Smart Home Automation Using IOT (Internet OF Things)

[1]Mr. Jawwad Khizar Patel, [2]Mr. Mohammed Abdul Moyeed,
[3]Mr. Syed Ahmed Zayaanuddin, [4]Mr. Mohammed, [5]Mrs. E. Shilpa

[1]Serial Innovator, Patentee, Entrepreneur, Student VIII- Semester, Electronics and Communication Engineering,
Lords Institute of Engineering & Technology, Hyderabad

[2, 3, 4] Student VIII- Semester, Electronics and Communication Engineering, Lords Institute of Engineering & Technology,
and published national research paper

[5] Associate Professor, Department of Electronics and Communication Engineering, Lords Institute of Engineering &
Technology, Hyderabad

Abstract: **A proposed development of the Internet in which everyday objects have network connectivity, allowing them to send and receive data.(or) The concept of internetworking of physical devices, vehicles, buildings and other items embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data is defined as "Internet of things".It is the basic necessity for developing a smart environment in which all the physical appliances communicate with each other to deliver ease of living reducing the manual work up to a great extent. This inter-connected smart environment is the future of electronic universe enabling sophistication to all the time consuming manual data transfers and instructions carried out by the mankind. The infrastructure of information society depends up on IOT, enhancing the opportunities for more direct integration between physical and cyber world. Therefore, ultimately providing improved efficiency, accuracy and economic benefits.**

Keywords: **Internet of things, sensors, worldwide controlling, windows application, Internet monitoring, smart sensor calibration.**

I. INTRODUCTION

Overview:

It is the residential extension of building automation and involves the control and automation of lighting, heating (such as smart thermostats), ventilation, air conditioning and security, as well as home appliances such as washer/dryers, ovens or refrigerators/freezers that use Wi-Fi for remote monitoring. Modern systems generally consist of switches and sensors connected to a central hub sometimes called a "gateway" from which the system is controlled with a user interface that is interacted either with a wall-mounted terminal, mobile phone software, tablet computer or a web interface, often but not always via internet cloud services.

Hardware Unit

Advantages of Home Automation Systems:

In recent years, wireless systems like Wi-Fi have become more and more common in home networking. Also in home and building automation systems, the use of wireless technologies gives several advantages that could not be achieved using a wired network only.

1) Reduced installation costs: First and foremost, installation costs are significantly reduced since no cabling is necessary. Wired solutions require cabling, where material as well as the professional laying of cables (e.g. into walls) is expensive.

2) System scalability and easy extension: Deploying a wireless network is especially advantageous when, due to new or changed requirements, extension of the network is necessary. In contrast to wired installations, in which cabling extension is tedious. This makes wireless installations a seminal investment.

3) Aesthetical benefits: Apart from covering a larger area, this attribute helps to full aesthetical requirements as well. Examples include representative buildings with all-glass architecture and historical buildings where design or conservatory reasons do not allow laying of cables. 4) Integration of mobile devices: With wireless networks, associating mobile devices such as PDAs and Smartphones with the automation system becomes possible everywhere and at any time, as a device's exact physical location is no longer crucial for a connection (as long as the device is in reach of the network).

