HOME AUTOMATION USING IOT

Srikar T[1], Dr. V Vijyashree Bolisetty[2], Dr. R V V Krishna[3]
[1]M.Tech, Embedded systems, Aditya college of Engineering and Technology, JNTUK-533437
[2]Associate Professor, Dept. of ECE, Aditya college of Engineering and Technology,JNTUK-533437
[3]Professor, Dept. of ECE, Aditya college of Engineering and Technology,JNTUK-533437

Communication mail:**talla.srikar@gmail.com**

ABSTRACT

In this study, RTOS and the Thing Speak cloud are proposed as a means of automating the routine tasks of daily life at home. Jim Hill popularized the term "domestics" to describe home automation, which has seen rapid development. The primary objective of current Internet of Things (IoT)-based monitoring of electrical equipment is to exert control over them in response to specific environmental conditions. There is a greater need for effective management in today's technological environment than ever before, since doing so is essential for maximizing output while minimizing power use. In most homes, the biggest power hogs are the fan, the lights, and the water pump. Avoiding the wasteful use of electricity and other resources caused by leaving on lights when it's not dark outsideor running high-velocity fans or when the water tank is full is a major benefit of this system. It has been suggested to implement a system that allows for remote control of domestic appliances to anywhere in the globe at any time, with the added benefit of optimizing the use of electrical resources. App is a cloud service that can collect data from sensors in the house and then let the user manage their electronic devices based on that information. Due to the user's busy schedule, the user will not be able to access the sensor data continually to take action through the cloud. Thus, the planned system utilizes ESP8266 to alert the user's mobile phone or other Internet of Things device in the event of an emergency.

Keywords: ***RTOS, IOT, ESP8266.***

1. INTRODUCTION

Some fundamental concepts form the foundation of the home automation progress. Human labor is reduced, and the technology may be used in many other contexts, including the military and surveillance applications that have recently emerged. These days, wireless technology is used to construct home automation systems. Wireless, Wi-Fi, and Zigbee Connection are the wireless technologies at the foundation of home automation. They implemented the messaging in projects based on the requirements and the applications. Further, there are a plethora of apps available in the Google Play store for controlling various home automation systems. The popular app Blynk was chosen for this project because of the extensive set of features it offers, which includes, among other things, buttons, gauges, sliders, and plotting tools. Wi-Fi technology allows for a higher number of home devices to be connected, controlled, and monitored, which is perfect for use in surveillance. This kind of Wi-Fi-controlled smart things is now feasible thanks to

advances in indoor localization technologies.

Smart homes are automated residences that make use of modern technological advances. Security and lighting systems, as well as reminder and entertainment gadgets, may all be integrated into a home's automation system and operated automatically per predetermined schedules. A computer loaded with the necessary software, the numerous systems to be operated, linking cables or wireless connections, a fast Internet connection, and necessary house systems are the foundation of the well home automation system. The Smartthings project uses a Node MCU-32S processors with 520KB of SRAM and an 8-bit digital-to-analog converter. The features of this paper include a smart security system, an entertainment system, the ability to regulate the lights, and alerts and reminders. An Android smartphone running the Blynk software may be used to remotely manage lights, alarms, reminders, and the media system. Through wireless communication, the android app directs the Arduino -32S to carry out the required task.

IoT[1] enables the remote sensing and controlling of items through preexisting network infrastructure, opening the door to more direct integration of both the physical realm into computer-based systems and bringing about gains in efficacy, precision, and monetary gain. These days, most people have access to 4G LTE cellular internet, which paves the way for faster developments in IoT-based smart appliances. Adding sensors and actuators to IoT makes it an example of the broader class of tech systems, which includes technologies like the remote control of various electrical appliances in the house, such as lights, fans, water pumps, and so on. Connecting sensor data with users' regular activities required the development of a dedicated system. Many existing remote controller solutions are designed to work with a Smartphone.

2. LITERATURE SURVEY

Rapid expansion of the internet has created new opportunities for progress in many areas. The market for home automation systems has been expanding rapidly over the last several years. In recent years, it's gained widespread attention from curious individuals all across the world.

