IoT Based Smart Home Automation with Security and Disaster Detector

Y M Raghavendra,
Assistant Professor, Dept. of ECE, GSSSIETW
Monika M (4GW17EC043), Gayathri U (4GW17EC018), Nalina L T (4GW17EC046), Gahana S Naik (4GW17EC016)

Abstract—**Internet of Things (IoT) is a framework where machines are implanted with programming, sensors and actuators. It conceptualizes the possibility of distantly associating and checking certifiable items (things) through the Web. With regards to our home, this idea can be joined to make it more intelligent, more secure and robotized. This IoT project centers around building a savvy remote home security framework which sends alarms to the proprietor by utilizing Web if there should arise an occurrence of any trespass. Plus, the equivalent can likewise be used for home mechanization by utilizing similar arrangement of sensors. Web of Things worldview has opened a promising entryway towards providing food of large number issues identified with horticulture, industry, security, and medication. This paper studies existing ways to deal with experience the important issues with debacles, for example, fire location and gas spillage discovery. The influence acquired by favoring this framework over the comparable sorts of existing frameworks is that the cautions and the status sent by the Wi-Fi associated microcontroller oversaw framework can be gotten by the client on his telephone inside a distance independent of whether his cell phone is associated with the web. The microcontroller utilized in the current model is the Arduino Mega 2560.**

I. INTRODUCTION

A smart home system is characterized as an assortment of sensors, actuators, specialized gadgets, and processing gadgets that are associated with one another to give home proprietors with administrations and applications (e.g., safety and security, computerization, amusement, and energy the executives) with least or no mediation. Nonetheless, smart home safety and security frameworks are in high request and consistently required for some, reasons including individuals' longing to have a sense of security in their own homes and to keep away from a high pace of wrongdoing. Also, later headways in the Internet of Things, pocket-size microcontrollers, and cheap sensors/actuators have given numerous chances to empower safety and security in brilliant homes.

Safety and security frameworks are utilized to screen indoor conditions to furnish mortgage holders with live updates and cautions when hurtful circumstances may emerge while they are far away. The point of these frameworks is to decipher the tactile information gathered (through sensors) from the general climate to give cautions or to do some proper activities (through actuators) against undesirable occasions. For example, fire in homes could happen for various reasons, like the consuming of materials, gases, also, electrical circuits, which could cause genuine mishaps.

To shield homes from fire, an alarm framework is an absolute necessity. Alarm frameworks are valuable in notice mortgage holders about this undesired circumstance and to forestall the deficiency of assets and human existence that could result from it.

Gas spillage is another undesirable circumstance. Liquefied Petrol Gas (LPG) is the most broadly utilized gas for cooking in homes. It is given in chambers and may impact because of spillage. Much of the time, occupants don't realize that gas is spilling. They in this way may illuminate fire that causes an impact. To keep away from this perilous circumstance, a gas spillage recognition framework should be introduced and utilized.

Crime is rampant these days as well. The establishment of safety frameworks in homes is hence essential. These frameworks can recognize developments that may happen because of a cheat going into a house. Furthermore, the client can handle the electrical apparatuses, for example, lights and fans and screen the house conditions from anyplace by utilizing cell phone, tablet or PC. As model, if the client has neglected to switch of the fan and he previously showed up at his office, he can turn off utilizing his smart gadget.

To stay away from every one of the circumstances referenced above, fire, gas spillage, and movement discovery frameworks should be created what's more, utilized. Doing as such will guarantee the wellbeing and security of mortgage holders and their families and will keep them from genuine mishaps and undesired circumstances. Crafted by shrewd home wellbeing and security frameworks begins with checking the general climate and afterward responding to the previously mentioned unforeseen occurrences that may happen while mortgage holders are away by sending alert notices. What's more, some appropriate activities may likewise be taken by the frameworks, for example, halting fire through the splashing of water and decreasing the convergence of gas through air ventilation. The checking cycle of these frameworks is performed through sensors like temperature sensors, gas sensors, and movement sensors. In occasion of a crisis, these frameworks may send notices, for example, messages and messages. Also, they may utilize actuators like signals, lights, and screens to tell close by individuals. A correspondence medium is needed to communicate with these frameworks. Remote correspondence, for example, ESP8266 Wi-Fi module is broadly utilized in this unique situation. The study starts with characterizing a few exploration questions covering a few parts of this subject. Then, at that point, it recognizes the connected papers that ought to be analyzed to answer the distinguished inquiries. At last, it's anything but a conversation of likely freedoms for research in the field. To accomplish the previously mentioned points, the applicable distributed papers were gathered and broadly broke down utilizing a deliberate cycle.

