



Smart Home Automation for Physically Challenged Person

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Abstract: As technology is advancing so houses are also getting smarter. Modern houses are gradually shifting from conventional switches to centralized control system, involving remote controlled switches. Presently, conventional wall switches located in different parts of the house makes it difficult for the user to go near them to operate. Even more it becomes more difficult for the elderly or physically handicapped people to do so. Home automation or Smart Homes can be described as introduction of technology within the home environment to provide convenience, comfort, security and energy efficiency to its occupants. Adding intelligence to home environment can provide increased quality of life. The system is designed and implemented through GSM based home automation system using messaging app and open-source electronics platform based on easy-to-use hardware and software.

Keywords: Smart Home Automation System, Smart Phone, Arduino, GSM, Bluetooth etc

I. INTRODUCTION

An automated device has ability to work with versatility, diligence and with lowest error rate. The idea of home automation system is a significant issue for Researchers and home appliances companies. Automation system not only helps to decrease the human labour but it also saves time and energy. Early home automation systems were used in labour saving machines but nowadays its main objective is provide facilities to elderly and handicapped people to perform their daily routine tasks and control the home appliances remotely. The "Home Automation" concept has existed for many years. The terms "Smart Home", "Intelligent Home" followed and has been used to introduce the concept of Networking appliances and devices in the house. Home automation Systems (HASs) represents a great research opportunity in creating new fields in engineering, and Computing. HASs includes centralized control of lighting, appliances, security locks of gates and doors and other systems, to provide improved comfort, energy efficiency and security system. HASs becoming popular nowadays and enter quickly in this emerging market. However, end users, especially the disabled and elderly due to their complexity and cost, do not always accept these systems. We are using GSM Sim- 900a Module

based wireless home automation system. This system can be implement with a low cost and it is easy to install in an existing home. GSM Sim- 900a Module technology has ability to transmit data serially with an excellent physical range depending on the type of android and smart devices. The design of proposed method is based on Arduino board, GSM Sim- 900a Module, sensors and smart phone application. GSM Sim900a Module is interfaced with Arduino board and home appliances are connected with Arduino board via relay. Smartphone application is used for serial communication between smart phone and GSM Sim- 900a Module which is further connected with Arduino board.

II. LITERATURE REVIEW

After analyzing and studying the literature survey, this chapter of "review of literature" presents some of the modern approaches and project works accomplished by the dignitaries in field of research. This includes IOT, M2M, RFID, Wireless sensor network, intelligent security alarm system, technologies upgraded in home automation system.

Somayya Madakam, R. Ramaswamy and SiddharthTripathi [1] purposed one of the buzzwords in the Information Technology is Internet of Things (IoT). The future is Internet

of Things, which will transform the real-world objects into intelligent virtual objects. The IoT aims to unify everything in our world under a common infrastructure, giving us not only control of things around us, but also keeping us informed of the state of the things. In Light of this, present study addresses IoT concepts through systematic review of scholarly research papers, corporate white papers, professional discussions with experts and online databases. Moreover, this research article focuses on definitions, geneses, basic requirements, characteristics and aliases of Internet of Things. The main objective of this paper is to provide an overview of Internet of Things, architectures, and vital technologies and their usages in our daily life. However, this manuscript will give good comprehension for the new researchers, who want to do research in this field of Internet of Things (Technological GOD) and facilitate knowledge accumulation in efficiently.

Kosmatos, E.A., Tselikas, N.D. and Boucouvalas [2] Wireless sensor network (WSN) is one of the rapidly growing sections in networking today [11]. It is a self-configured wireless network consisting of independent devices which are spatially distributed [12]. Formally, a WSN can be defined simply as a network of low-size and low complexity devices known as nodes that use wireless communication link to sense the environment and send the data gathered from the monitored environment to control unit for further processing and decisions. Moreover, the collected data is forwarded via multiple hop relaying, to a sink or base station, which is considered as an interface between users and the network, the sink can use the data locally, or is connected to other networks (e.g., the Internet) via a gateway.