For all these reasons, wireless technology is not only an attractive choice in renovation and refurbishment, but also for new installations.
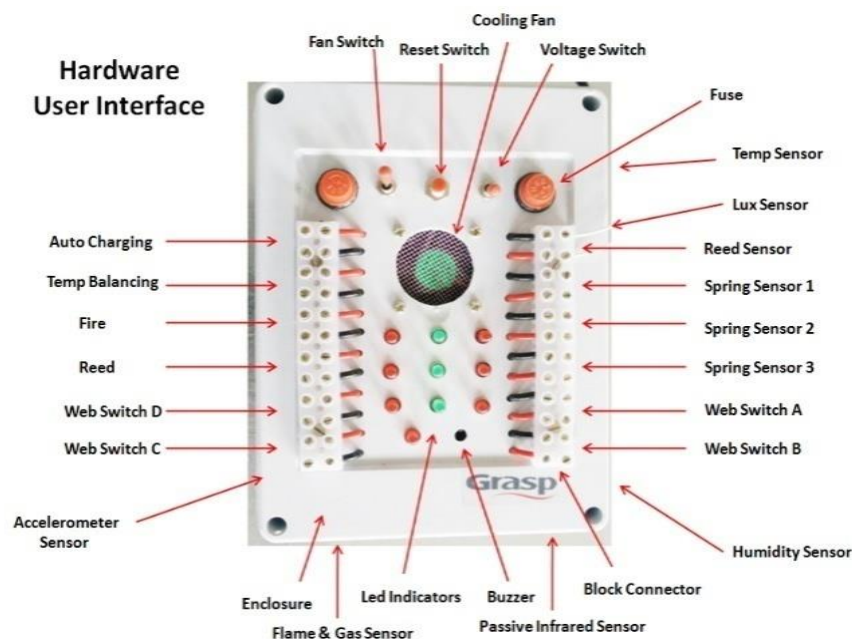
The User Interface of hardware is simple and well defined to significantly enhance the level of human-machine interaction. The connections are easy to understand through the diagrammatic representation of the system. The design is crafted in such a manner that the necessary space is provided between different components and connection. It also ensures the portability factor of the proposed system due to its compact craftsmanship. The apparatus is light weight as well, which in-turn contributes to the portability factor.

II. PROPOSED SYSTEM FEATURE

The proposed system is a distributed home automation system which consists of several layers on board, sensors. Server controls and monitors the various sensors, and can be easily configured to handle more hardware interface module (sensors). The **ARM CORTEX M3** development board is interfaced with a computer consisting of dedicated program to drive the product which also acts as a communication fragment. Automation System can be accessed from the web browser of any device with web access using server IP remotely from any PC or mobile handheld device connected to the internet with appropriate web browser through server real IP (internet IP).

Wi-Fi technology is selected to be the network infrastructure that connects server and the sensors. Wi-Fi is chosen to improve system security (by using secure Wi-Fi connection), and to increase system mobility and scalability. An online domain space is being used with one of the leading web suppliers to provide a sophisticated ping rate and security.

III. SYSTEM DESIGN AND IMPLEMENTATION

Proposed Smart Home Automation System:

The proposed model of the home automation system is as shown in the figure above. The model consist of different sensors like temperature, humidity, light detection, toxic gas, motion detection,accelerometer, magnetic detection and buzzer. Initially the ARM Cortex M3 connects to the internet through Wi-Fi module (ESP8266). When the connection is established it will start reading the parameters of sensors like p1, p2, p3 etc. The threshold levels for the required sensors are set as t1, t2, t3 etc. The sensor data are sent to the web server and stored in the cloud. The data can be analyzed anywhere any time. If the sensor parameters are greater than the threshold level then the respective alarm a1, a2, a3 etc. will be raised and the required actuation is done for the controlling of the parameters. In the proposed model the temperature, light intensity, security, gas leakage, natural calamity, motion in the house is monitored. All the above parametric information detected is stored in cloud for analysis. If the quantities exceed the threshold level then the respective appliances will turn on/off/regulate automatically accordingly till the readings return to their previous values. The user can also monitor the electric appliances through the internet via web server. If the lights or any electrical appliances are left on in hurry can be seen and turned off remotely through simply typing the IP address of the web server. The manual control over IP helps to enhance home security to another level.

The system is efficiently power conserving with smart protocols which consistently minimize power consumption.

