 ISSN: 2454-4248
31 – 38

A Brief on Home Automation Using IoT

Taanvi Goyal[1], Aditi Sharma[2], Renu Soni[3], Mr. Indra Kishor[4]
[1,2]Student, Department of Information Technology, AIET, Jaipur, Rajasthan
[3]Student, Department of Computer Science & Engineering, AIET, Jaipur, Rajasthan
[4]Assistant Professor, Department of Computer Science & Engineering, AIET, Jaipur, Rajasthan
taanvigoyal911@gmail.com,aditisharma3698@gmail.com,renusoni3939@gmail.com,ijs2k8@gmail.com

Abstract: With the recent advances in automation worldwide, items that are widely available to every person of the country are crucial to keeping their rapidly developing environment up to date. We are delighted to showcase our investigation using these items on an IOT-based home automation device designed, implemented and produced in India. Energy efficiency conservation is becoming a major challenge in developing countries worldwide, in particular. A key cause is the lack of knowledge among end-users (or customers), which may help mitigate the above-mentioned problem, of the employment of new and developing techniques and technologies e.g. Internet-of-things (IoT). This research presented the most advanced technology in the literature on IoT-compatible energy conservation methods. This study also points out aspects of the infrastructure and communication models utilised to create IoT-enabled applications in the literature.

Keywords— Internet of things (IoT), Home appliances, Arduino mega2560, Graphical user interface (GUI), Server, Door permission, NodeMCU.

*****

I. INTRODUCTION

One of the most important components of a luxury house is the home automation system. Clever, safe, user-friendly and affordable home electronics are both comfort and comfort. Everybody nowadays desires a safe and happy home life. Different research activities have been carried out in home automation technology. The interoperability of many technologies in the home environment is the key aspect of the development. As a communications protocol, Smartphone and Wi-Fi and raspberry pi are displayed as a server for home device monitoring and control.

Minoli et al. [3] have launched IPv6 and 6LoWPAN, a single network server for both the conventional and developing parts of home automation. Since no connections have to be carried up, the wireless solution ZigBee and 6LoWPAN are in place. The monitoring of energy use in the house via the Internet of Things (IoT) in real time data may be found in and designed the home automation system based upon an independent Arduino BT Board, the home automation system for cellular telephones. The Smartphone and Bluetooth technology gives physically challenged person aid and support.

The Bluetooth idea is suited for home device control. Ku€nzel et al. [7] offered an overview of wireless sensor networks, including difficulties. K et al. [8] conducted monitoring and subsequently calculation of the power utilised by the equipment for electrical characteristics on home devices such as voltage current. This technology, which makes the right use of electricity in a household, can enhance the power management in a household. House automation also

 ISSN: 2454-4248
31 – 38

known as "domotics" is construction control of a house, which in brief is connected to a central structure also known as a "gateway" by devices over which control must be carried out. In the United States, some 1,5 million home automation devices/systems have been installed, according to an experimental work done [6].

This system includes two components, including the control and monitoring of the devices and the intelligent permission system. Different procedures such as graphical user interface are available to monitor and control home equipment (GUI). This automation system allows distant users to transmit and receive data through the internet. The user may monitor online or offline the ON/OFF state and operate the home devices. He is able to look at his family, safety officers etc from anywhere, anytime via his Smartphone or desktop. For convenient and safe contact, the door licence system allows the visitor and the homeowner the free choice[8][9].

II. PROPOSED SYSTEM

The below figure 1 shows the fundamental work of the system suggested. This system eliminates the bridge stage from the current system as opposed to the present system, which reduces the hardware set. The division on the switchboard is accomplished for tapping on the device in the second phase. The gadget is mounted to the desired job via the switchboard.

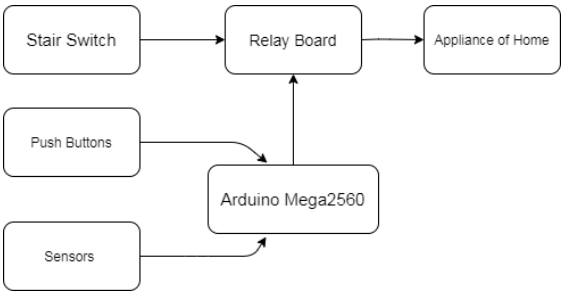

Figure 1: The proposed working idea

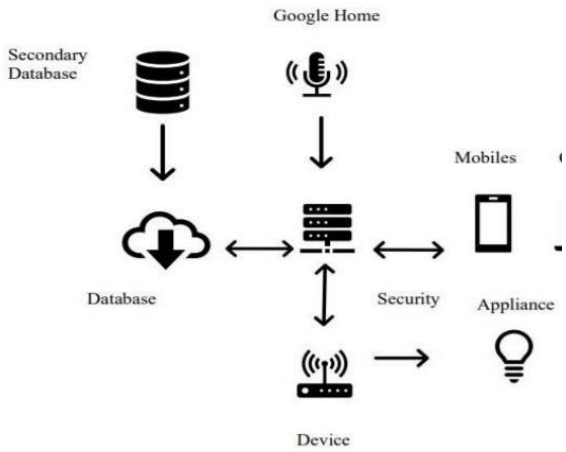

Figure 2: Working architecture

This system may provide advantages over the present system

• Cost efficient. • Plug & Play. • No Include the following. • No upgrading necessary for the appliance.

