

IOT Based Home Automation and Security System

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Abstract — A home is the place where people usually spend a lot of quality time. Human race has always made endless efforts, trying to achieve comfort combined with simplicity. That's the reason why we actually ended by with the concept of "Smart Home". In this paper implement the IOT Based Home Automation and Security System. This framework is featured to be handy but yet secured. This system uses ESP8266 is a wireless communication device, which gives a wireless access to smart phones, using low power. It is low cast but safe and reliable. UNO Arduino microcontroller is the Central Processing Unit. It processed all proposed system. In this paper the gas sensors and PIR sensors are used for security purpose. According to the sensor's signals received sensing signals by microcontroller, a message will be send is established to mobile station through a GSM modem and thus warns the presence of unauthorized user in the home to owner-occupier.

Keywords — ESP8266(wireless module), UNO Arduino, gas sensor, PIR sensor, GSM module, power LED Indicator, transformer.

I. INTRODUCTION

The advancement in the technology has made us to enter into a different world where we can interact with the objects. The virtual view over the internet has been extended into the physical world on the objects surrounding us. The Internet of Things is the interface of physical devices nested with electronics, software, sensors, actuators, and network connectivity that enables the devices to transfer the data. In other words it can be specified as a simple way of connecting a physical device to an internet. Everything is becoming smarter now-a-days with the help of Internet of Things. This includes everything starting from smart phones, smart homes, smart cities, intelligent transportation, etc., Each and every thing is uniquely identifiable through its computing system but it is able to interoperate with the existing internet infrastructure. Experts estimate that will Internet of Things consist of almost 50 billion of objects by 2020.

II. IOT IN HOME AUTOMATION AND SECURITY

Recently many controlled devices such as ARM, Arduino are being developed using Internet of Things to help controlled the home appliances and home security purpose. Smart home automation system is increasingly used due to the endless efforts of Humans. From a social point of view, residents are admitted to smart homes for comfort combined with

simplicity. And also luxury, improving quality of live, and for providing security against intrusion, breaking and entering. Secondly, home automation is achieved using a single controller, monitoring and the controlling many interconnected electronic appliances. Smart homes are cheap, low-power, cost effective, efficient, and realize the automation of a variety of domestic appliances using user-friendly interface any other handheld devices. This idea will be more helpful for handicapped patients, and people with disabilities can benefit from this smart home to totally operate, with high performance, all appliances and devices from anywhere in the house. When a resident is living alone, the ubiquitous access becomes very important and it is realized by using ESP8266 wireless communication between the remote control and the master control panel board.

III. IMPORTANCE OF THE PROJECT

This project combined embedded system technology and wireless technology. In this system two-way communication is established between the mobile user and the visitors. The person can know the visitor motion from any remote location and also secures the home from strangers and intruders. This System contains user mobile which includes user modes options such as active and hibernate mode.

The user mobile also includes options for viewing the motion of the visitors, turning on and off the electronic devices in home at particular time, two way communication facility, and offline option and activating alarm system etc. This system controls all electronics home appliances viewing of the house interiors for surveillance purposes and provides an indication in case of any occurrence of violation.

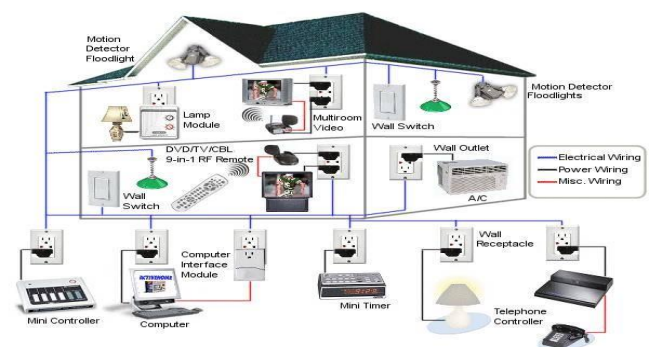


Figure 1: Home Automation example

Wireless based home automation systems decrease cost and effort and enhance system flexibility. In Home automation system there are many interconnected devices for controlling various functions within a house. Mobile devices are portable and it provides a user interface in a home automation system. Home Automation is becoming an unavoidable thing in our fast developing and current life style. It provides better security system where there is high level of theft. This tends to the use of GSM network, mobile phone and electronics circuit to achieve an automated system which is programmed to work as a thinking device to accomplish this purpose. To secure it against theft, crime, powerful security system is required not only to detect but also pre-empt hazards. In this project motion sensors with low-power consumption are placed where an intruder must pass through. According to the sensor's signals received by microcontroller, a text message will be send to mobile station through a GSM modem and thus warns the presence of unauthorized user in the home to owner.

