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Home Automation Using IOT by MQTT Protocol with Power Consumption Monitoring for Better Budgeting

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ABSTRACT

The Internet of Things (IoT) is a concept that entails using the Internet to link and monitor real-world items (things). When it comes to our home, we can leverage this principle to make it smarter, safer, and more automated. This Internet of Things project focuses on creating a smart wireless home security system that provides alerts to the owner via the Internet in the event of a trespass and, if desired, raises an alarm. Furthermore, by utilising the same set of sensors, the same can be used for home automation. The advantage gained by choosing this system over similar current systems is that the user can receive warnings and status from the Wi-Fi connected microcontroller managed system on his phone from any distance, regardless of whether his phone is connected to the internet. We'll construct a home automation system with the MQTT Protocol, a Wi-Fi module, and an Arduino Uno in this project. We will be able to operate lights, fans, and other home appliances via a web browser on a PC or mobile device. These AC mains appliances will be linked to relays that the Arduino will operate. We'll send control commands through a Web Browser like Google Chrome or Mozilla Firefox, and Arduino will operate as a Web Server. The ESP8266 is one of the most widely used and low-cost Wi-Fi modules on the market today.

Keywords: Internet of Things (IoT), MQTT, Power consumption, Home Automation.

1. INTRODUCTION

Wireless Home security and Home automation are the dual aspects of this project. If any kind of human movement is detected at the entry of the user's residence, the currently developed prototype of the system sends alerts to the owner via voice calls over the Internet and sounds an alarm at the user's choice. The technology also includes the ability to send alert messages to concerned security officers in the event of a severe emergency. Instead of triggering the security alarm, if the owner determines that the person entering his house is not an intruder but an unexpected guest, the user/owner can make arrangements such as opening the door and turning on various appliances inside the house that are also connected and controlled by the micro-controller in the system to welcome his visitor. When the user enters the room, the system allows him to make arrangements from his doorstep so that as soon as he enters his house, he may put himself at ease without having to physically turn on the electrical equipment or, for example, his favourite television channel. Thus using the same set of sensors the dual problems of home security and home automation can be solved on a complementary basis. Internet of Things is the latest and emerging technology, which will enable physical objects used in day to day life to connect to the internet and exchange data. In this paper, Smart home control system 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. This system uses PIC controller interfaced with MQTT using AT COMMANDS and sensors that enables wireless communication and remote control of various electrical appliances with in their home. First point

2. Literature Survey

Leoke et al [1] introduces a smart home system which could supervise household appliances remotely and realize real-time monitoring of home security status through mobile phone. The paper also describes the realization of system hardware and software in detail. This System combined embedded technique with GSM. Design adopted the Liod platform for master control system which core processor is PXA270 Xscale and singlechip expansion

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module to realize the information collection, analysis and processing. GSM module communicated to transmit all the information gathered by this system. Design also realized the video data acquisition, which can be transmitted via wireless or cable network to monitoring center to remotely understand the house condition. On the whole, through this system we can remotely and real-time monitor house status.As people living standard and security consciousness improvement, people pay more and more attention to the safe and comfortable living environment, so smart home has become a hot spot.

Pavithra et al [2] proposes an efficient implementation for IoT (Internet of Things) used for monitoring and controlling the home appliances via World Wide Web. Home automation system uses the portable devices as a user interface. They can communicate with home automation network through an Internet gateway, by means of low power communication protocols like Zigbee, Wi-Fi etc. This project aims at controlling home appliances via Smartphone using Wi-Fi as communication protocol and raspberry pi as server system. The user here will move directly with the system through a web-based interface over the web, whereas home appliances like lights, fan and door lock are remotely controlled through easy website. An extra feature that enhances the facet of protection from fireplace accidents is its capability of sleuthing the smoke in order that within the event of any fireplace, associates an alerting message and an image is sent to Smartphone. The server will be interfaced with relay hardware circuits that control the appliances running at home. The communication with server allows the user to select the appropriate device. The communication with server permits the user to pick out the acceptable device.

Zong-Lion et[3] al This thesis report describes the development of a smart home environment based on an accurate wireless sensors network using ZigBee communication protocol. In order to recognize the states/state changes of everyday objects, we used 81 sensors to sense the 42 everyday objects we selected in a realistic home environment. Knowing the states of the everyday objects is essential to perform further advanced computation for instance activity recognition. The promising results we obtained consequently provide a good base for such developments. The system has been evaluated in a realistic home environment with background noise (ambient light variations, WI-FI network with same frequency, etc). The sensing nodes have shown some interesting results with a precision value of 91.2% and a recall value of 98.8% concerning the recognition of the everyday objects' state changes. The experimentation has been accomplished by four individual users during one week. They were all wearing the same equipment for collecting data: a wearable camera and digital video recorder in order to obtain the ground truth, and an ultra-portable laptop (the personal server) connected to the receiving node. The ground truth obtained from the video recording is compared with the state changes information recorded in the personal server to evaluate the performance of the system.Many related works can be found concerning the development of a smart environment or a wireless sensor networking. A literature survey is presented to compare the different technologies used, the components used, etc.