S.No	Title	Technology	Limitations
1.	DoorAutomationsystem for smartHome Implementation.	PneumaticControl.	HAS suffersacertainlack of accessibility.
2.	Equipment forpowerlinecommunication based on singlecarrier systemforHome Automationsystem.	Combinationof WirelessandPLCTechnology.	Advancedmeasurementseriesisnotavailable.
3.	PowerMeterMonitoring forhome appliancesbasedonmobiledata communication.	Current kWhMeterTechnology.	
4.	DesignandImplementationof an Automatedsecurity systemusing TwilioMessagingservice.	Internet ofThings.	Can’tdevelopforfacerecognitionto restrictaccesstotheenclosedarea.
5.	Solar AssistedAdvanced smarthomeautomation.	Smart homeautomationusing solarpower, PROTEUS software.	CostEffective.

6.	A safe approachusingVirtualDevices toevaluate HomeAutomationArchitecture prior	WebTechnologyand InternetofThings.	High cost.
	installations		
7.	Smart HomeAutomation withauniquedoormonitoringsystemforoldage people usingpython, opencv,Android,Rasperrypi.	GSM/Zigbee module.	This system is not to predict Energy utilization in the household.
8.	Bluetoothbased HomeAutomationsystem using cellphone.	Bluetooth Technology.	Cost is not flexibile.
9.	Eyrie SmartHomeAutomationusing Internet ofThings.	Internet of Things.	Cost efficient.
10.	EmbeddedSystem forHome Automation usingSMS.	Global System for Mobile Communicat ion (GSM).	This system is not developed the audio or voice based remote home.

3. METHODOLOGY

Both software and hardware design play significant roles in the system's development process. Hardware design entails putting together components such a microcontroller, sensors, and actuators, whereas software design entails writing and uploading code to the microcontroller. The system architecture depicts a microcontroller coupled with sensor-modules and servo for use in home monitoring and control. In this blueprint, we see how the various pieces of hardware are arranged. Below, you'll find details and specs for a number of separate parts. The model has three sensor-modules and three loads, all of which may be controlled through a mobile application.

The system architecture is divided into two halves, i.e. Connectivity to a router is built into the hardware. To add to that, it might activate or deactivate appliances like lights and fans that you tell it to. The 'Control Unit' is the official name for this component. And, ii. In terms of the design's software, it consists of the Thing Speaking app, the If This Then That app, and the Voice Search app, all of which would be installed on an Android smartphone. The microcontroller is part of the Control Unit. Node MCU, an Arduino UNO, and a Channel Relay board. Using the internet, the Blynk app on to an Android mobile may talk to the microcontroller and transmit the appropriate signal. The skeleton of the system's layout is seen in Figure 3.1.

NodeMCU was created with the intention of making coding for the ESP8266 easier. There are two main parts to this. i. An ESP8266 open-source firmware that is based on the chip manufacturer's private software development kit. The embedded Lua (eLua) programming environment provided by the firmware is a lightweight alternative to more complex languages. The Lua programming language is simple to pick up for newcomers. To add, the Android IDE can be used to write code for NodeMCU as well. ii. The ESP8266 chip mounted on a common circuit board for use in development kits. The board comes equipped with a USB connector that is already linked to the chip, a hardware reset button, a Wi-Fi antenna,

several LEDs, and GPIO (General Purpose Input Output) ports that are breadboard compatible.

To switch between two different electrical circuits, a relay uses electromagnetic forces. In a circuit, a relay functions as a switch, an automated switch that is actuated by a microampere current. Relays come in a variety of forms and may be powered by a wide range of currents. Whenever a circuit is constructed, the voltage at which it will activate must be taken into account. The appliances' ON/OFF functionality is handled by a relay circuit in this setup. NodeMCU is the microcontroller responsible for supplying the high/low signal. It is possible to switch off or on appliances by applying different voltages to their relays.

