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An Efficient Home Automation and Security System using Arduino and 1-Sheeld

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Abstract

Smart Home Automation and Security Systems gains more popularity in the last decades. Most of the Smart home appliances are controlled by Smartphone's. Smart Home Automation and Security system makes you able to control all your house lights with your voice commands, not only controlling the lights of your houses but also provides security to the house when a stranger enters the house either when you are asleep or out of your home. It sends an Email to you saying that a stranger has entered your home and an alarm system (buzzer) will start ringing at your home so that if you are asleep you could wakeup or if you are out your neighbors could listen to the alarm and come into action. For lights functioning we need to give a voice command, the voice is detected and the operation is performed. We also uses the temperature sensors that senses the temperature of the house. If the temperature is more than 35o C then an alarm (buzzer) will ring at your home and the system will send you an email indicating that the temperature has raised higher than 35o C. In this paper we are proposing a method, with the help of this anyone can safeguard their homes from the thieves or strangers or any harmful accident, and get the appliances to operate automatically with just a single command, either in the form of text or voice.

Keywords: Automation, Arduino UNO, Smart home, One shield, Home security, Security system, Lights, Alarm.

I. Introduction

In today's world the demand for Home Automation has increased rapidly. The Home Automation system are used to provide Comfort, Convenience, and Security to the residents. Nowadays, most home automation systems are used to provide ease to the elderly and disabled people as they reduce the human labor. Some people who do business move to different places on their work don't check the components of their household The Smart Home Automation is more helpful in such type of situations. Then houses are controlled by Smart Home Automation automatically. Phrenic household systems assembles with the network, household components, observing the appliances [7]. This system is very helpful for monitoring the appliances of home without the presence of humans physically. So that, the humans can control the appliances virtually without any fear, even they are at long distances.

Home automation system are designed and developed by using a single controller which has the ability to control and monitor the functioning of different appliances such as power plugs, lights, temperature and humidity sensors, smoke, gas and fire detectors as well as emergency and security

systems. One of the greatest advantage of home automation system is that it can be controlled and managed easily from any of the remote devices like smart phone, tablet. The rapid growth of wireless technologies has influenced the users to use smart phones to remotely control and monitor the home appliances around the world. Several home automation systems use smart phones to communicate with microcontrollers using various wireless communication techniques such as Bluetooth, GSM, ZigBee, Wi-Fi, and EnOcean. A wide range of functions and services are offered in various types of home automation, some of the common features in Home Automation are appliance control, thermostat control, remote control lighting, security camera, text alerts. This paper describes the implementation and working principles of Bluetooth technology based Home Automation system.

II. Related Work Structure of DVR

Home Automation System has gained world popularity these days. Most of the researchers discussed about Home automation and Security System and also discuss how this mechanism improves the quality of living. Firstly, the hand guester technology has been used in the year 1993 for the controlling of the real-world entities, which is also called as the novel control network. Next, the phone based technology which is being used till today with some modifications has been introduced in 1998. After a long gap in the year 2002 the Bluetooth has been used for the controlling of the home appliances. The personal computer based technology web-server has been used in the year 2004 for the connectivity of the devices remotely. The ZigBee mini-controller was used for the connectivity of the devices within the home in the year 2009. The VCHAS based on ZigBee and Wi-Fi network both are incorporated through a joint gateway is being proposed by authors in [1]. This method controlled the appliances without any physical efforts which makes this system more friendly and comfortable. Many researchers works on home automation, The researcher in [2] discussed about implementation of home automation system using Bluetooth technology that can control up to 18 devices including home appliances and different sensors in the home including ultrasonic, water level detection and moisture sensors. In [3] Authors describes the development by replacing the existing device fingerprinting concept and also discusses the numerous hazards in existing device fingerprinting approaches. They proposed a two-stage verification process for smart homes, using device fingerprints and login credentials, which verifies the user device as well as the user accessing the home over the Internet. Unlike any other previous approaches, our Device Fingerprinting algorithm considers a device's geographical location while computing its fingerprint. A cost-effective and hybrid (local and remote) IoT-based home automation system with a user-friendly interface for smart phones and laptops. A prototype called IoT@HoMe is developed with an algorithm to enable the monitoring of home conditions and automate the control of home appliances over the Internet anytime and anywhere is proposed by the authors in [4]. Further, the researchers discussed about the energy consumption in automation system. The authors in [5] proposed a bottom-up approach to develop novel system-level energy consumption models for consumer HAS devices and quantify the energy consumption for a typical HAS. The introduction of the design of home automation system with the good flexibility and of low cost was introduced by Rajeev Piyare [9].