*Proposed Home Automation System Functions:*

The proposed home automation system has the capabilities to control the following components in users home and monitor the following alarms:

- Temperature and humidity

- Motion detection

- Fire and smoke detection

- Toxic element detection

- Natural calamity detection

- Locking system/ Home security

- Light level

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The proposed home automation system can control the following appliance:

• Lights on/off/dim/brighten

• Fan on/off/regulate

• On/off/regulate different appliances

• Security alarms (Burglar/Natural calamity, etc.)
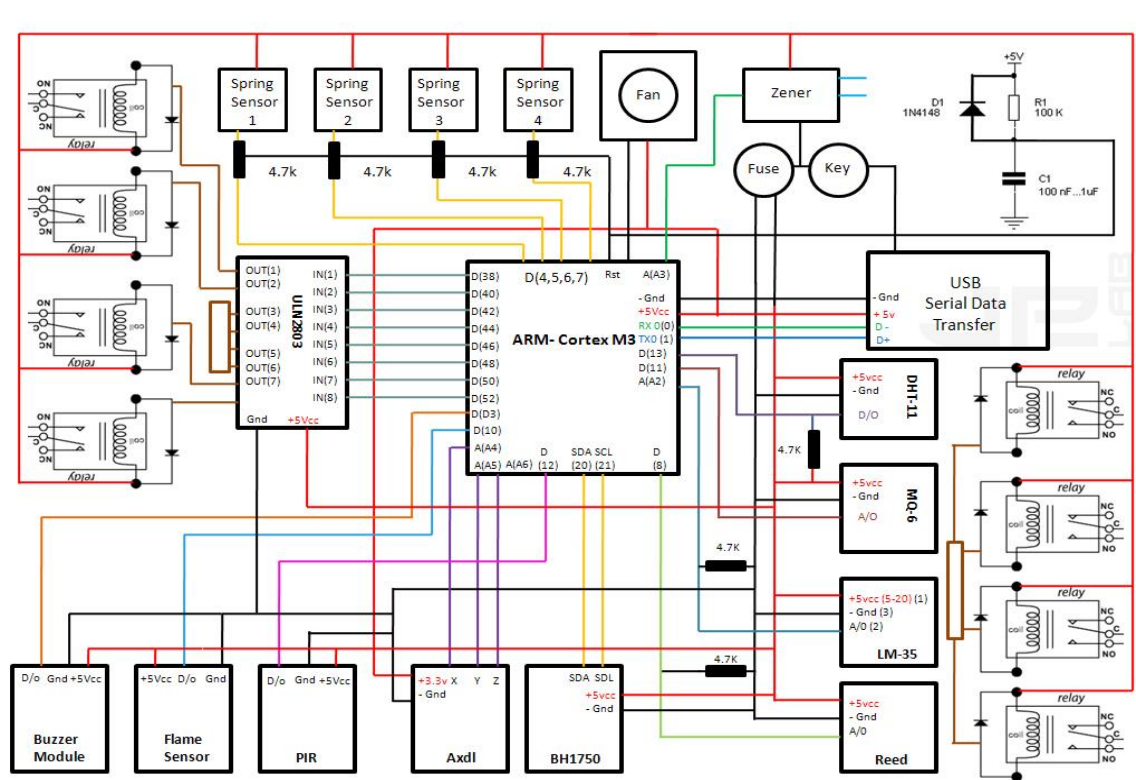
Block Diagram of System:
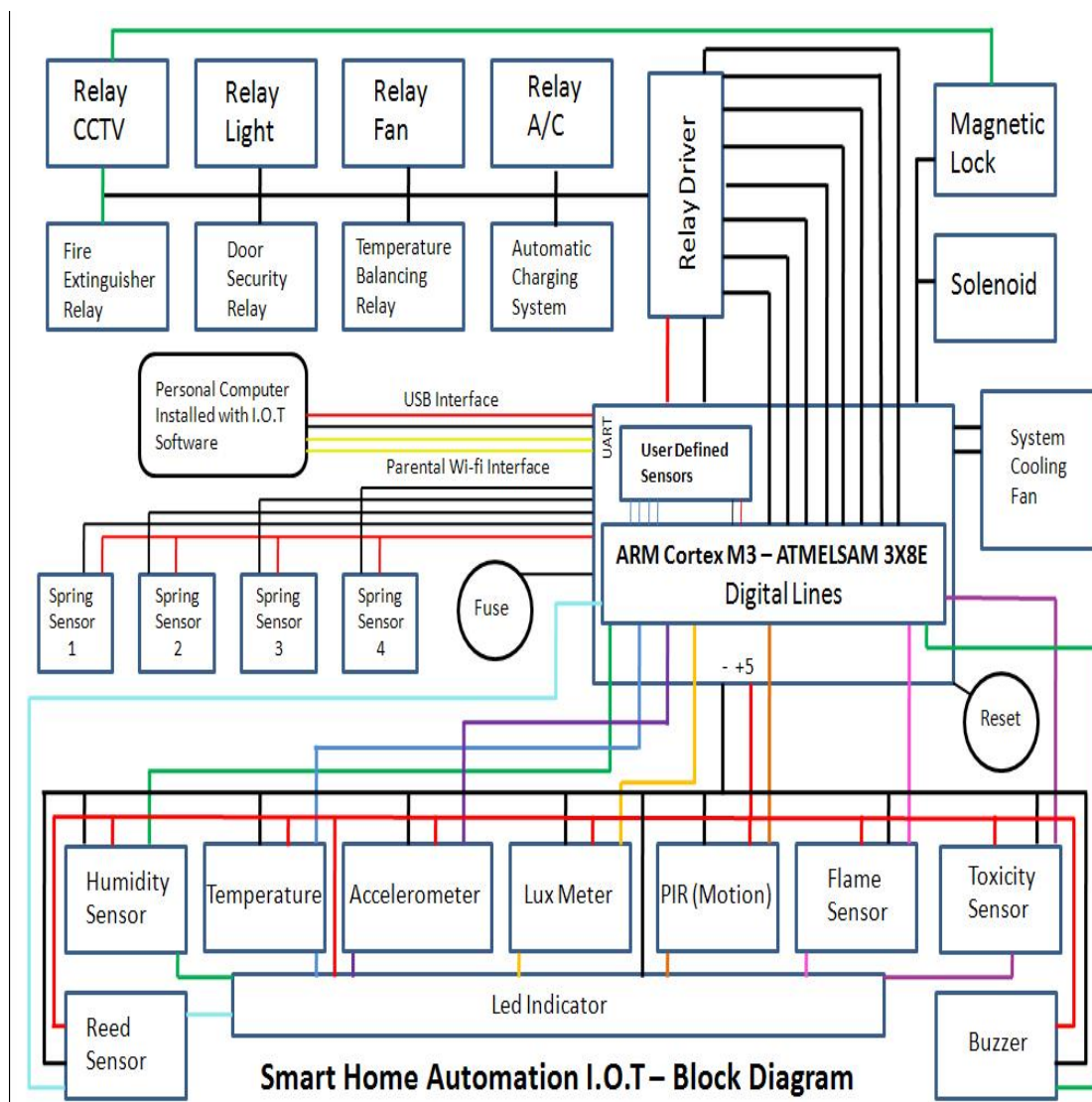
The above figure represents the block components and their connections with respect to the key component of the system i.e. the micro-processor (ARM Cortex M3). Various sensors along with a buzzer are shown in the bottom region right above an LED indicator, whereas the upper region consists of relays and spring sensors to control a large number of appliances or devices.