 ISSN: 2454-4248
31 – 38

III. SYSTEM FUNCTIONALITY

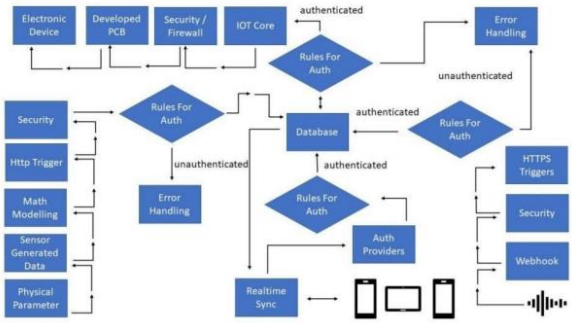

Figure 3: Flowchart of entire system

To describe about the functioning of the system designed and developed, the above figure 3 shows the flowchart of the system.

Directly connected to electrical gadgets will be developed gadget. The gadget is coupled to a platform for the IOT core safety. Only then is the CRUDE operation carried out when the rules and regulations are complied with [5].

Error handling - The data is processed when the rules are not fulfilled, and the user's next input retriggers the procedure.

Authentication - Authentication providers are the key to match before updating and publishing data. This is done on mobile apps and similar platforms.

Realtime Sync- Syncs the data in all logged in devices.

It decides whether the database should be upgraded or down based on the amount of users at that moment utilising the database. In addition, the application also offers additional security.

IV. SYSTEM HARDWARE

Initially attempts were made to reach an automated house model by the installed device together with all deliverables, including mobile appliances, sensors modules... This project utilised many electrical components, modules, hardware, etc. This section provides the details of the hardware setup and the hardware utilised for the demonstration [7].

As noted in the preceding section, a PCB board incorporates the solution we have offered for the challenges described. The PCB board has been soldered with all the components [2].

The PCB is fitted/connected to the room control panel and is connected to the Wifi to operate the electrical appliances linked to the control panel.

V. CIRCUIT BUILDING

It is vital for the intended work of equipment to connect it correctly and with the right value of each component, resistor, capacity, etc. In order to achieve the correct results from the planned circuit, many calculations are carried out

 ISSN: 2454-4248
31 – 38

by us. Some data for which the relevant components were collected [11]. Each circuit will be calculated and operated as follows:

Figure 4: Printed circuit board used

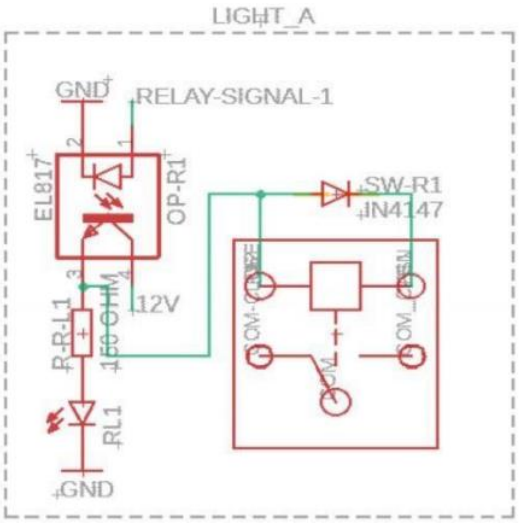

Figure 5: Circuit diagram for light control system

The circuit contains optocoupler, resistor, diode, relay.

Each of which has the following function:

- Optocoupler: the optocoupler's principal role is to transmit electrical signal in terms of a light system. This also protects against voltage.
- Resistors: The resistor restricts the quantity of current into the circuit.
- Relay: Relaxation at a time is possible by open the NO (normally open) one circuit and close the other by NC (Normally Closed).

VI. CIRCUIT INTEGRATION WITH NODE MCU

Node MCU is the microcontroller we utilised for controlling all the circuit peripherals and sections. We use the ESP 12F microcontroller that might be called the node MCU brain.

 ISSN: 2454-4248
31 – 38

The core of today's project is the WiFi-enabled board, the NodeMCU development board based in ESP8266. The open source platform for the development of embedded WiFi-based devices is based on the popular WiFi module ESP8266 running NodeMCU, which uses Lua based software.

