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Research Article

IoT based automation of a home and alert system

Zahraa M. Baqir
University of Thi-Qar, Electrical and Electronic Engineering Department, Thi-Qar, Iraq, zmbhmaly@gmail.com

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Abstract:

The paper's purpose is to have a low-cost, low-energy home control and security system. The home equipment is linked to the I/O ports of this board by relays for entering and dominated devices and equipment from a distance, and it is dependent on an associated micro – web server to the ESP32 microcontroller board. This equipment can be controlled using a smart phone app or web server. Wireless communication exists between the smartphone and the ESP32 board. To set the chance and action of the suggested home management system, motion sensors have been incorporated. This method was created with the goal of allowing a wide range of devices to be controlled with the fewest possible variables. Using the password of authorized users who can access and control the home appliances.

Keywords: *Blynk application, ESP3, Home automation, Internet of Things (IoT), PIR sensor.*

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1. INTRODUCTION

IoT is a scenario wherein various electronic gadgets, each with its own IP address, communicate with one another over the internet. In IoT technology, the electronic devices should have sensors, and they should sense the signal electrically and respond accordingly. And the sensed data was sent over the Internet to the other device [1]. While prices are rising, there is an increasing concentrate to include IoT technology to decrease those prices. With this in mind the Smart Home design allows the user to construct and protect a house that is smart sufficient to keep energy grades down while as well as more automated employments. A smart home will take usefulness, of its medium and allow smooth control whether the user is near or far. With a home that has this usefulness, you can know that home is execute at its best in energy accomplishment [1-3].

The idea of the smart home system is shown in Figure 1 ESP32 microcontroller is applied to gain magnitudes of physical situation through sensors linked to it. These inserted sensors such as the Passive Infrared Sensor (PIR) to reveal motion in the home when the security system is worked. The switching on and off of the devices is controlled by the smart phone from internet.

Figure 1: Smart Home.

2. METHODOLOGY

The work is primarily a strategy for bringing home management to a wider audience. This scheme consists of two major modules: the hardware module and the software module. At the core of this scheme is the ESP32 microcontroller which is also useful of serve as a small web server and the interface for all the hardware modules. All links and controls in this scheme pass through the ESP32. The smart home scheme offers switching operations to control devices joined to the relay switch. Another aspect of this scheme is the interruption detection which it shows using the PIR sensor and all these can be derived from the Smartphone application. Using ESP32 can interface with other systems to supply Wi-Fi and Bluetooth operation through its connection protocols, as a result, the necessity allows connecting between the ESP32 board and computer is abstracted, decreasing the costs and allowing it to function independently. The Wi-Fi chip allows the web via a wireless router, which acts as the internet gateway for the ESP32. Figure 2 shows a block diagram.

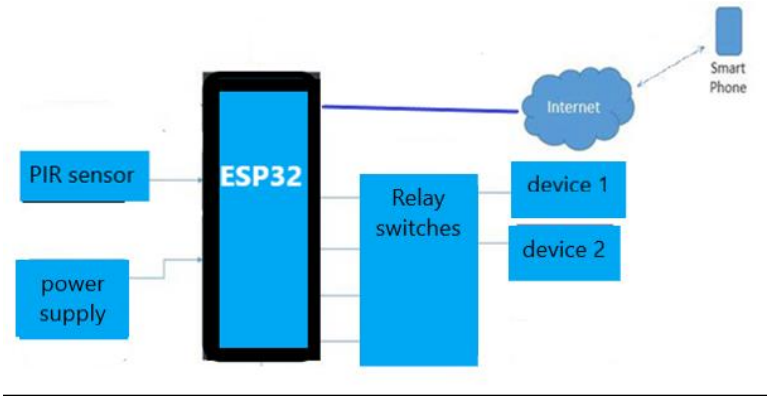

Figure. 1: Block diagram

3. HARDWARE REQUIREMENT

The modules used are,

- NODEMCU ESP32
- Motion Detector (Passive InfraRed)
- Relay

The NODEMCU (ESP32) In comparison to other controllers like PIC, PLC, and others, it was chosen as the microcontroller for this scheme because of its small size, compatibility, and stress-free interface [4].