Special Issue - 2021

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
NCCDS - 2021 Conference Proceedings

The subsequent sections of this paper have been organized as follows: Section II presents a short literature review on IoT systems utilized for home automation. Section III gives the issue proclamation to the proposed project work. Section IV describes the methodology used to conduct this study systematically. Section V presents the results and outcomes of this study. Section VI presents the conclusions of the proposed work. Some further changes which should be possible to expand the loyalty and ease of use of the current model have been discussed in segment VII.

II. LITERATURE REVIEW

I. Qusay I. Sarhan "Deliberate Study on Brilliant Home Wellbeing and Security Frameworks Utilizing the Arduino Stage", IEEE, date of distribution July 10, 2020. This review deliberately reports the best-in-class commitments in keen home wellbeing and security frameworks utilizing Arduino. Consequently, to characterize, analyze, and examine the applications, the empowering sensors, the Arduino sheets, the ready warnings, and the structures that have been utilized and utilized in these frameworks were recognized.

II. A Daissaoui, A Boulmakoul, L. Karim, and A. L shower, "IoT and large information examination for shrewd structures: A review," Procedia Software engineering, Volume 170, Jan. 2020. This study efficiently reports the best-in-class commitments in keen home wellbeing and security frameworks utilizing Arduino. In this way, to order, analyze, and examine the applications, the empowering sensors, the Arduino sheets, the ready notifications, and the models that have been utilized and utilized in these frameworks were identified. In this examination, 63 applicable exploration papers from five notable writing data sets distributed in the course of recent years from 2014-2019 were chosen. The distributed papers were a combination of commitments from meetings, diaries, and workshops, with most of papers being distributed in gatherings. The considered papers were widely investigated and examined according to alternate points of view and depended on a bunch of examination questions.

III. S Otoum, B. Kantarci, and H T Mouftah, "On the practicality of profound learning in sensor network interruption identification", IEEE Systems administration Letters, 2019. In this examination paper, the total plan and working approach of a home robotization project are clarified. This proposed framework includes two modes, the administrator side in which the client ready to plan the total model of the home and the client side in which the client can handle every gadget of the home with a simple GUI-based interface. The proposed framework additionally has dynamic capacity about the situation with every gadget of the home. An AI calculation SVM with a direct portion is applied for dynamic about the situation with home apparatuses either ON or OFF.

IV. M S R A P. Mallap, G. Joga Rao, B. Prasanna Vinod Kumar Sahu, J. Sudheer Kumar, Sai Krishna, " An Epic Methodology for Home Computerization ",

Global Diary of Logical Exploration in Science, Designing and Innovation (IJSRSET), Volume 4, Walk April 2018. Here, a model keen home mechanization utilizing IoT is introduced. This work will be conveyed forward by incorporating transfers to Arduino board for controlling home machines from a far off area in a genuine situation. As an expansion, creators propose a conventional IoT structure and use distributed computing framework for associating and overseeing. Expected to fill in prevalence sooner rather than later is the utilization of brilliant home items to build family wellbeing, explicitly identified with fire insurance and carbon monoxide observing. Presently reconnecting and controlling the couple of gadgets in home apparatuses.

V. K V Daya Sagar, Ch. Ramesh Kumar, Ch. Sai Geethika, M. Yathisha, "Worldwide Diary of Pune and Applied Science Volume114 No. 10 2017. The security framework and home apparatuses control utilizing Web of Things has been tentatively demonstrated to work agreeably. By associating basic machines to it and the apparatuses were effectively controlled distantly through web. The planned framework not just screen the sensor information, similar to temperature, gas, light, movement sensors, yet additionally impels a cycle as per the prerequisite, for instance turning on the light when it gets dim. It additionally stores the sensor information in the cloud. This will assist the client with dissecting the state of different boundaries in the home whenever anyplace.