A. ARDUINO MICROCONTROLLER:

Variety of microprocessors and controllers are used in the design of Arduino. Digital and analog input/output (I/O) pins are equipped in boards that may be interfaced to various expansion boards and other circuits.

Serial communications interfaces is a feature in this board, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are programmed using features from the programming languages C and C++.

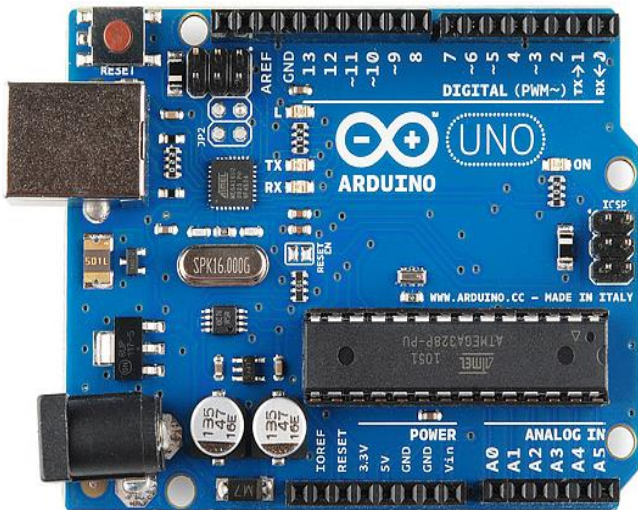


Figure 1: Arduino UNO

B. POWER BOARD:

Voltage Regulator

A voltage regulator is used to maintain constant voltage level. Voltage regulator is also used for regulating the AC or DC voltages. A voltage regulator contain negative feed-forward design or it may also contain negative feedback control loops. It may use an electromechanical mechanism, or electronic components.

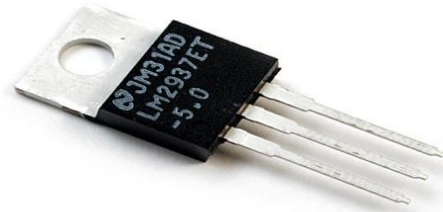


Figure 3: Power LED Indicator

DC voltages used by the processor and other elements is stabilized by electronic voltage regulators.

C. WiFi Module

The ESP8266 is an almost limitless fountain of information available all of which has been provided by excellent support. The ESP8266 is support the wireless communication between the devices. Based on the instruction provided by IOT (Internet of Things) gives solutions.



Figure 3:ESP8266 Wi-Fi Module

Note: The ESP8266 Module is not capable of 5-3V logic shifting and will require an external [Logic Level Converter](#). Please do not power it directly from your 5V board.

Note: This new version of the ESP8266 Wi-Fi Module has increased the flash disk size from 512k to 1MB.

D. GSM Module

GSM or a GPRS module is a chip which establish communication between a mobile device or a computing machine and a GSM or GPRS system. Modem is the desperate part in GSM or GPRS module.

These modules contains GSM module or GPRS modem. These modem are powered by a

power supply circuit and communication interfaces (like RS-232, USB 2.0, and others) for computer. GSM modem can be a mobile phone that provides GSM modem capabilities, or GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection.



Figure 5: GSM Module

GSM mobile network is interfaced with the mobile termination and a base band processor controls this process. The access to SIM, speech encoding and decoding, signaling and other network related tasks are handled by this processor. The operations related to keypad, screen, phone memory and other hardware and software services embedded into the handset is carried by a Terminal Equipment which is an application processor. By using AT commands the Terminal Adapter establishes communication between the Terminal Equipment and the Mobile Termination. The base band processor carry out the communication with the network in a GSM/GPRS mobile.

E. Working of Sensors:

- GAS SENSOR:

The gas sensor module consists of a steel exoskeleton in which a sensing element is housed. Through connecting leads this sensing element will be subjected . This current is known as heating current through it, the gases which comes closest to the sensing element will get ionized and are absorbed by the sensing element. This changes the resistance of the sensing element which is then alters the value of the current going out of it.