ESP32 is a Wi-Fi enabled open source module developed on top of the manufacturer's proprietary SDK. The ESP32 is distinguished by its basic programming environment, which features a basic and quick programming language. The board has standard-sized GPIO pins that can be placed into our custom board, a tiny USB connector, a hard reset button, an antenna for Wi-Fi, LED lights, and other features [5, 6]. The NODEMCU diagram is shown in Figure 3. (ESP32). It has a Tensilica Xtensa Diamond Standard 106Micro-based L106 32bit RISC CPU core that runs at 80 MHz and has 32 Kbit instruction RAM. This module includes an IEEE 802.11 b/g/n Wi-Fi module that can handle the vast majority of bandwidth[3, 7, 8].

Figure 2: ESP32 Chip

The Passive Infra-Red (PIR) sensors provide permeation to detect movement, and are used to determine if human movement is inside or outside of the sensor's scope [9]. The PIR sensor is a gadget that becomes electrically charged when it is heated. Motion will be identified by scaling changes in the infrared level emitted by ringing objects. They have characteristics such as tiny size, low cost, low power

consumption, and ease of use. They are commonly utilized in domestic equipment and tools in homes and companies for all of these reasons [10]. The PIR sensor is shown in Figure 4.

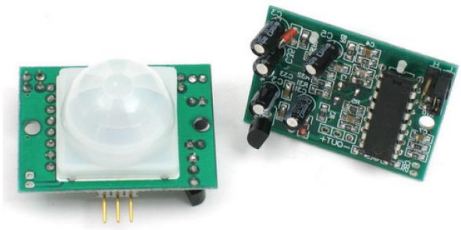

Figure 3: PIR motion sensor.

The relay switches: The relay switches have the capacity to be generated from an upper load of 10A at 240V to allow for power stoppers and switching of electrical equipment inside the home [9]. Any residential appliance can be derived from this, as these gadgets do not draw a lot of current. When a voltage is applied to it, it becomes charged. They are made up of three contactors: normally open (NO), normally closed (NC), and common (COM), which can be used to turn on and off home appliances using a subtle mix of these contactors. Figure 5 shows a relay module.

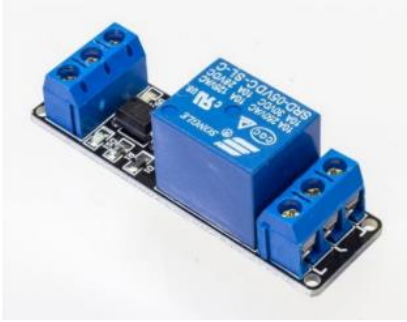

Figure 4: Relay.

4. WIFI MODULE

The ability of ESP's high-performance wireless SOCs allowing mobile platform manufacturers to combine Wi Fi functionalities addicted to another applications at the lowermost cost and with the greatest flexibility is unsurpassed.

5. SOFTWARE REQUIREMENTS

In order to operate and execute the specified wireless home automation system, a program must be built with efficient logic, and the code must be simple to validate and compile when it is written. Figure 6 depicts a complete flowchart depicting the entire system's functionality.

The detailed flowchart, which shows how the complete system works and is controlled via a smartphone app. The goal of this paper is to make the method of triggering household appliances more automated. To improve the accuracy of this project, a program built using the Arduino IDE was utilized Node MCU as a link between the Blynk app and the microcontroller. The developed application was uploaded to the node MCU using the Arduino IDE, and the module was configured to connect to the Blynk server. The Blynk app has been modified to incorporate on/off switches in order to remotely activatethe relays

attached to node MCU module as the input pins, and the Blynk app has been configured to connect with the certain distant Wi-Fi module using the Unique ID provided by the Blynk.