BasmaM.Mohammed Ei-Basioni et al [5]proposes a new design for the smart home using the wireless sensor network and the biometric technologies. The proposed system employs the biometric in the authentication for home entrance which enhances home security as well as easiness of home entering process. The proposed smart home Wireless Biometric Smart Home (WB-SH) design is one of the few designs or it is the only design that addresses the integration between the wireless sensor network and biometric in building smart homes. The structure of the system is described and the incorporated communications are analyzed, also an estimation for the whole system cost is given which is something lacking in a lot of other smart home designs offers. The cost of the whole WB-SH system is determined to be approximately $6000, which is a suitable cost with respect to the costs of existing systems and with respect to its offered services. WB-SH is designed to be capable of incorporating in a building automation system and it can be applied to offices, clinics, and other places. The paper ends with an imagination for the future of the smart home when employs the biometric technology in a larger and more comprehensive form.

The flagship publication of the MTT-S is IEEE Transactions on Microwave Theory and Techniques. As the premier journal in the microwave field, it seek to capture and disseminate knowledge of RF, microwave, guided-wave, and wireless technologies. Provide a service to many of members who want to publish their contributions, and provide a service to readers by presenting the best, rigorously reviewed papers in the microwave field. Also provide essential fundamentals - continuing education - that enable readers to develop core understanding from which new concepts and products can be developed. Presumably, many articles are read this way. So the old wisecrack that a paper was read by the authors and the reviewers alone is certainly not true. A large spike in downloads occurs within days of an issue being released, so there are many people who use electronic access as the primary means for reading the transactions.

4. Existing System

The Internet of Things (IoT) is a rapidly expanding industry that is continuing to grow. In fact, "every day 5.5 million new things get connected to the Internet of Things" and it is projected that by 2020 there will be 30 billion connected devices, a huge increase from the current 6.4 billion devices. Smart home technology falls within this field. While the idea of a smart home is not a new one, the growing IoT space and emerging technologies are making new applications possible.To meet the criteria for an accurate, passive, non-intrusive system with a long battery life, multiple options were considered. The main options for location devices were RFID, facial recognition, and smartphones.

Both RFID and facial recognition software were ruled out because they do not meet the non-intrusive objective. RFID requires the user to wear an additional piece of technology and facial recognitionsoftware is invasive to the user's privacy. There are currently projected 4.77 billion smartphones in use today. The use of smartphones is so widespread now that seventynine percent of people ages 18-44 have their smartphones with them 22 hours a day. This supports the viability of using the smartphone as a non-intrusive method to locate a person within their home. In addition to a location device, a wireless personal area network (WPAN) is a central part of an indoor location system. There are many choices available when trying to select the best WPAN such as ZigBee, traditional Bluetooth, and Wi-Fi. Bluetooth Low Energy stands out for a variety of reasons. ZigBee is not found in iPhones and therefore is not conducive to smartphone localization. Wi-Fi is designed for computer-to-computer, communication and consumes a large amount of power; so while Wi-Fi is compatible with mobile devices, it is not the best solution [6]. While traditional Bluetooth has all of the functionality to

successfully implement this project the standard was designed to transmit large quantities of data, resulting in an excessive power draw unnecessary for this application.

4. Proposed System

The physical layer comprises of the gadgets which are to be controlled. The information interface layer comprises of IoT passage switch, gadget supervisor and different correspondence conventions. The gadget director will be the piece of raspberry pi. The Arduino is utilized as the IoT entryway which conveys to PC or advanced cell by implies web in the system and transport layer. The application and introduction layer comprise of online interface which is only outlining a site page by which we can control the different machines. The apparatuses can likewise be controlled by making an application in cell phone which is like online interface. Advanced mobile phones can be utilized to make the quick move if there is a crisis and it will naturally interface with close-by flame station if there should arise an occurrence of any fire mischances.