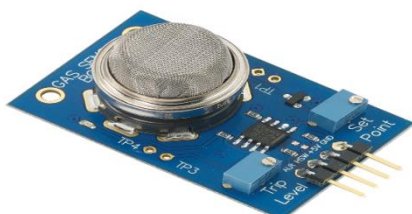


Figure 6: GAS Sensor

- PIR SENSOR:

PIR sensor is used to sense the motion of the human. It is also called as motion sensor. When a human pass through this sensor it will automatically sense the motion and it will send text message to the mobile phone. IR radiation is used in this motion sensor to sense the motion.

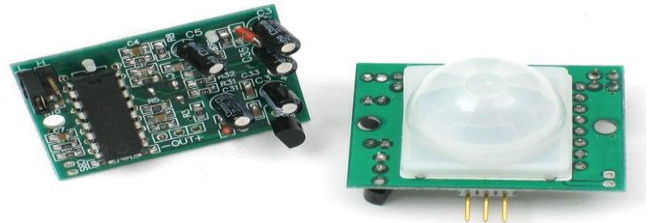


Figure 6: PIR Sensor

IV. WORKING OF PROPOSED SYSTEM

In this system home automation is used for controlling the home appliances and also for providing security to home. Mobile is one of the important component used in this system. An application is developed and it is installed in the mobile. ESP8266 is a Wi-Fi module which is used for providing communication between the application in the mobile and the system. PIR sensor is used in this system which will be used to sense the motion of the person crossing the sensor and once the motion is detected a message will be send to the registered mobile. Similarly a gas sensor is used which will detect the leak of any gases in the home and a message will be send to the user.

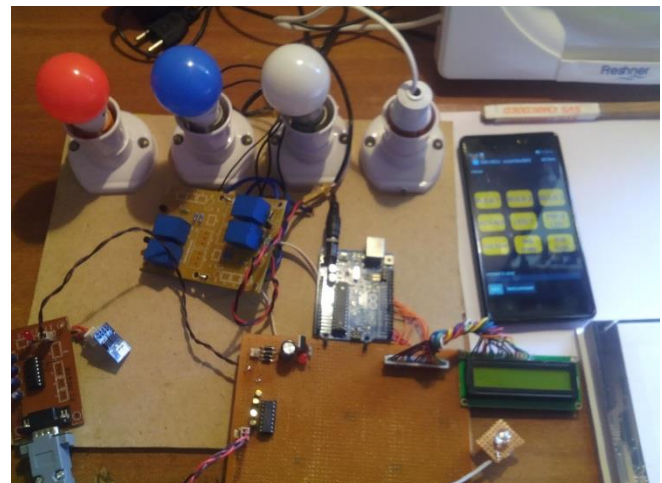


Figure 7: Experimental setup

V. REAL TIME APPLICATION:



VI. CONCLUSION

Based on Arduino Uno microcontroller as central controller a design concept for a wireless real-time home automation system has been obtained. There are two modes in this system, the first mode in which the user can monitor and control all the home appliances through their mobile phones from any parts of the world or even in home by using Wi-Fi communication. The second mode was a self-automated mode that made the Arduino Uno controller to control and monitor appliances in the home automatically by the signals received from related sensors. To verify the reliability of the system a hardware implementation of the system was carried out. The system which is implemented was a simple, low cost and flexible that can be expanded and scaled up. Using wireless sensor technologies a future improvement can be added to the proposed system. The proposed system can also be used to detect the gas leakages in home. It can also be used to detect the motion of the person for that PIR sensor is used.

VII. FURTHER EXTENSION

Identifying the problem and gathering a solution, an initial system planning combined with the feasibility analysis, the requirements and maintenance concept of the smart home was discussed. The performance measures and the functional analysis are also discussed. Many prototypes and choices were presented (COTS, and custom made choices) and as far as we went through this phase, system specifications and system review were done. When the smart home conceptual idea was done, we rushed into the preliminary (subsystem) phases. The first step was developing a design requirement. This requirement process will then be followed by the subsystems which contains security, control, entertainment, comfort, energy were accomplished with functional analysis with their level where the use of appropriate tools and technologies were applied along with choosing the products, process, and materials as there were many tradeoffs. Finally, a formal review was sent to the customer with the impact of environmental, economical, and social

effects. As the requirements were the first rational step to begin, the final phase in production is the detailed design handling the specific components of the project.

VIII. REFERENCES

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