The system has a tendency to internally heat after a prolonged usage like any other electronic processing device. Therefore, a dedicated cooling fan is fabricated on the board to extract the unwanted heat which can be triggered automatically based on the threshold level as well as manually operated.

The communication module of the system is also represented above in the figure which comprises of information sharing to various networks or the internet.

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Circuit Diagram of System:

The circuit diagram is a complete detailed representation of connections of core as well as miscellaneous components required to perform data collection/representation. The red lines are used to understand the Vcc network, black lines are based on the common grounding phenomenon and the colored lines define the data transmission connections from sensors to the path following towards relays and spring sensors.

The rectangular black bars are the pull-down resistors which are necessary for reducing the signal strength to an optimum level.

IV. SOFTWARE

The micro-processor is programmed in embedded C which is known for its commonality with C programming as an extension. Its syntax is comparatively easy to understand and implement.
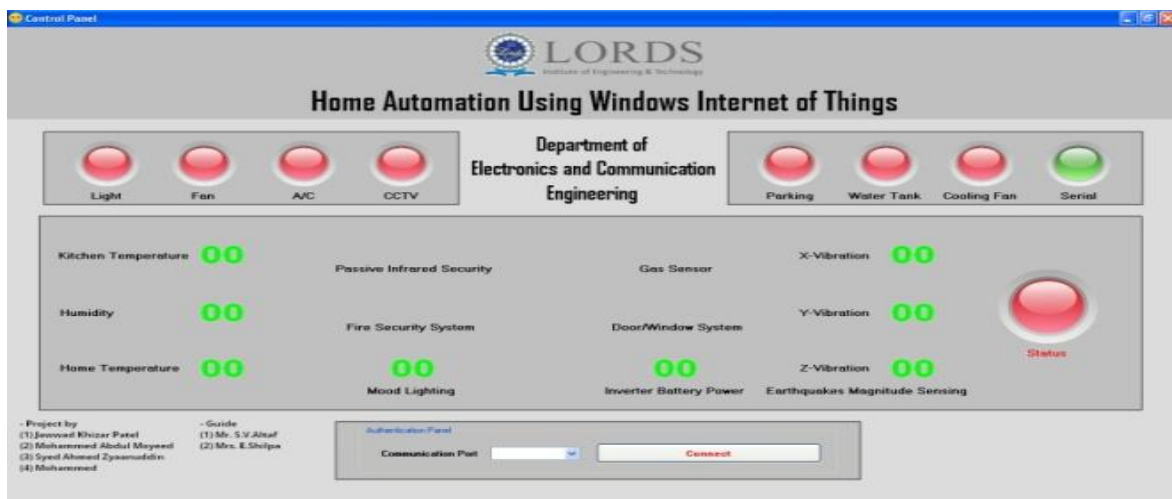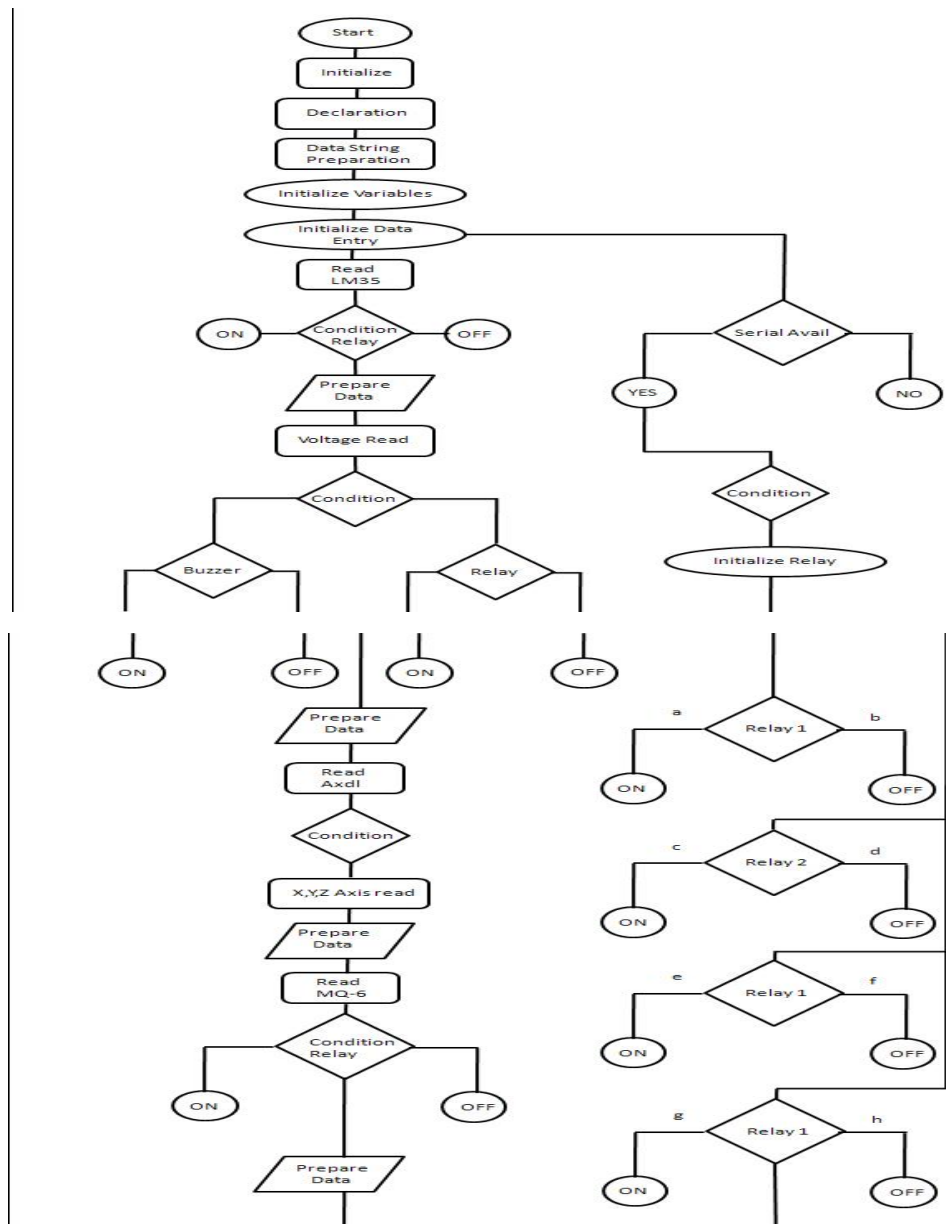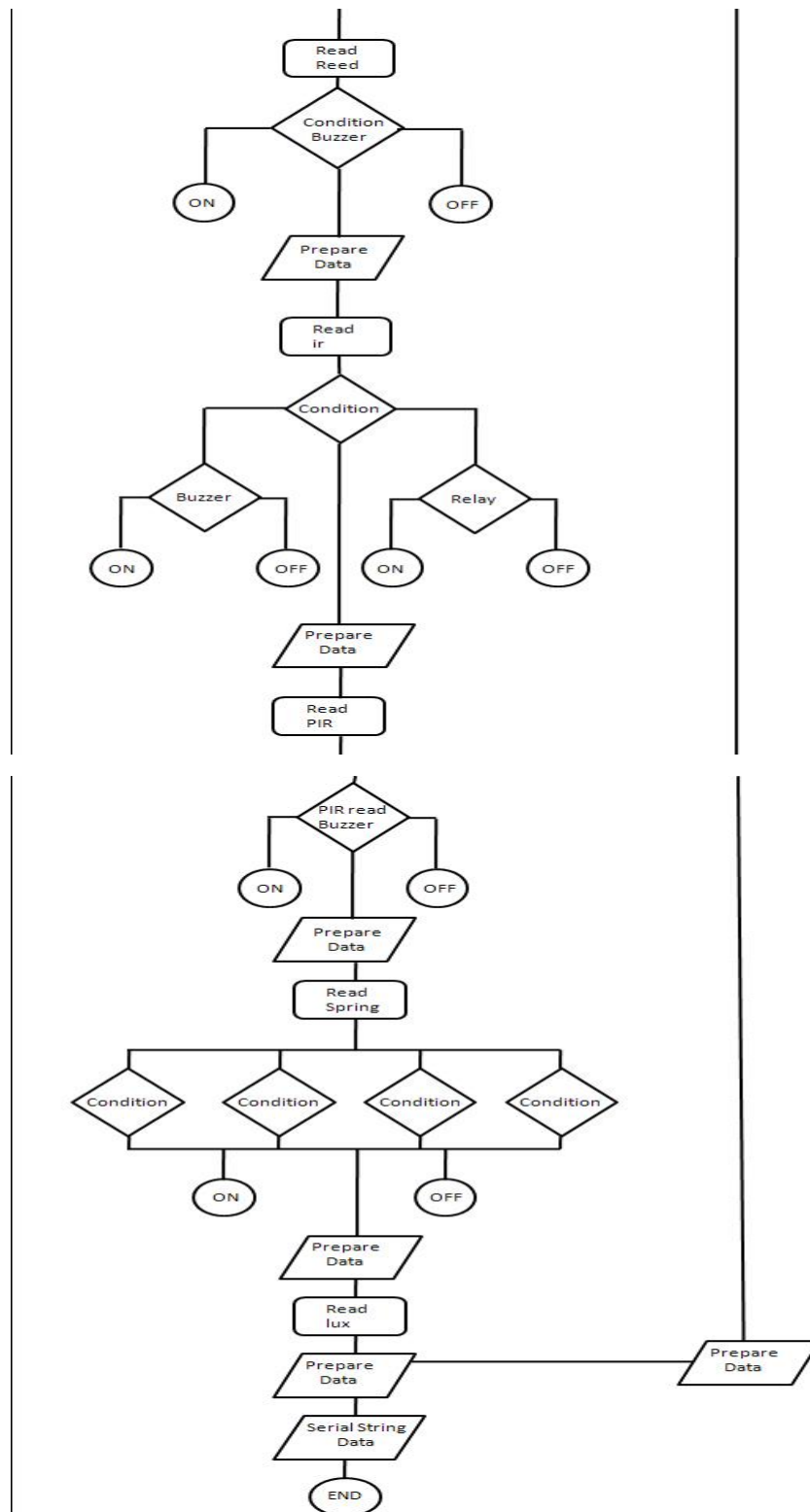