The researchers in [8] introduced a voice recognition system by using the wireless Home Automation System which recognizes the voice frequencies and control the home appliances. Generally, the able-bodied people can use these type of Home Automation Systems but, in case of handicapped and old-aged people, they might not be able to use the technology efficiently. For such people Android ADK technology was used for the controlling of their appliances at their homes. This happened in the year 2013. Even in the early days, in 2020 IoT, ArduinoTmega2560 has been used for controlling. General Packet Radio Service(GRPS) speech recognition was used for operating the electrical appliances in the year 2015. ElegooMega2560 web server was used for intimating the home-guard or the owner about the opening of the door or the actions that are performed on their doors, this was used recently in 2019. In this way the IoT has been gradually increased its impact on the day-to-day life of the humans by reducing their efforts on the controlling of their home devices with the help of the mobile applications which are developed by using IoT Technology [6].

III. Proposed Work

Home Automation is a Smart Home technology which provides the homeguard security by controlling the smart appliances by the smart home applications often installing them on their smart phones. These applications even provide security for the appliances that we use, like fans, lights, fire alarms, etc.

Wifi or Internet is connected to the appliances and hence they are controlled by it. Not only, the Internet or WIFi but, sensors are also used for the controlling of these devices. The particular devices or loads are connected to the sensors by the help of Arduino UNO. Thus the IOT receives the messages from these sensors and the respective appliance functioning will be done accordingly. This technology helps the people to control their devices even though they are at long distances from their homes. It also provides security about the conditions of the appliances at the home to the owner by forwarding directives or commands to the owner in the form of messages.

Home automation and security systems using smart phone, Arduino UNO board and 1sheeld board that uses Bluetooth technology to connect to the smart phone. The hardware architecture of this system consists of the Arduino UNO board, 1Sheeld board and a smart phone, the communication between Arduino UNO board and cell phone is is done via the 1Sheeld board that is wirelessly connected to the smart phone which has the 1Sheeld app in it. The 1Sheeld board has a range of 30ft, 115200bps data rate and 7.4MHz bandwidth. In this system, Arduino UNO board is connected to the devices of home via broadcast.

The mobile phone uses a software application called 1Sheeld app which allows the user to control the home appliances. It builds an Arduino interface in the smart phone. This app has many features i.e., shields which are used as per the requirements for the system the user uses, for example, it has voice recognizer shield which allows to recognize the voice commands, there is an E-mail sheeld which is used to take send commands and messages respectively, SMS sheeld to send and receive messages, cameras sheeld to capture the picture, Text to speech sheeld which is used to give voice messages back to the user, Face book sheeld, Twitter sheeld, clock sheeld, and many more, these sheelds and 1Sheeld board allows to perform almost most of the work using the smart phone instead of buying all the required sensors for each module separately and making it costly to use. Just a single board and an application in your smart phone is all enough to have a secure home automation system. The block diagram of Bluetooth based home automation system.

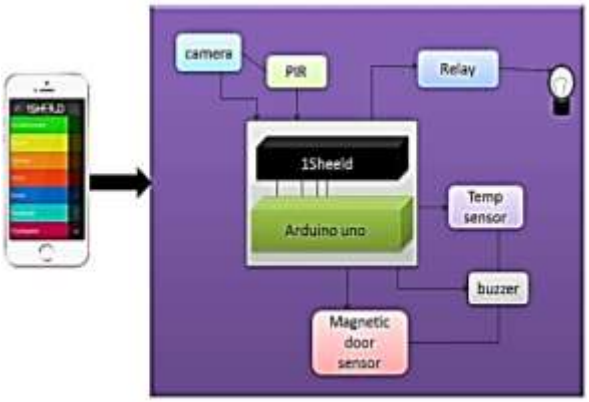

Fig.1. Voice recognition based home automation and security system.

From Fig.1 it is clear how, A Voice recognition based home automation and security system uses the voice commands of the user to perform the functions, the user can control the appliances just with a speech command. the voice recognizer shield present in the 1Shield app is used to give commands to the 1Shield board embedded Arduino UNO the command is understood and the operation is executed. This makes it easy to operate the appliances with just a voice command, you do not need to move from your place and just have to speak and the work is done like saying someone to do it and the other person listens to us and does the work asked to perform. The same way Arduino UNO with 1Shield also listens to what we say. Humans can sometimes be lazy to listen but Arduino is never lazy it listens to your command every time.