VI. Nepal Seismic tremor: 8,000,000 Individuals Influenced, UN Says. World Debacle Report. Gotten to: Apr. 29, 2017. Reception of new procedures could decrease the shots at losing human lives just as harm to enormous scope foundations because of both normal and human-made debacles. IoT, which permits crease less entomb association among heterogeneous gadgets with different usefulness, is a suitable answer for calamity the executives. By applying information examination and artificial knowledge instruments, IoT-empowered catastrophe the executive's frameworks are utilized for early notice about the accident. Since the effect of any calamity is gigantic, the IoT-empowered fiasco the board framework can be applied to find the person in question and conceivable salvage tasks. This article sums up the accessible IoT-based advancements for calamity the executives and the reasonableness to apply into the unfortunate circumstances.

VII. K V Daya Sagar, Ch. Ramesh Kumar, Ch. Sai Geethika, M Yathisha, "Global Diary of Unadulterated and Applied Math Volume 114 2017. In this paper, an IoT based calculation is proposed for the savvy home framework to mechanize the Fan, screen the gas spillage and tell through an alert, interruption identification and energy observing. The proposed calculation was basically executed on MSP435 based TI CC3220SL launchpad for the testing reason. The outcome shows that the calculation is skilled to notice the movement of an

Special Issue - 2021

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
NCCDS - 2021 Conference Proceedings

individual, to notice the interruption by checking and send the message to a cell phone. The temperature and force utilizations are observed through a portable Application in around the world and can be controlled being away from home. the framework is productive and practical as far as giving solid data and computerization. In future, this work can be to execute in a keen city to computerize it as a savvy home to robotize it as brilliant home.

VIII. Shopan Dey, Ayon Roy and Sandip Das, Home Computerization Utilizing Web of Things, 2016, IEEE. In this paper we zeroed in on various interaction of working or controlling electrical and electronic apparatuses distantly with the assistance of Arduino. This strategy for controlling such applications is alluded to as computerization. The test arrangement which we planned has its point of convergence on controlling distinctive home apparatuses giving 100% proficiency. Because of headway in innovation, Wi-Fi network is effectively accessible in all spots like home, Place of business and Mechanical Structure so proposed remote organization effortlessly controlled utilizing any Wi-Fi organization. The wiring cost is diminished. Since less wiring is needed for the switches. This likewise dispenses with power utilization inside the structure when the heaps were in off conditions. This framework is additionally stage autonomous permitting any internet browser in any stage to interface ESP8266-01.

IX. Veena A. Patil, Darshana S. Khilari, Akhilesh S. Sheelavant," Shrewd LOCK" in Global Diary of Designing Applied Sciences and Innovation, Volume 1, June-July 2016. Here there is conversation about the plan of the Savvy Home Mechanization Framework. The proposed framework can give robotization just as better security to the home. By utilizing this framework home machines can be distant controlled and checked. The framework makes conceivable to screen and control the things in the home from any distant area through web. It makes the human existence agreeable. The proposed framework will diminish time and energy. Additionally, the wellbeing of individuals in the house will be kept up with.

III. PROBLEM STATEMENT

The problem statements that occurred in current situation/existing system are as follows:

1) Security System-Numerous individuals are consistently progressing from one spot to another because of business requests. A few groups can put two or three days from their home leaving all their home devices with no sort of checking and control. A few gadgets are left connected to control attachments though others should be connected to and out of force attachments at various spans relying upon the time. This requires a person to physically go to every one of the gadgets freely occasionally. Indeed, even old and the disabled client dealt with issue to physically get to control of light and fan rather than robotization measure. A few gadgets if not

controlled as expected devour a ton of energy which prompts additional consumption on power. So, all such checking and controlling of house hold appliances can be done. In our project, **Automatic door open and close, Motion detection intruder alert and Controlling of home appliances like fan and light** are performed.

2) Disaster Detection-Disasters frequently occur nearby human work. More often than not, it is either regular (e.g., avalanche, tremor, wave, flood, woods fire, and lightning) or man-made (e.g., mechanical blast, spillage in an oil pipeline, spillage in gas creation, and psychological oppressor assaults). Notwithstanding the reason for episode, debacle prompts enormous obliteration as far as financial and living souls. In our project, we are detecting few disasters such as **Fire detection and Gas leakage detection.**
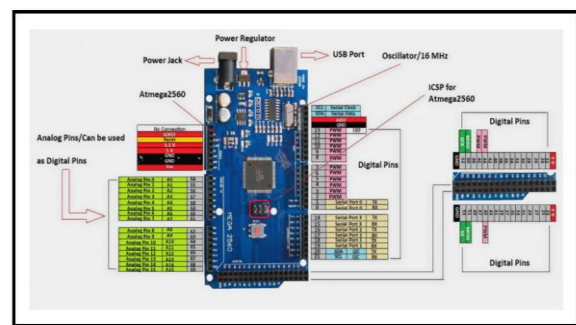
IV. METHODOLOGY