3 Souza, Alberto M.C. Amazonas and Jose R.A. [3] The aim of this paper is to describe the development of a novel smart home application based on an architecture and middleware of the Internet of Things. It integrates temperature and light sensors and the residence interacts directly with them by means of the middleware, controls the brightness of the lights, and turns on and off the air and entertainment systems of house. The proposed architecture provides an intuitive user interface, security, and environment self-adaptation and user context awareness.

Aggarwal, R. and Lal Das, M. (2012) RFID [4] One of the buzzwords in the Information Technology is Internet of Things (IoT). The future is Internet of Things, which will transform the real-world objects into intelligent virtual objects. The IoT aims to unify everything in our world under a common infrastructure, giving us not only control of things around us, but also keeping us informed of the state of the things. In Light of this, present study addresses IoT concepts through systematic review of scholarly research papers, corporate white papers, professional discussions with experts and online databases. Moreover, this research article focuses on definitions, geneses, basic requirements, characteristics and aliases of Internet of Things. The main objective of this paper is to provide an overview of Internet of Things, architectures, and vital technologies and their usages in our daily life. However, this manuscript will give good comprehension for

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Biddlecombe et al. [5] proposed “Intelligent Residential Security Alarm and Remote-Control System Based. On Single Chip Computer”, the paper focuses on, Intelligent residential burglar alarm, emergency alarm, fire alarm, toxic gas leakage remote automatic sound alarm and remote-control system, which is based on 89c51 single chip computer. The system can perform an automatic alarm, which calls the police hotline number automatically. It can also be a voice alarm and shows alarm occurred address. This intelligent security system can be used control the electrical power remotely through telephone.

Butler, D. (2020) Computing [6] purposed Smart Things are a group of devices which can be monitored and controlled via a hub device (central processors) and web services. Smart Things adding support for popular connected products such as the Belkin WeMo family of devices, Philips Hue color-changing bulbs, and the Sonos home music system. The idea of smart objects and the IoT was recently popularized [13]. As with those products, Smart Things users will now be able to control and automate today's additions directly through the Smart 4 Things applications. The world of smart fridges, smart washing machines, smart TV, other home appliances, smart shoes and smart phones is already in use, but the practice of user experience design for Internet of Things is still fairly new concept.

Dodson, S. (2008) [7] Radio Frequency Identification (RFID) is a system that transmits the identity of an object or person wirelessly using radio waves in the form of a serial number [20]. First use of RFID device was happened in 2nd world war in Brittan and it is used for Identify of Friend or Foe in 1948. Later RFID technology is founded at Auto-ID center in MIT in the year 1999.

Gershenfeld, N., Krikorian, R. and Cohen [8] presented that the IoT, machine-to-machine communication (M2M) helps devices exchange data, requiring power, efficiency, security and reliability. This paper advances new ideas for designing a security protocol in the IoT so as to facilitate secure M2M

M. Wu, T. J. Lu, F. Y. Ling, J. Sun, and H. Y. Du [9] Proposed abundance of telecommunications systems makes it possible to have somewhat significant quantity of radiofrequency energy in the environment. This energy can be recycled to power ultra-lowpower devices such as Wireless Sensor Network (WSN). In this paper, the performance of a miniature RF/DC converter is evaluated in order to enslave a WSN's performance to the amount of the recovered energy. More precisely, a highly sensitive and efficient rectifier is designed to achieve optimum performance in the GSM band. The design method relies on a judicious choice of the rectifying diode which is the basis of most losses in a rectifying antenna (rectenna)

III. METHODOLOGY

In this chapter, modelling and development of different components of the proposed smart home automation are presented in detail. Various controls required to control the Different Types of Appliances for Your Home and programming is done on the Arduino Uno (Arduino is an open-source electronics platform based on easy-to-use hardware and software based on microcontroller) by Arduino ide MATERIAL AND METHOD FOR SMART HOME AUTOMATION SYSTEM