A. Home Security

Nobody wants their house to be unsecure. In the automatic world today everything is performed automatically. As seen above the appliances can be operated automatically same way the house can be given security automatically. This paper shows the security from theft and fire.

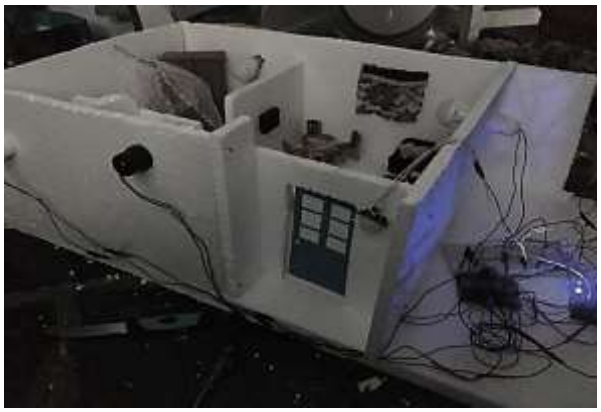

Fig. 2. Experimental Setup for Proposed Method

Fig.3. Experimental Setup for Proposed Method

The first sensor which is used for this purpose is reed switch which is attached to the door so that when the sensor is in live state and if the thief tries to open the door and enter the house, the reed switch raises an alarm and sends an alert Email to the owner as shown in Fig.2. A PIR sensor is also fitted outside the door where if the thief is sensed in front of the door the PIR sensor goes high and

snaps a picture which is send to the owner through Email, with which we can try to get the thief if he succeeds to escape.

The sensor used for detecting the temperature is the Temperature sensor LM35. This sensor is capable of rating from the range of -55^{o}C to 150^{o}C. If the temperature goes higher then what the owner has described then an alarm is raised and an alert is send to the owner through Email.

IV. Conclusion

The electrical appliances are integrated by the Smart Home System. As shown in Fig.3 The building of automation is not only done but also the house work activities like fans, lights, etc are controlled by the techniques of Smart Home System. We proposed a novel procedure which will give the enhanced recognition of the surroundings conditions in home, after studying and understanding the literature look work and some other subsisting works. The evolution of the Smart Home System which was achieved by the Internet of Things technologies facilitates an easier way to access the devices just with sound without moving from place to place. The security system provides a better security to the house.

References

[1]. Krishna, Ishan, and K. Lavanya. “Intelligent home automation system using BitVoicer.” 2011-11th International Conference on Intelligent Systems and Control (ISCO). IEEE, 2017.
[2]. Asadullah, Muhammad, and Khalil Ullah. "Smart home automation system using Bluetooth technology." 2017 International Conference on Innovations in Electrical Engineering and Computational Technologies (ICIEECT). IEEE, 2017.
[3]. Jose, Arun Cyril, Reza Malekian, and Ning Ye. "Improving home automation security; integrating device fingerprinting into smart home." IEEE Access 4 (2016): 5776-5787.
[4]. Jabbar, Waheb A., et al. "Design and Fabrication of Smart Home With Internet of Things Enabled Automation System." IEEE Access 7 (2019): 144059-144074.
[5]. Li, Weixian, et al. "A novel smart energy theft system (SETS) for IoT-based smart home." IEEE Internet of Things Journal 6.3 (2019): 5531-5539.
[6]. Langhammer, Nils, and Ruediger Kays. "Performance evaluation of wireless home automation networks in indoor scenarios." IEEE Transactions on Smart Grid 3.4 (2012): 2252-2261.
[7]. R. Piyare, S.R. Lee. Smart Home-Control and Monitoring System Using Smart Phone. ICCA, ASTL, 2013 - researchgate.net
[8]. H. AlShu'eili, G. S. Gupta and S. Mukhopadhyay, "Voice recognition based wireless home automation system," Mechatronics (ICOM), 2011 4th International Conference On, Kuala Lumpur, 2011, pp. 1-6.
[9]. M.Tazil and R.Piyare – “ Bluetooth Based Home Automation System Using Cell Phone”, 2011 IEEE 15th International Symposium on Consumer Smart Phone“, 2011.” IEEE International forum on Consumer Electronics”.