Fig. 1: Arduino mega 2560 pinout configuration

The Arduino Mega 2560 is a microcontroller board dependent on the ATmega2560. It has 54 advanced info/yield pins (of which 14 can be utilized as PWM yields), 16 simple information sources, 4 UARTs (equipment sequential ports), a 16 MHz gem oscillator, a USB association, a force jack, an ICSP header, and a reset button. It contains all that expected to help the microcontroller; basically, associate it to a PC with a USB link or force it with an air conditioner to-DC connector or battery to begin.
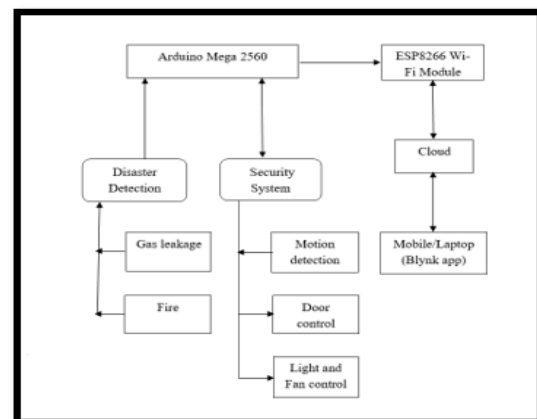

Fig. 2: Home automation system architecture

Disaster detection includes gas leakage and fire detection and security system includes motion detection intruder alert, automatic door opening and closing, and controlling of few

home appliances like lights and fans. All the data obtained is sent to Arduino board. Here ESP8266 acts as communication channel between Arduino and Blynk app. Based on the data received from ESP8266, expected results are obtained in Blynk app.

1) Disaster Detection

a) Fire Detection- Fire recognition frameworks are regularly utilized in smart homes to guarantee home owner security and to keep away from or decrease property misfortune. On account of fire danger, these frameworks consequently advise property holders about this crisis circumstance and may play out some appropriate activities to decrease the effect. Normal reasons for fire could be gas spillage, cooking flare-ups, and electrical fire including electrical contactless, broken outlets, and defective machines. Here, **IR based flame sensors** is connected to **pin 9** of Arduino board is utilized to identify fire. A flame-sensor is one kind of detector which is mainly designed for detecting as well as responding to the occurrence of a fire or flame. A furnace flame sensor works by detecting the presence of a flame within the furnace. At the point when fire begins in any space inside a home, the temperature of the encompassing air increments dramatically until arriving at a most extreme level, while moistness diminishes until arriving at any rate level or even zero. The sensor is a short length of thin metallic rod that creates a small current of electricity in order to confirm there is fire burning within the furnace. Range is 760 nm to 1100 nm (Light Wavelength).

b) Gas Leakage Detection- LPG is a colorless, odorless fluid that promptly dissipates into a gas. Ordinarily, it is given in chambers, with odorants added to assist with identifying spills. LPG is a fundamental need of each family, as it is utilized for cooking and warming. Notwithstanding, its spillage could prompt catastrophes. At the point when the gas meets a wells spring of start, it can consume or detonate. Breathing in LPG fume at high fixations in any event, for a brief time frame can cause blacking out, suffocation, or potentially demise. Here, various gas sensors can be utilized to recognize the presence of gas in the climate. **MQ2 Gas sensor** is connected to **pin Ao** of Arduino board is utilized in our task. The gas touchy material utilized in the MQ2 gas sensor is SnO2 i.e., Tin oxide, a low electrically conductive material in clean air. When there is flammable gas in the encompassing air, the electrical conductivity of the sensor will increment with the higher power of the combustible gas. All gases contain some percentage of alcohol content in them. As, most hand sanitizers, whether you get them at the mall or at your local drugstore, will contain some kind of alcohol content in them. Using MQ2 sensor, we can detect combustible gas (Intensity – 300~10000ppm and preheating time should be ≥2 minutes) and smoke detection.