Fig: Control panel

A custom designed dedicated software (JP Control panel) has been developed in order to collect and represent information in real time which is transmitted serially from the development board to the communication device i.e. a personal computer in this case. The software is a windows application based on .net platform and programmed in C# language which makes it easier to code and to successfully deliver required data as a continuously refreshing output from various sensors simultaneously in real-time. This information is displayed on a well-defined and simple user-interface to monitor and control the surroundings.

The project has a merit of real-time monitoring and control through the web, this means that it can be accessed from anywhere on the globe with an internet connection. To implement this feature, a domain space is employed with a windows shared host to upload information online through a virtual port which is merged with the internet protocol. This web-service is called as JP web-service and its graphical user-interface is programmed in PHP. HTML is a format that instructs a computer to display a web page online. The documents themselves are plain text files with special "tags" or codes that a web browser uses to interpret and display information on your computer screen. HTML stands for Hyper Text Markup Language; an HTML file is a text file containing small markup tags. The markup tags tell the Web browser how to display the page. An HTML files must have an htm or html file extension.

V. IMPLEMENTATION (FLOW CHART) AND WORKING

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VI. HYPOTHESIS

The ARM cortex when interfaced with various Wi-Fi modules, could not match the delay loop. In order to fix the issue, the specific ESP8266 was replaced with personal computer as a module for communication. Through this method, the real time decryption of information was possible on the assigned PC and eventually the readings could be transmitted with some delay to the domain space through internet acting as a medium.
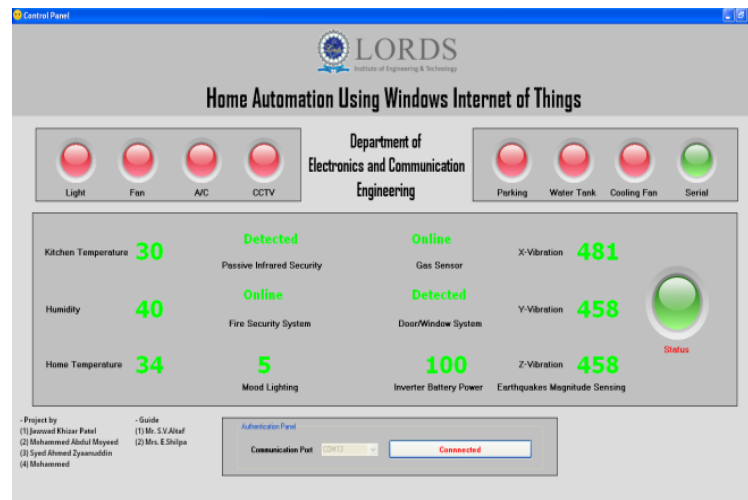
VII. RESULT

Fig: Control desk

Fig: Hardware

The obtained reading of information is displayed on the JP control panel which is installed on the PC. The PC acting as the power supply as well as communication module, displays the real-time information simultaneously gathered from all input sensing devices.