CLOUD SERVER

Different applications situated at home can be remotely controlled or checked by embedding the gadgets with the web server. The static and dynamic data are put away in inserted framework and it satisfies the requests on web programs. Such kind of web servers are called implanted web server. It's not exclusively that we will utilize the Arduino to instigate the data from servers by means of the web; in any case it likewise can go about as a server itself. There are numerous option web servers that might be introducing on the Arduino. Antiquated web servers, similar to Apache, serve the records from Arduino board to buyers. Arduino additionally can serve sound, video, workable projects, and far a considerable measure. Notwithstanding, there's another type of instruments that achieve programming dialects like Python, Ruby, and JavaScript to make net servers that progressively produce the hypertext increase dialect once they get interchanges convention demands from an online program.
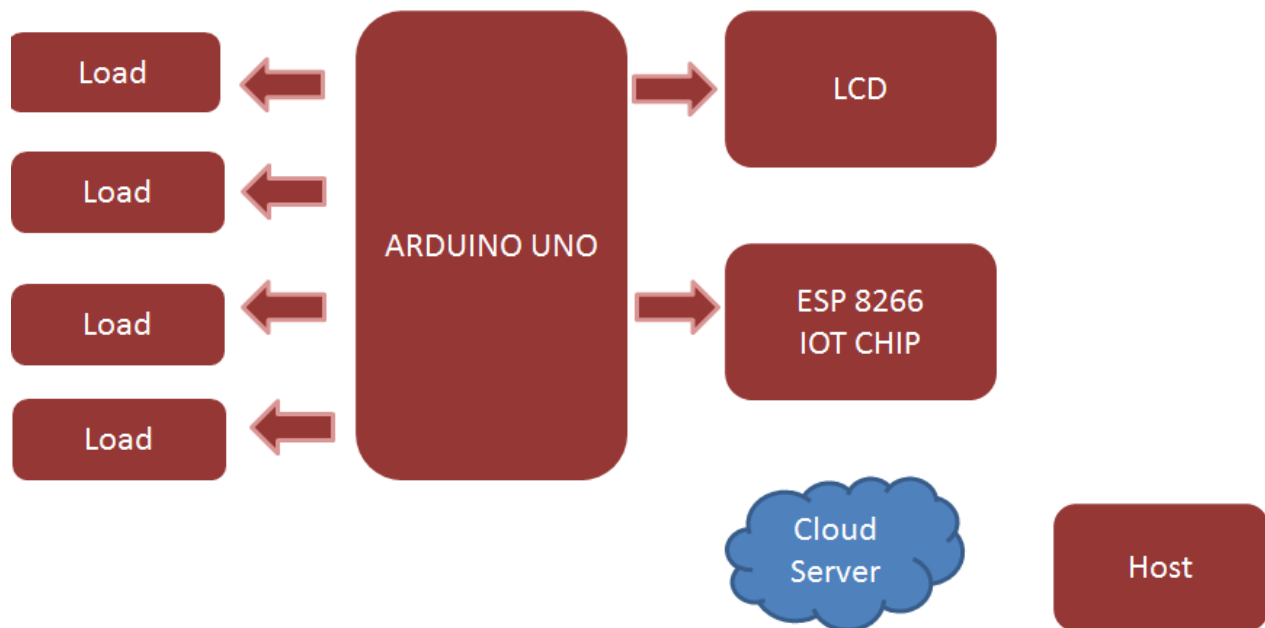

METHODOLOGY

Home Automation and Each and Every Individual Devices in the Home are monitored its current consumption. So we can control the current consumption within our budget. The venture proposes a productive usage for IoT (Internet of Things) utilized for checking and controlling the home machines through World Wide Web. Home robotization framework utilizes the convenient gadgets as a UI. They can speak with home computerization arrange through an Internet entryway, by methods for low power correspondence conventions like Wi-Fi and so on. This venture goes for controlling home machines through Smartphone utilizing Wi-Fi as correspondence convention and Arduino as server framework. The client here will move specifically with the framework through an online interface over the web, while home apparatuses like lights, fan and entryway bolt are remotely controlled through simple site. Expectation calculations to realize next occasion acknowledgment. Further, an Episode Discovery helps in finding the recurrence of event of these occasions and focusing on the specific occasions for mechanization. The adequacy of the Prediction calculations utilized is illustrated; making it clear how they end up being a key part in the productive usage of a Smart Home design. An additional element that improves the feature of assurance from chimney