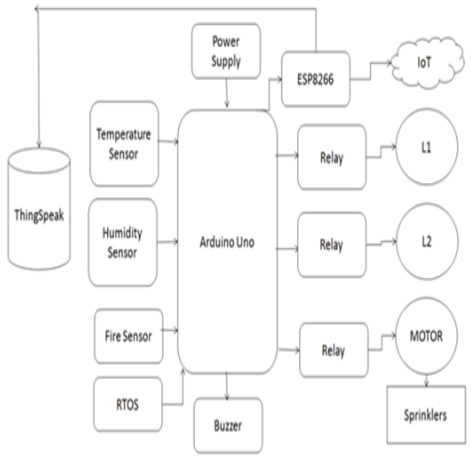

Figure 1: Proposed system

Blynk is an online platform with mobile applications for iOS and Android that allow you to remotely manage various boards including Arduino, Raspberry Pi, NodeMCU, and more. Blynk was created

with IoT in mind. To name just a few of its many useful features, it allows for remote

hardware control, the presentation of sensor data, the storage of data, and the visualization of that data. The Blynk app has to be set up, and we do that for you. First, we make a project, and then we choose the microcontroller. The microcontroller's digital pins are then assigned to relays, and toggle buttons are made to operate them. As soon as this is completed, Blynk will send a token of authentication to the project's associated email address.

Authorized users in a remote environment may access the system from anywhere using an internet-enabled smart phone app and a Wi-Fi, data connection linked to a 3G/4G network. Typically, a home network will have a router and an external hardware module. In the proposed design, the Home router(gateway) is responsible for translating data across the Internets by means of requests and answers. The heart of the Home Gateway is an embedded microcontroller and Ethernet-based webserver based on the Arduino platform. The server's primary function is to manage, regulate, and monitor system components, allowing hardware interface modules to carry out their designated tasks utilizing actuators and to report server-triggered events, such as smoke detector activations, to the server. The sensors and actuators are wired directly to the hardware interface modules. It can regulate electrical loads like lights and outlets, as well as access and safety features like locks and gates. The system is compatible with sensors for monitoring and managing the home environment, including temperature, smoke, and humidity.

4. IMPLEMENTAION

Real Time clock basedhome automation in an advanceprojecttocontrolthedevicesintimely andsystematicmanner. The devices can be controlled wirelessly from otherplacesusingwirelesstechnology.RTC

eISSN 1303-5150

withEEPROMcan recordalltheworkingparametersinthedevice sorappliances.Basicallytheprojectisaconce pttobringautomation in

Figure 2: NodeMCU

the industry or home. All the home applianceswillbecontrolledbymobileapp. Theappliancesintheindustry or home will be interfaced with centralized microcontrollerNODEMCUforthesystemat icworking.Theinbuilt RTC and EEPROM present in the controller will beactivated for the operation. The controller also interfacedwithWIFItoreceivethecontrolco mmandsfrom Wi-Fishield (Wi-Fi hotspot). The operator will be provided withMobile app having Wi-Fi in that. If operator wants to switchthe Light to turn on or off he needs to switch control buttonprovided in app. Once he switched the Wi-Fi will send thedata to Wi-Fi present at microcontroller. As and when therequest is receivedthemicrocontrolleractivatestheRT Cand EEPROM and as per request received the operation willbedone.Inthesamewayallotherapplianc escanbecontrolled.

A. NODEMCU

NODEMCU(esp8266)hasbeenselecte dasthecontrollerforthissystemduetoitscomp actsize,compatibility, easy interfacing over several other type ofcontroller including Programmable Integrated Circuit (PIC),Programmable Logic Controller (PLC) and others. ESP8266is an open source firmware that is built on top of the chipmanufacturer's proprietary SDK. The firmware provides asimple programming environment, which is a very simpleand fast scripting language The ESP8266 chip incorporateson a standard circuit board. The board has a built-in USBport that is already wired up with the chip, a hardware resetbutton, Wi-Fi antenna, LED lights, and standard-sized GPIO(General Purpose Input Output) pins that can plug into abreadboard..Figure-3showsthe diagram of NODEMCU(ESP8266).IthasProcessorcall edL10632bitRISC

microprocessorcorebasedontheTensilica XtensaDiamond Standard 106Micro running at 80 MHz and has amemory of 32 Kbit instruction RAM ,32 Kbit instructioncache RAM, 80 Kbit user data RAM&16 KbitETS systemdataRAM.Ithas inbuilt Wi-Fimoduleof IEEE802.11b/g/nWi-Fi.