2) Security System

a) Intrusion Detection-Intrusion detection systems are systems introduced in homes to caution owners and prevent undesirable circumstances, for example, house break-ins and violent crimes. Interruption can be distinguished by means of three location techniques, specifically, motion-based recognition, vibration-based identification, and picture-based

discovery. In our project, we are showing motion-based detection.

Motion-based detection-Here, motion sensors are used to detect intrusion. When there is a movement in any space inside a home, the pre-owned movement sensor will identify that development. To distinguish interruption by means of movement, various kinds of sensors can be utilized. The **PIR sensor** stands for Passive Infrared sensor is a low-cost sensor which can detect the presence of human beings or animal and is connected to **pin 11** of Arduino board. It is an electronic sensor that detect general movement. PIR sensors are commonly used in security system. It can distinguish between object movement and human movement. It detects the infrared light emanated by a warm item. It comprises of pyro electric sensors which present changes in their temperature (because of episode infrared radiation) into electric sign. It covers a distance of about 7 meters.

b) Lights and fans control- The client can physically turn on or off few home appliances like lights and fans using Blynk app. Even the client can use temperature sensors like **DHT11 sensor** which is a commonly used Temperature and Humidity sensor that can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of ±1°C and ±1% is connected to **pin 6** of Arduino board. This sensor displays the temperature of the surrounding environment. Based on the temperature, fan will automatically turn ON/OFF. It is a commonly used Temperature and Humidity sensor that can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of ±1°C and ±1%. The client has the decision to adjust the room conditions dependent on the sensor readings (temperature, dampness, and so forth) like control the speed of the fan from the versatile application or the speed will be naturally changed dependent on the room temperature. By this way, the energy effectiveness can be improved in light of the fact that when the electrical machines are consequently or handily killed when not utilized, this will save more energy and reduction electrical bill cost.

DC motor, Relay, External battery

c)Door control-RFID(Radio Frequency Identification) tags are used for automatic door open or close. With RFID, remote programmed recognizable proof takes an unmistakable structure: the item, area, or individual is set apart with a remarkable identifier code as a hexadecimal number contained with the RFID tag, which is implanted in the RFID card. **Mifare RC522 Module RFID Reader** is utilized in our task. This module usually comes with a RFID card tag and key chain. The Reader can both read from and write to key cards or key rings. The tag reader creates a particular interrogation zone, inside which the tag can communicate with the reader. The reader also has a receiver that captures a reply signal from the tags, and decodes that signal. The key card and key ring that comes with the kit each contains a small embedded RFID chip. Every RFID chip has a unique serial number that identifies that particular key card. The RC522 RFID Reader module is designed to create a 13.56MHz electromagnetic field that it uses to communicate with the RFID tags. Both RFID reader module and RFID cards should share the same frequency range i.e., 13.56MHz. The main functionality of RFID tags is that they store a unique identifier that can be

Special Issue - 2021

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
NCCDS - 2021 Conference Proceedings

read. RFID is useful to identify people, to make transactions, etc. We can use an RFID system to open a door. The RFID door lock system provides ease of implementation, and the RFID card cannot be duplicated. For example, only the person with the right information on his card is allowed to open the door. The angle at which the door has to be opened or closed is based on **Servo motor** which is connected to **pin 12** of Arduino board. A Servo Motor is a small device that has an output shaft. This shaft can be positioned to specific angular positions by sending servo a coded signal. As long as the coded signal exists on the input line, the servo will maintain the angular position of the shaft. If the coded signal changes, the angular position of the shaft changes. In our project, servo motor is used to rotate in an angle of 0 to 90 degree.