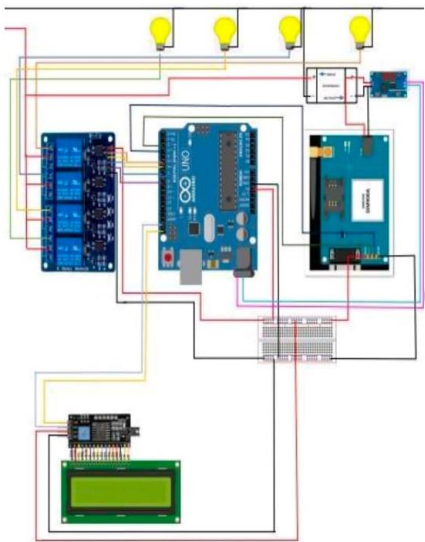
Home automation or domestics is building automation for a home, called a smart home or smart house. A home automation system will monitor and/or control home attributes such as lighting, climate, entertainment systems, and appliances. It may also include home security such as access control and alarm systems. When connected with the Internet, home devices are an important constituent of the Internet of Things. Home automation gives you access to control Appliances in your home from a mobile device anywhere in the world. Home automation include commands, such as having Appliances your turn on or off at specific commands for specific Appliances

The Arduino Uno is an open-source microcontroller board based on the Microchip atmega328p microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.[1] The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. [4] It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.

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2. 4CH RELAY MODULE Relay operation is signalled by one blue LED, this is for all four relay modules, it could be better if each relay module had its own signalling LED. The output screw terminals are marked 1-2-3, it would be better if their manufacturer marked NC-COM-NO, this marking better describes the condition of the relay. The relay can also switch other than the supply voltage, for example 110V or 24V (be careful, the power supply from the source must always be 12V)
3. GSM SIM 900a: The SIM900A is a readily available GSM/GPRS module, used in many mobile phones and PDA. The module can also be used for developing IOT (Internet of Things) and Embedded Applications. SIM900A is a dual-band GSM/GPRS engine that works on frequencies EGSM 900MHz and DCS 1800MHz. SIM900A features GPRS multi-slot class 10/ class 8 (optional) and supports the GPRS coding schemes CS-1, CS-2, CS3 and CS-4.
4. Dc to dc down convertor DC-DC Buck Converter Step Down Module LM2596 Power Supply is a step-down(buck) switching regulator, capable of driving a 3-A load with excellent line and load regulation. These devices are available in fixed output voltages of 3.3 V, 5 V, 12 V, and an adjustable output version. The LM2596 series operates at a switching frequency of 150kHz, thus allowing smaller sized filter components than what would be required with lower frequency switching regulators. This is an LM2596 DC-DC buck converter step-down power module with the high-precision potentiometer, capable of driving a load up to 3A with high efficiency, which can work with Freeduino UNO, other mainboards, and basic modules. When the output current keeps greater than 2.5A (or output power greater than 10W), please add a heat sink to it. This device is internally compensated to minimize the number of external components to simplify the power supply design. Since LM2596 converter is a switch-mode power supply, its efficiency is significantly higher in comparison with popular three-terminal linear regulators, especially with higher input voltages. The LM2596 operates at a switching frequency of 150 kHz thus allowing smaller sized filter components than what would be needed with lower frequency switching regulators.
5. LCD DISPLAY 16X2: 16x2 LCD is named so because; it has 16 Columns and 2 Rows. There are a lot of combinations available like, 8x1, 8x2, 10x2, 16x1, etc. but the most used one is the 16x2 LCD. So, it will have $(16 \times 2 = 32)$ 32 characters in total and each character will be made of 5×8 Pixel Dots. Now, we know that each character has $(5 \times 8 = 40)$ 40 Pixels and for 32 Characters we will have (32×40) 1280 Pixels. Further, the LCD should also be instructed about the Position of the Pixels. Hence it will be a hectic task to handle everything with the help of MCU, hence an Interface IC like HD44780 is used, which is mounted on the backside of the LCD Module itself. The function of this IC is to get the Commands and Data from the MCU and process them to display meaningful information onto our LCD Screen. If you are an advanced programmer and would like to create your own library for interfacing your Microcontroller with this LCD module then you have to understand the HD44780 IC working and commands which can be found its datasheet.
6. I2C stands for Inter-Integrated Circuit. It is a bus interface connection protocol incorporated into devices for serial communication. It was originally designed by Philips Semiconductor in 1982. Recently, it is a widely used protocol for short-distance communication. It is also known as Two Wired Interface (TWI). Working of