VIII. CONCLUSION AND FUTURE WORK

Smart Home automation based on Internet of things has been proved to work quite satisfactorily with a set of added sensors which not only measure temperature, humidity, toxicity, light intensity, magnetic field, earthquakes and various other safety measures but also protect an equipped region with smart security measures to prevent burglaries and theft. The power consumption is significantly low with advanced features like automatic charging with an external battery

The system can be further innovated with a capability of human mood detection through cameras and artificial intelligence protocols. This will take technology to another level by interpreting human moods and controlling ambient lightning as well as musical playlists for a seamless visual and audio experience towards the future.

IX. RELATED WORK

1. Sirsath N. S, Dhole P. S, Mohire N. P, Naik S. C & Ratnaparkhi N.S

This paper proposes a Home Automation system that employs the integration of multi-touch mobile devices, cloud networking, wireless communication, and power-line communication to provide the user with remote control of various lights and appliances within their home. This system uses a consolidation of a mobile phone application, handheld wireless remote, and PC based program to provide a means of user interface to the consumer.

2. Basil Hamed

The main objective of this Paper is to design and implement a control and monitor system for smart house. Smart house system consists of many systems that controlled by LabVIEW software as the main controlling system in this paper. Also, the smart house system was supported by remote control system as a sub controlling system. The system also is connected to the internet to monitor and control the house equipment's from anywhere in the world using Lab view.

3. Deepali Javale, Mohd. Mohsin, Shreerang Nandanwar

The prime objective of this paper is to assist handicapped/old aged people. It gives basic idea of how to control various home appliances and provide a security using Android phone/tab. The design consists of Android phone with home automation application, Arduino Mega ADK. User can interact with the android phone and send control signal to the Arduino ADK which in turn will control other embedded devices/sensors.

4. Basma M. Mohammad El-Basioni, Sherine M. Abd Elkader and Mahmoud Abdelmonim Fakhreldin

This paper proposes a new design for the smart home using the wireless sensor network and the biometric technologies. The proposed system employs the biometric in the authentication for home entrance which enhances home security as well as easiness of home entering process. The structure of the system is described and the incorporated communications are analyzed, also an estimation for the whole system cost is given which is something lacking in a lot of other smart home designs offers. WB-SH is designed to be capable of incorporating in a building automation system and it can be applied to offices, clinics, and other places. The paper ends with an imagination for the future of the smart home when employs the biometric technology in a larger and more comprehensive form. The paper ends with an imagination for the future of the smart home when employs the biometric technology in a larger and more comprehensive form.

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AUTHOR'S PROFILE:

Mr. Jawwad Khizar Patel

Pursuing B-Tech in Electronics and Communication Engineering from Lords Institute of Engineering and Technology, Hyderabad, being an inventor himself holding 2 patents in the fields of Electronics and publish many national and international research paper, He Got featured in over 200 media channels in about 50 countries across different streams –print, radio, TV and Web He owns his Personal Lab and a Website.

Mr. Mohammed Abdul Moyeed

Pursuing B-Tech in Electronics and Communication Engineering from Lords Institute of Engineering and Technology, Hyderabad, and Published National Research Paper.

Mr. Syed Ahmed Zayaanuddin

Pursuing B-Tech in Electronics and Communication Engineering from Lords Institute of Engineering and Technology, Hyderabad, and Published National Research Paper.

Mr. Mohammed

Pursuing B-Tech in Electronics and Communication Engineering from Lords Institute of Engineering and Technology, Hyderabad, and Published National Research Paper.

Mrs. E Shilpa

Assoc professor in ECE department at Lords Institute of Engineering and Technology, Hyderabad.