technology, on the platform you usually use to acquire applications and be connected to a Wifi network.



7) *DISPLAY* - The IOT displays on the market that solve the problem of wireless communication. Thanks to the ESP32 microcontroller onboard it's easy to send and receive dataover Wifi and Bluetooth.



8) *Water Motor* - IOT Water motor Controller automates the functioning of water motor, on the basis of flow and the level of water in storage tanks.This IOT water motor is ideal for smart homes, IOT based smart agriculture, IOT based industrial solutions and smart offices.



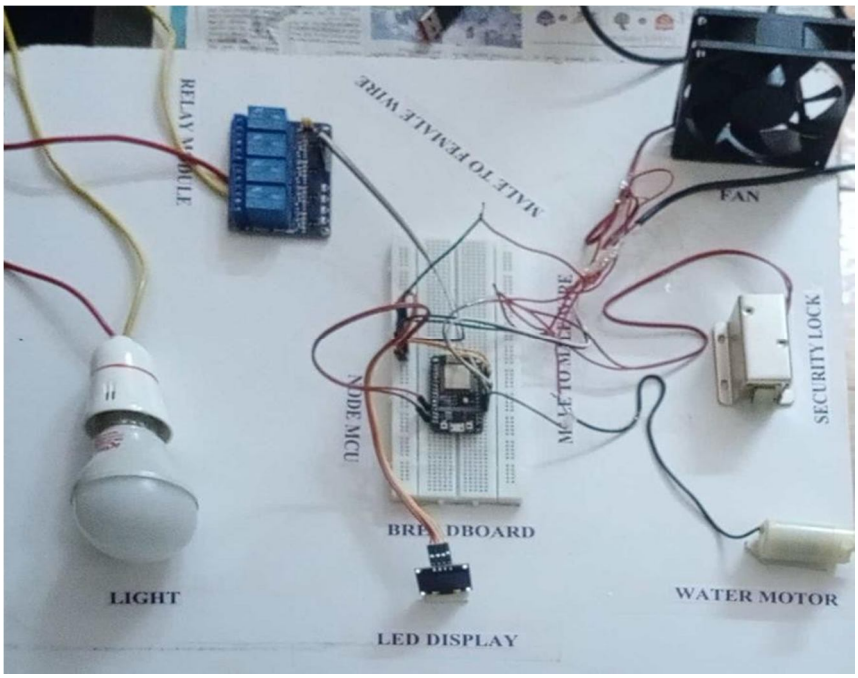
V. APPLICATION INTERFACE





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VI. IMPLEMENTATION



VII. CONCLUSION

It is evident from this project work that an individual control home automation system can be cheaply made from low-cost locally available components and can be used to control multifarious home appliances ranging from anywhere. As it is based on IOT we can assign access to our electronic devices being anywhere across the world. The designed home automation system was tested a number of times and certified to control different home appliances used in the lighting system, air conditioning system, home entertainment system and many more . Hence, this system is scalable and flexible.

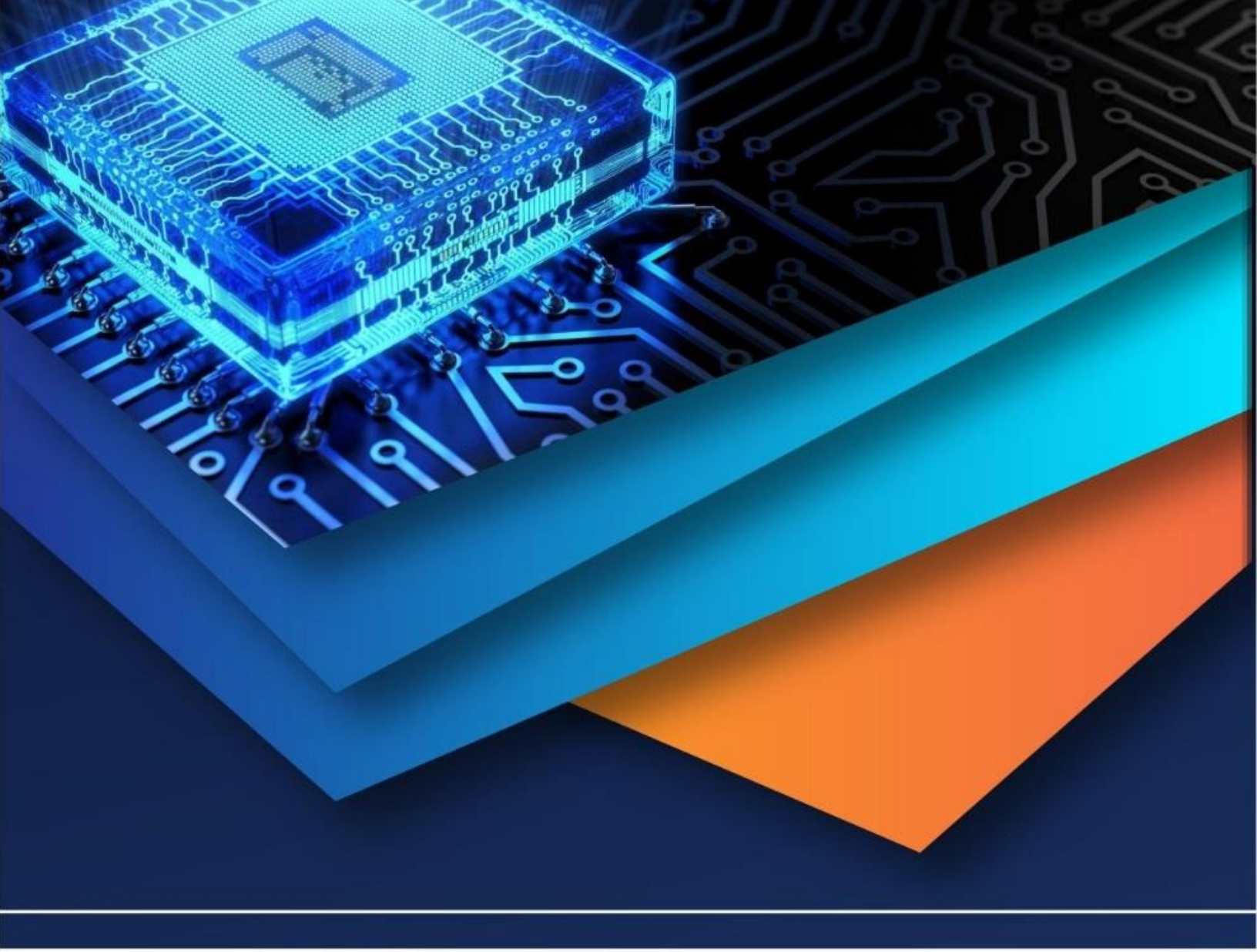
VIII. FUTURE WORK

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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