I2C Communication Protocol: It uses only 2 bi-directional open-drain lines for data communication called SDA and SCL. Both these lines are pulled high. Serial Data (SDA) – Transfer of data takes place through this pin. Serial Clock (SCL) – It carries the clock signal. I2C operates in 2 modes – 1. Master mode 2. Slave mode Each data bit transferred on SDA line is synchronized by a high to the low pulse of each clock on the SCL line. According to I2C protocols, the data line cannot change when the clock line is high, it can change only when the clock line is low. The 2 lines are open drain; hence a pull-up resistor is required so that the lines are high since the devices on the I2C bus are active low. The data is transmitted in the form of packets which comprises 9 bits. The sequence of these bits is – Start Condition – 1 bit Slave Address – 8 bits Acknowledge – 1 bit

IV. CIRCUIT DIAGRAM:



V. WORKING

A simple home automation project using Arduino UNO, GSM MODULE and a smart phone. The aim of this project is to control different home appliances using a smart phone. When the power is turned on, the connection LED on the GSM MODULE starts blinking. We need to start the messaging app in our smart phone and get connected to the GSM MODULE. If the pairing is successful, the LED becomes stable. Now, in the app, we need to set different keys for different loads and their corresponding value that must be transmitted when that key is pressed. Then we are ready to control the loads. When a key is pressed in the smart phone, the GSM MODULE receives the corresponding data and intern transmits that data to Arduino. If we send “Fan on”, then the data received by the

GSM MODULE. This data is transmitted to Arduino then compares the received data with the data written in the sketch and accordingly turns on the ‘Fan on’. The similar action can be applicable to other keys and loads. Using this type of connection, we can control turn on or off different home electrical appliances using our Smart phones. The GSM MODULE has 4 – pins: VCC, TX, RX and GND. VCC and GND pins are connected to 5V and ground to Arduino UNO. The GSM MODULE works on 12V. The TX and RX pins of the GSM MODULE must be connected to RX and TX pins of the Arduino. When connecting RX to TX pins of Arduino (or any microcontroller as a matter of fact), we need to be careful as the pin can tolerate only 5V. But the voltage from TX pin or Arduino will be 5V. So, a voltage divider network consisting of 10K and 20K resistors are used to reduce the voltage to 5V approximately. **Social Aspect:** In our society with a majority of physically challenged persons there is seen to be a growing concern of control of home appliances manually which poses a major complexity to physically challenge and senior citizens. By using this device of smart home automation people who are physically challenged and are senior citizens can easily access the control of their appliances by using their cell phone with just one message. This project resolves the problem of manual switching.

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Advantages:

1. Wireless control: By using this project wireless control can be within the hands of user
2. Monitoring: This circuit allows monitoring of all appliances within range of communication with GSM MODULE
3. Status checking: When user doesn't know appliances is on off then user can check the status only.

Future Scope:

This device of home automation can be useful in all applications which find their place in coming times Major electrical and electronic companies around the globe are now replacing their conventional methods of manual switching and are replacing them with home automation technique. This technology in 21st century proves to be an “icing over the cake” in field of technology.

Conclusion:

Introduced design and implementation of a low cost, flexible and wireless solution to the home appliances control by using the Arduino GSM MODULE and the cell phone will be used to access the home appliances. This adds a protection from unauthorized users. This system can be used as a test bed for any appliances that requires on-off switching applications without any internet connection.

VI. ACKNOWLEDGMENT

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