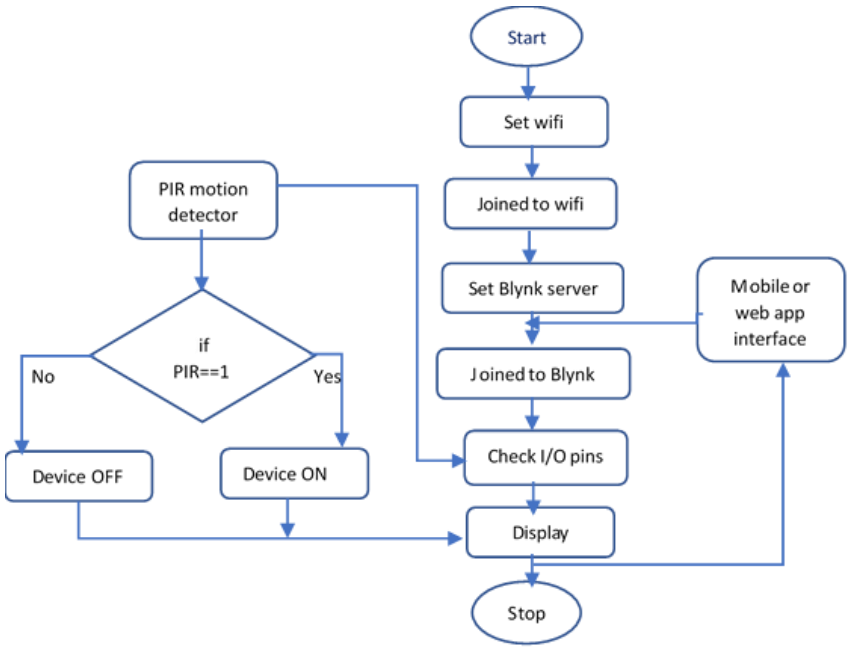

Figure 5: Flow chart.

6. RESULT AND DISCUSSION

Output images showing in figures 7, 8, 9, 10, 11, 12.

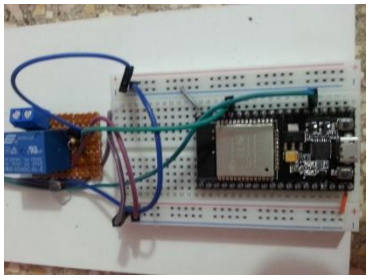

Figure 6: NODE MCU integration.

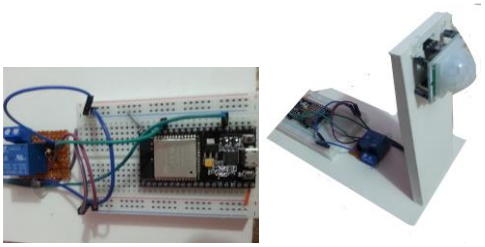

Figure 7: Integration of all components.

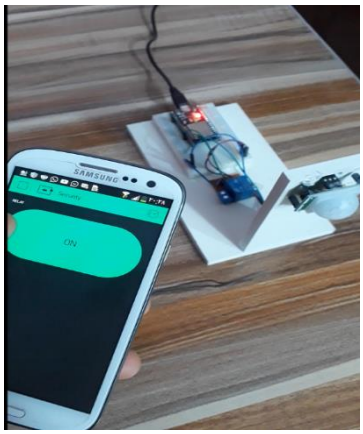

Figure 8: Blynk app. controlled in relay.

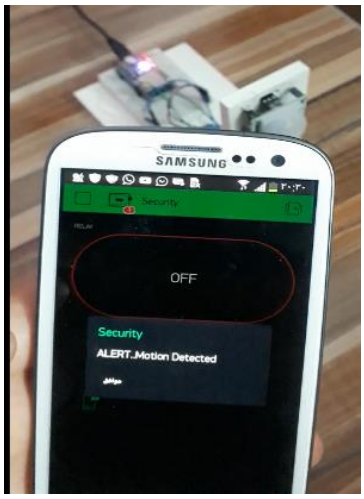

Figure10: Blynk notification when motion detection.