VI. IMPLEMENTATION

Figure 3 shows the Implementation of the proposed work where all the sensors used in this system are mounted on the Arduino board. The outputs are obtained through the rotation of the servo motor where we can automatically control home doors, indication, and disaster detection can be shown through led on/off. The whole model results can be noticed in Blynk app which is shown in figure 4.
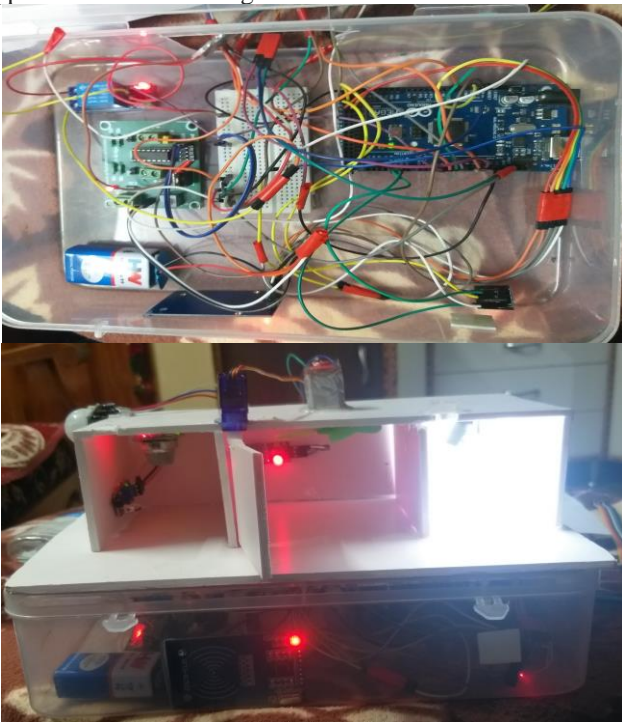

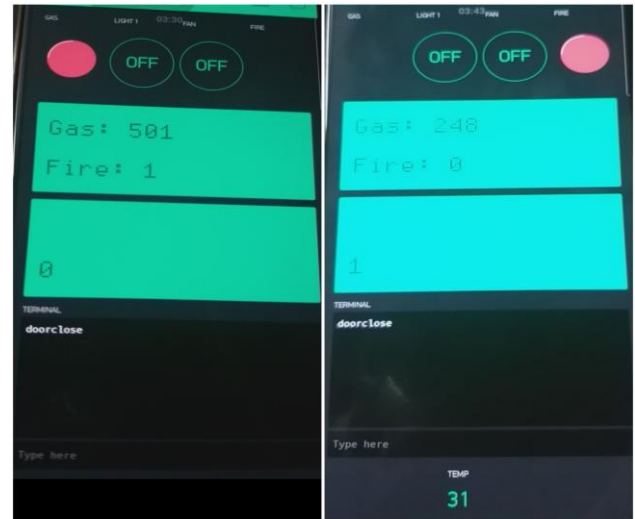Fig. 3: Implementation of the proposed system

Fig. 4: Results shown in Blynk app

Blynk app- Blynk is a web of things stage which permits controlling electronic gadgets distantly utilizing its iOS and android applications. It gives dashboard by which client can make realistic interface utilizing various gadgets. Blynk can likewise store and show sensor information. Blynk gives libraries to the greater part of the famous equipment stages like Arduino, ESP8266, Raspberry pi, Sparkle Fun and so forth In the Blynk three most significant segments are Application, Worker and Libraries. Application can assist with making the interface. Worker is liable for all the correspondence among application and the designs. Furthermore, Libraries empowers correspondence for equipment with the worker utilizing orders.

V. RESULTS

This project is fabricated based on literature review and examination on various journal and paper appropriately accessible and created in understanding so it can give adaptability in activity. The prime objective of our project is to utilize an android advanced mobile phone to control the home appliances advantageously which will give home security and to detect few disasters.

1. We can easily control various home appliances like fan, light through Blynk app. As we can control devices from a long distance, thus it gives ease of access.
2. We can detect motion and we can even access the door opening and closing which will provide highest security.
3. We can identify some disasters such as gas leakage and fire.
4. As the operation is faster, power can be saved significantly. It is more efficient and it also saves time thus electricity bills can also be reduced.

VI. CONCLUSION

1. This smart home automation has been working acceptably by utilizing the Arduino mega 2560 microcontroller board, ESP8266 Wi-Fi module and web over Wi-Fi or cell phones. It empowers the control of the electrical machines like the lights and fan at home effectively and productively by means of

Special Issue - 2021

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
NCCDS - 2021 Conference Proceedings

Wi-Fi. The sensor can screen the movement, humidity and temperature of the house. This smart home automation system provides a comfortable, intelligence, good security and improve the quality of life. By utilizing this keen smart home framework, electric bill can be diminished in light of the fact that the client can handle the electrical apparatuses whenever without utilizing human energy.

2. This system is not just utilized in controlling of home apparatuses like lights and fans, however it is likewise intended for checking reason that is, programmed opening and shutting of entryways, which is finished with the assistance of RFID reader module and cards utilized in it and movement recognition intruder alert using PIR sensor.

3. This system is not only used for security, even it is used to track various household hazards or disasters such as gas leakage using MQ2 sensor and fire detection using IR based flame sensor.