Figure 6: NodeMCU

The Arduino IDE is one of the easiest means of programming NodeMCU. However, by installing the board support file for NodeMCU, you must configure the Arduino IDE.

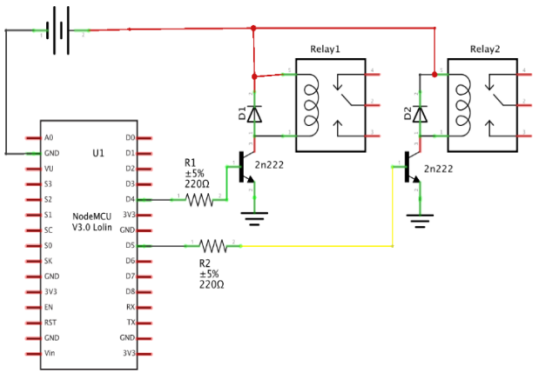

Figure 7: NodeMCU- Relay Module

The figure 1 in the report shows the IoT-based monitoring and control diagram for intelligent home devices. It includes of its peripheral devices of controllers such as Arduino Mega2560. In doing so, Arduino processes both the device control signal and the communication system text message. It accepts 2.4 TFT input, push button and Hall Effect sensor and the output goes across to the relay board.

VII. BACKEND INTEGRATION AND DEVELOPMENT

Backend Integration means that the device is connected to the cloud platform and handles all the events created by the application, together with sensor triggers and the voice interface. We used several cloud tools to do this, such as Firebase, Google OAuth 2.0, etc. We had also applied our skill in dart, java, python, kotlin, etc... numerous SDKs, such as Firebase Auth, Firebase Database, etc. We utilised the IoT core to authenticate the security of our device and it gives the correct flow of data to the device without issue. Offline status may also be dealt with.

 ISSN: 2454-4248
31 – 38

The application end of the cloud also offers adequate authentication. It also enables us to expand and manage our payment according to our restrictions in a highly effective method. The Firebase is a number of services including authentication, database administration, user management and more, enabling users to access several authentication platforms such a Google sign-in. We will also offer additional functionalities, such an IoT node, to link the backend to the cloud platform IoT core and then link the IoT core to the Firebase.

VIII. EXPERIMENT AND RESULT

The experiment and testing of the above-mentioned system was conducted and successfully executed in a room. You may use your IP address 192.168.50.154/login.html to reach the home automation system through a smartphone. Ardunio is the server of the intelligent home

The user identification page and the user identification password are required for the login page. It prevents illegal access to the intelligent home system. The contents of the home page are arranged such that the contents of the smartphone automatically adjust to any screen. This is why users may choose a different-screen smartphone. Likewise, the room list and the content of the home page may also be automatically adjusted and the contents of the many websites may be organised optimally.

The control displays the homepage of home appliance monitoring and checking. Step 2 lists the rooms in the building, where the equipments, such as bedroom, sitting area or kitchen, will be selected. The bedroom is controlled and the status of a bedroom's equipment is monitored.

The bulb is chosen to know the condition (ON or OFF). You may access the control and status window page of the device that you have chosen to switch on a bulb. GUI makes user-friendly device monitoring and control easier. The control step is a series of instructions to monitor and control the user's devices [15].

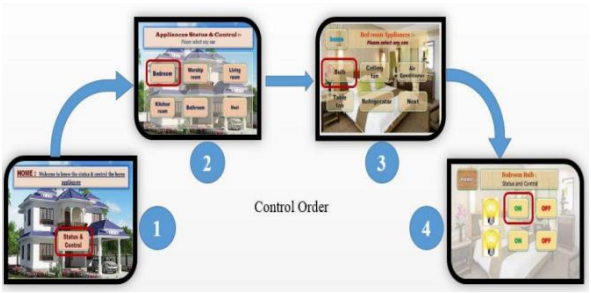

Figure 8: Control steps of smart home using GUI interface

IX. DISCUSSION

The homepage offers the opportunity to access home appliances, messages may be accessed by voice, video, text and camera, and live video streaming is offered from a smart home.

Without any involvement on a laptop/desktop or Smartphone, the home automation user may remotely view the family and the security employees of Smart Home and can also monitor and operate domestic devices.

 ISSN: 2454-4248
31 – 38

This technique may also be employed by careful planning and monitoring of the equipment to reduce electrical energy wastage in the residence. For longer-term operations, the system responsiveness is good and durable [13, 14].