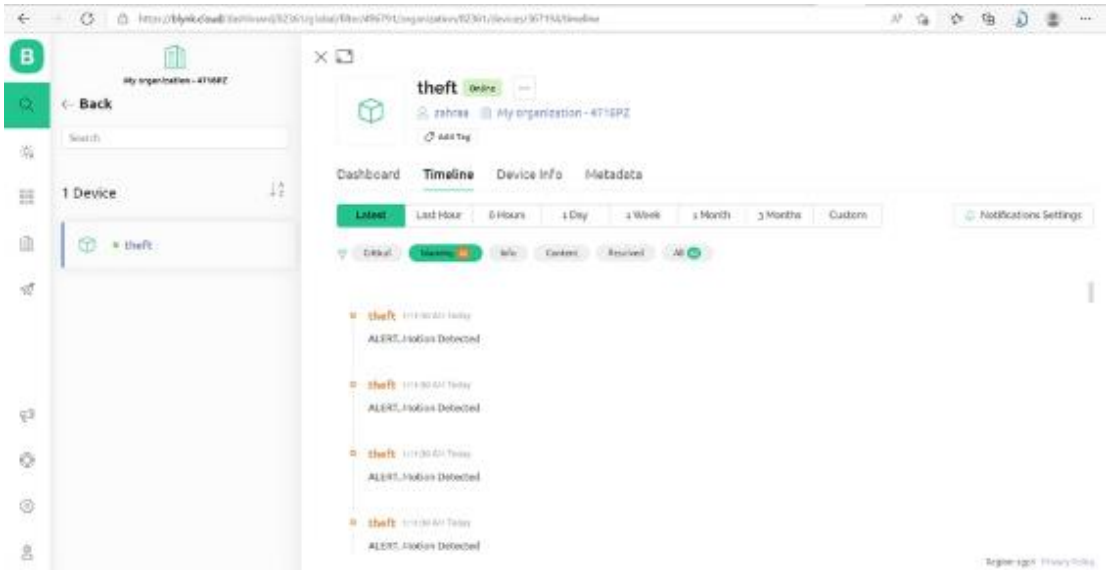

Figure 9: Report of notification in mobile app.

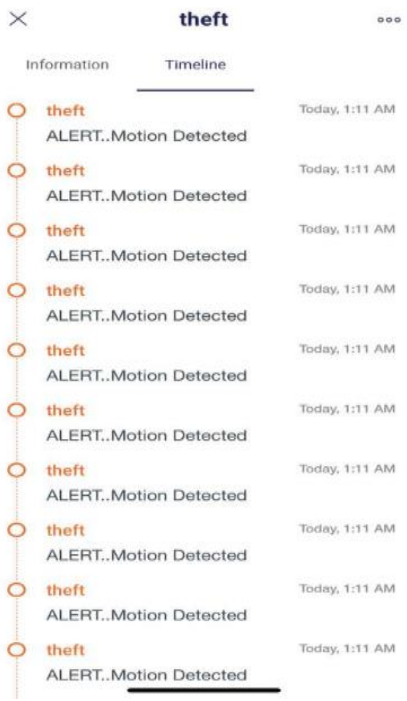

Figure 10: Report of notification on web dashboard.

7. CONCLUSION

Our home automation technology has, however, been tested and deployed in a functional prototype. The PIR sensor ensures that the appliances only turn on when there is actual movement within the set range. All of the associated appliances may be monitored remotely using the Blynk smartphone app, that works with both Android and apple smartphones. This prototype is being used to address a variety of real-world issues, such as streetlight automation and conserving energy by turning off appliances/devices when no physical action is taken. In the future addition, we're also focusing on integrating the with a prototype of an ultrasonic sensor which will permit us to extract data like distance through an object/person and improve human movement precision recognition using that data. To summarize, while this prototype may appear basic, the principle underlying it is quite revolutionary.

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