B. Relay

Relay is nothing but it is the electromagnetic switch. Relayallows one circuit to switch another circuit while they areseparated. Relay is used when we want to use a low voltagecircuit to turn ON and OFF the device which required highvoltage for its operation. For example, 5V supply connectedto the relay is sufficient to drive the bulb operated on 230VAC mains. Relays are available in various configurations ofoperating voltages like 6V, 9V, 12V, 24V and so on. Relayis divided into two parts, one is input and other is output.Input side is nothing but acoil which generate magneticfield when small input voltage is given to it. Relay havingthree contactors: Normally closed (NC), Normally opened(NO)andcommon(COM).Byusin gthe

Figure 3: Temperature Sensor

propercombinationsofthecontactorselectr icalappliancesmayturnON or OFF. [2]

Figure 4: Relay

C. LightSensor

A Light Sensor is something that a robot can use to detectthe current ambient light level - i.e. how bright/dark it is.Therearearangeofdifferenttypesoflight sensors,including'Photoresistors','Photod iodes',and'Phototransistors'.

Figure 5: Light sensor

D. TemperatureSensor

This module is used to measure temperature. DS18B20 areone wire bus protocol, which requires only one data line forcommunicationwith NodeMCU.LM35is a temperaturesensor that can measure temperature in the range of -55°C to150°C.Itis a3-terminaldevicethatprovides ananalogvoltageproportional tothetemperatureNodeMCU ADCcanbeusedtomeasureanalogvoltagefro mLM35andsotemperaturewhichisinproport ionto theanalogvoltage.

5. RESULTS AND DISCUSSION

The Arduino IDE is used to write programs for the Arduino Uno, and the board may be connected to a wide variety of sensors (such as a temperature sensor, PIR sensor, flame sensor, or gas sensor) through jumper wires. The sensors provide data into the Arduino, and the microcontroller may then be instructed to carry out predetermined actions in response to those readings, so allowing the user to automate the functioning of the appliances.

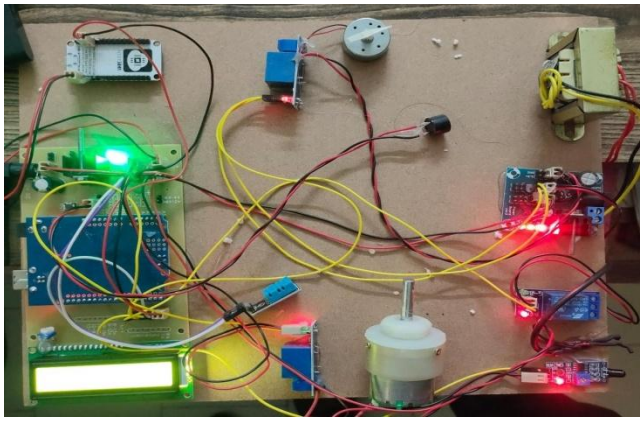

Figure 6: The Hardware Implementation of the Kit.

Figure 7 : Sprinklers Off when No Fire.

Figure 8 : Normal Temperature when temperature senses the below 35^{o} C.

Figure 9: Display of Sensor Values.

- The ESP8266P controller runs the home automation system, while the Blynk android app on a mobile phone issues commands through the Wi-Fi connection.
- The ESP8266P features a built-in Wi-Fi module and can communicate with home automation gadgets.
- One authentication token connects both wireless networks.
- • ThingSpeak will use wi-fi to send commands to the electrical devices, allowing the devices to operate as needed.
- The user must input the right actual IP address and password in order to connect to and utilize the smart home micro web-server. A response packet with response code 200 indicates that the android web server has granted access to the smart home app operating on the android platform. The micro web-answer server's is determined by the application's processing of the response packet. If the response packet from the web server has the code 200, indicating that the password was successfully entered, the program will go to the main control page and synchronize using the information included in the response packet. If the wrong password is entered, a 404 error packet will be issued. Standard format for a response packet. The response code and the list of devices and their statuses are separated by a space, while the devices themselves are separated by a colon (:). The response packet will read "200 Fan:1" if the user's request to switch on the device associated with the IP address "Fan" from the app was successful. A value of 0 denotes an off state and a value of 1 an on state.
- Advantages
- Centralized control of all of your electronic gadgets at home.
- Adaptability to emerging technologies and home furnishings.
- Optimal home safety measures
- Accessing your home's electronics from afar.
- Enhanced power efficiency
- There will be an increase in the efficiency of home appliances.