mishaps is its ability of sleuthing the smoke all together that inside the occasion of any chimney, relates an alarming message and a picture is sent to Smartphone. The server will be interfaced with transfer equipment circuits that control the machines running at home. The correspondence with server enables the client to choose the suitable gadget. The correspondence with server allows the client to choose the adequate gadget. The server speaks with the comparing transfers. In the event that the web association is down or the server isn't up, the inserted framework board still will oversee and work the apparatuses locally. By this we give a climbable and cost viable Home Automation framework. Consider that, at 7:00 am, the caution goes off, which flags the room night light to turn off and all the while the espresso producer in the kitchen to switch on. Ann heads to the restroom, the news and climate figure is shown on the washroom reflect. At the point when Ann gets done with prepping and heads towards the kitchen to make them morning espresso, the lavatory light goes off, the news. Program moves to the kitchen divider. At the point when Ann leaves for work, the Smart Home secures the home and later that it puts in a basic supply request for drain and bread. At the point when Ann lands from work, the basic supply arrange has arrived. The Smart Home is speedy in recording minute subtle elements of connection of Ann with her home each and every moment.

4. Circuit Diagram
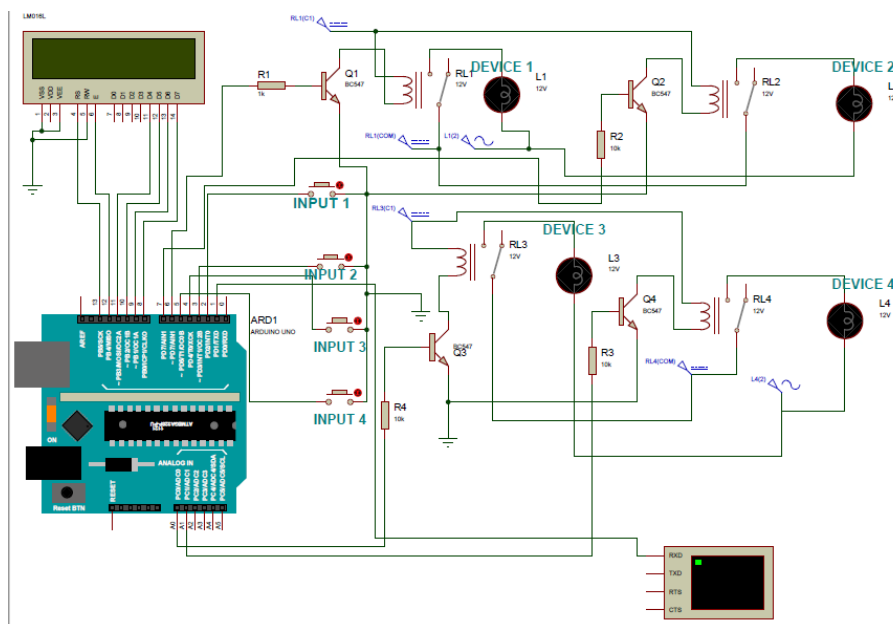
First we can connect ESP8266 with the Arduino Uno. The ESP8266 runs on 3.3V, it may damage if you connect it directly to 5V from Arduino.Connect the VCC and CH_PD of the ESP8266 to the 3.3V output pin of Arduino. CH_PD is Chip Power Down pin, which is active low. So we will give 3.3V to it, which will enable the chip. Then connect the TXD pin of the ESP8266 with the digital pin 2 of the Arduino. Then make a voltage divider to make 3.3V for the RXD of the ESP8266 which is connected to the pin 3 of Arduino. Here we are using software UART through digital pins 2 & 3 of Arduino. Lastly, connect the ground of the ESP8266 with the ground of the Arduino.Now we can connect relays to Arduino. Connect three relays to pins 11, 12 and 13 of the Arduino. Also connect 5V and ground from the Arduino to power the relay. Note that here I am using relay modules which having built in transistor driver. So don't forget to add driver when you are using bare relays. We can connect AC devices to the output terminals of those relays. First connect one wire (Phase) of the AC source with the common terminal (COM) of all relays and the second wire (Neutral) of AC source to one terminal of AC devices. Then connect the other terminal of AC devices to the NO (Normally Open) terminal of relays

4. Conclusions

The Current consumption is monitored and controlled by mobile app using the cloud storage, Thus the entire history of each and every Indidval devices are stored. The information interface layer comprises of IoT passage switch, gadget supervisor and different correspondence conventions. The gadget director will be the piece of raspberry pi. The Arduino is utilized as the IoT entryway which conveys to PC or advanced cell by implies web in the system and transport layer. The application and introduction layer comprise of online interface which is only outlining a site page by which we can control the different machines. The apparatuses can likewise be controlled by making an application in cell phone which is like online interface. Advanced mobile phones can be utilized to make the quick move if there is a crisis and it will naturally interface with close-by flame station if there should arise an occurrence of any fire mischances.

Acknowledgements

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