VII. FUTURE SCOPE

1. As the system is subject to the client's caution and judge capacity of the circumstance (regardless of whether it is a visitor or a gate crasher going into his home) a camera can be associated with the microcontroller which may help the client in taking choices whether to initiate the security framework or welcome the visitor. The caught image of the visitor or interloper after face discovery, can be sent to the client. The client can additionally advance a similar photo to the police headquarters in the event that the person wishes.

2. Further this system might be made more synchronized by coordinating the voice call highlight inside a similar smart phone application through which the client can even control his home apparatuses with no voice call being set off to his phone.

3. In future, login can also be done with various forthcoming innovations like retina/fingerprint scanning. We can add picture preparing to further develop precision of the security framework.

REFERENCES

[1] Qusay I Sarhan, "Systematic Survey on Smart Home Safety and Security Systems Using the Arduino Platform", IEEE Access, July 2020.

[2] A. Daissaoui, A. Boulmakoul, L. Karim, and A. L bath, ''IoT and big data analytics for smart buildings: A survey,'' Procedia Computer Science, vol. 170, pp. 161–168, Jan. 2020.

[3] W. Anani, A. Oudo, and A. Hamou, "A survey of wireless communications for IoT echo-systems", in Proc. IEEE Can. Conf. Electr. Comput. Eng. (CCECE), May 2019.

[4] L. D. Liao, C. C. Chuang, T. R. Ger, Y. Wang, Y. C. Tsao, I. J. Wang, D. F. Jhang, T. S. Chu, C. H. Tsao, C. N. Tsai, and S. F. Chen, ''Design and validation of a multifunctional android-based smart home control and monitoring system,'' IEEE Access, vol. 7, no. 1, pp. 1–9, 2019.

[5] A. K. Srivastava, S. Thakur, A. Kumar, and A. Raj, ''IoT based LPG cylinder monitoring system,'' in Proc. IEEE Int. Symp. Smart Electron. Syst. (ISES), Dec. 2019, pp. 268–271.

[6] V. S. Koprda, Z. Balogh, and M. Magdin, ''Developing system from low cost devices to build a security and fire system as a part of IoT,'' in Proc. Int. Conf. Intell. Comput., 2019, pp. 142–154.

[7] S. Amit, A. S. Koshy, S. Samprita, S. Joshi, and N. Ranjitha, ''Internet of Things (IoT) enabled sustainable home automation along with security using solar energy,'' in Proc. Int. Conf. Communication Electron. Syst. (ICCES), Jul. 2019, pp.1026–1029.

[8] M. B. Yassein, I. Hmeidi, F. Shatnawi, W. Mardini, and Y. Khamayseh, ''Smart home is not smart enough to protect You– protocols, challenges and open issues,'' Procedia Computer Sci., vol. 160, pp. 134–141, 2019.

[9] V. Williams, S. Terence J., and J. Immaculate, ''Survey on Internet of Things based smart home'' in Proc. Int. Conf. Intell. Sustain. Syst. (ICISS), Feb. 2019, pp. 460–464.

[10] H. Hejazi, H. Rajab, T. Cinkler, and L. Lengyel, ''Survey of platforms for massive IoT,'' in Proc. IEEE Int. Conf. Future IoT Technol. (Future IoT), Jan. 2018, pp. 1–8.

[11] Ravi Kishore Kodali, Vishal Jain, Suvadeep Bose and Lakshmi Boppanna, "IOT Based Smart Security and Home Automation System".

[12] I. Majumdar, B. Banerjee, M. T. Preeth, and M. K. Hota, "Design of Weather Monitoring System and Smart Home Automation," in ieee international conference on system, computation, automation and networking (ICSCAN). IEEE, 2018, pp. 1–5.

[13] S. Gunputh, A. P. Murdan, and V. Oree, "Design and implementation of a low-cost Arduino-based smart home system," in IEEE 9th International Conference on Communication Software and Networks (ICCSN). IEEE, 2017, pp. 1491–1495.

[14] (Apr. 2015). Nepal Earthquake: Eight Million People Affected, UN Says. Accessed: Apr. 29, 2017. [Online]. Available: www.bbc.com/news/world asia-32492232.

[15] World Disaster Report. Accessed: Apr. 29, 2017. [Online]. Available: http://www.ifrc.org/world-disasters-report-2014/data.