CONCLUSION & FUTURE SCOPE

The goal of this project was to suggest a method for automatically controlling common household appliances that is both affordable and practical. With the implementation of IOTCHA's (Internet of Things Controlled Home Automation) design, the strategy discussed in the project was a success. For the elderly or disabled who are confined to a wheelchair and unable to reach the power switch themselves, this system is an excellent alternative. Possible future ramifications of GACHA are substantial. GACHA can be made more useful for home automation by enhancing its power, intelligence, and scalability. By adjusting the fan speed, for instance, a greater number of appliances, such as a coffee maker, air conditioner, and so on, can be synchronized. Making one's very own private ThingSpeak server can significantly increase the speed at which the system responds. The truth is, though, that no

eISSN 1303-5150

system is foolproof. There is always room for development. Putting on one's thinking cap and attempting to make the system better is all that is required.

REFFERENCES

1. H. Singh, V. Pallagani, V. Khandelwal and U. Venkanna, "IoT based smart home automation system using sensor node," 2018 4th International Conference on Recent Advances in Information Technology (RAIT), Dhanbad, 2018, pp. 1-5.

2. P. J. Rani, J. Bakthakumar, B. P. Kumaar, U. P. Kumaar and S. Kumar, "Voice controlled home automation system using Natural Language Processing (NLP) and Internet of Things (IoT)," 2017 Third International Conference on Science Technology Engineering & Management (ICONSTEM), Chennai, 2017, pp. 368-373.

3. N. Vikram, K. S. Harish, M. S. Nihaal, R. Umesh, A. Shetty and A. Kumar, "A Low Cost Home Automation System Using Wi-Fi Based Wireless Sensor Network Incorporating Internet of Things (IoT)," 2017 IEEE 7th International Advance Computing Conference (IACC), Hyderabad, 2017, pp. 174-178.

4. N. Kushiro, S. Suzuki, M. Nakata, H. Takahara and M. Inoue, "Integrated residential gateway controller for home energy management system," in IEEE Transactions on Consumer Electronics, vol. 49, no. 3, pp. 629-636, Aug. 2003

5. V. H. Bhide and S. Wagh, "i-learning IoT: An intelligent self learning system for home automation using IoT," 2015 International Conference on Communications and Signal Processing (ICCSP), Melmaruvathur, 2015, pp. 1763-1767.

6. P. S. Nagendra Reddy, K. T. Kumar Reddy, P. A. Kumar Reddy, G. N. Kodanda Ramaiah and S. N. Kishor, "An IoT based home automation using android application," 2016 International Conference on Signal Processing, Communication, Power and Embedded System (SCOPES), Paralakhemundi, 2016, pp. 285-290.

7. C. J. Baby, F. A. Khan and J. N. Swathi, "Home automation using IoT and a chatbot using natural language processing," 2017 Innovations inPower and Advanced Computing Technologies (i-PACT), Vellore, 2017, pp. 1-6.

8. Bromley, K., Perry, M., Webb, G. “Trends in Smart Home Systems, Connectivity and services” 2003, www.nextwave.org.uk

9. Thomas Baudel and Michel Beaudouin-Lafon. 1993. Charade: remote control of objects using free-hand gestures. Commun. ACM 36, 7 (July 1993).

10. IFTTT: https://ifttt.com/discover https://www.pocketlint.com/SmartHome/SmarHomenew s

11. Blynk : https://www.blynk.cc/ https://docs.blynk.cc/ [3] NodeMCU: https://nodemcu.readthedocs.io/en/master https://iotbytes.wordpress.com/nodemcupinout/

12. Google Assistant:

https://assistant.google.com/intl/en_in/
https://www.pocketlint.com/Apps/Appsnews/Googleapp news

13. IoT: https://internetofthingsagenda.techtarget.com/definition /IoT-device

14. ULN2803 IC working: http://www.gadgetronicx.com/working-of-uln2803-ic/Webhooks: https://webhooks.pbworks.com/w/page/13385124/Fro ntPage

15. Application/JSON: https://www.json.org/ [9] Arduino IDE: https://www.arduino.cc/en/Guide/Environment