X. CONCLUSION

Most of the project has been devoted to the population of the middle class has the emergent technology i.e., home automation, IoT, cloud. To achieve the major binding aim was the development of the gadget minimising cost aspect and making the finest experience cheaper. Most services and technologies. The objective was to develop a tool to regulate standard lights and fans with correct identification security remotely from anywhere to safeguard user routine, choice, and nobody else may modify the current status of the appliance except on user. The scope of this project may be seen as a product presented on the technical market for this project. Other variables include making the necessary modifications with the aim and the same concept may be used for control of equipment in offices, schools, etc. This project may also be utilised in agriculture approaches like irrigation with the aid of a self-communicating network and other necessities [10, 12]. This article offers the intelligent home a cheap and adaptable option. Different ways like GUI interface and world wide web operate the home appliances. The household person may observe from anywhere at any time his family, security guards and the building, as required or required by him. It increases building safety and allows the user to warn and take the actions required for the protection of family members. The technology minimises the housekeeper's work to monitor and regulate the equipment and to handle the guest in the most appropriate manner by verifying and responding appropriately.

REFERENCE

[1] Guth Jasmin, Breitenbücher Uwe, Falkenthal Michael, Fremantle Paul, Kopp Oliver, Leymann Frank, Reinfurt Lukas. 2018, A Detailed Analysis of IoT Platform Architectures: Concepts, Similarities, and Differences, Institute of Architecture of Application Systems, 10.1007/978-981-10-5861-5_4.
[2] Zanella Andrea, Bui Nicola, Castellani Angelo, Vangelista Lorenzo, Zorzi Michele. 2014 Internet of Things for Smart Cities, IEEE Internet of Things Journal, 10.1109/JIOT.2014.2306328.
[3] Minoli Daniel, Occhiogrosso Benedict, Sohraby Kazem, Gleason James, Kouns Jake, 2017, IoT Considerations, Requirements, and Architectures for Insurance Applications, IEEE.
[4] Seth Amit, Srivastava Biplav, Michahelles Florian, 2018, Recent trends in Internet of Things, IEEE.
[5] Himanshu Arora, Manish Kumar, Sanjay Tiwari, “Improve Image security in combination method of LSB stenography and RSA Encryption Algorithm”, International Journal of Advanced Science & Technology (IJAST), Vol.8, pp. 6167-6177, April 2020, ISSN: 2005-4238
[6] Zhang Huibo, Yoshino Hiroshi, 2010, Analysis of indoor humidity environment in Chinese residential buildings, Department of Architecture and Building Science, Elsevier, 10.1016/j.buildenv.2010.03.011.
[7] Giuseppea Elisa Di, D’Orazioa Marco, 2014, Moisture buffering “active” devices for indoor humidity control: preliminary experimental evaluations, 6th International Conference on Sustainability in Energy and Buildings, SEB-14, ScienceDirect, 10.1016/j.egypro.2014.12.365.
[8] Vittal Kr. Mittal, Manish Mukhija, Kailash Kumar, “A study of the variables that influence IOT EDGE-based communication protocols with low latency”, International Journal on recent Researches in Science, Engineering & Technology, Vol.13, Issue 12, pp. 1170-1174, ISSN (online): 2348-3105, Dec. 2015.
[9] K. Gill, S.-H. Yang, F. Yao, and X. Lu, ―A ZigBee-based home automation system, ‖ IEEE Transactions on Consumer Electronics, vol. 55, no. 2, pp. 422–430, 2009.

 ISSN: 2454-4248
31 – 38

[10] Manish Kumar, Dr. Sunil Kumar, Dr. Harish Nagar, "Comparative Analysis of Different Steganography Technique for image or Data Security", International Journal of Advanced Science & Technology (IJAST), Vol.29, pp. 11246-11253, April 2020, ISSN: 2005-4238.

[11] M. Kovatsch, M. Weiss, and D. Guinard, ―Embedding internet technology for home automation, in Proc. IEEE Conf. Emerging Technologies and Factory Automation (ETFA), 2010, pp. 1–8, 2010.

[12] R. Bhilare and S. Mali, ―IoT based smart home with real time Emetering using E-controller, in Proc. IEEE Conf. Annual IEEE India Conference (INDICON), Dec 2015. pp. 1-6.

[13] Manish Kumar, Dr. Sunil Kumar, Dr. Harish Nagar, "Comparative Analysis of Different Cryptography Technique for image or Data Security", in Wesleyan Journal of Research, Vol. 13, No. 69, pp.9-20, March 2021, UGC Care-listed, ISSN: 0975-1386.

[14] Ravi Khandelwal, Manish Kumar Mukhija, Satish Alaria, "Numerical Simulation and Performance Assessment of Improved Particle Swarm Optimization Based Request Scheduling in Edge Computing for IOT Applications", International Journal of Contemporary Architecture "The New ARCH", ISSN 2198-7688, pp. 155-169, Vol. 8, No. 2, 2021.

[15] Jadaun, A., S. K. Alaria, and Y. Saini. "Comparative Study and Design Light Weight Data Security System for Secure Data Transmission in Internet of Things". International Journal on Recent and Innovation Trends in Computing and Communication, Vol. 9, no. 3, pp. 28 -32, Mar. 2021.