CHAPTER-1

INTRODUCTION

Chapter -1

INTRODUCTION

1.1 OBJECTIVES

The main motive of this project is to automate all the controls of all the electronic devices present in our home. Security along with automation of lights and other devices in home is handy and helps us to save time. In today's age of digital technology and intelligent systems, home automation has become one of the fastest developing application-based technologies in the world.

Home security system for detecting any motion into a monitored area by a PIR detector, a motion detecting sensor. A security system has a free-standing PIR detector. The term PIR is the short form of the Passive Infra-Red. The term "passive" indicates that the sensor does not actively take part in the process, which means, it does not emit the referred IR signals itself, rather passively detects the infrared radiations coming from the human body in the surrounding area.

IoT is the area of network in connection with consequences, result and actions via internet allowing them to send and receive data. Here, things are connected among themselves without human intervening for automatic identification of intended activities. IoT helps in sharing of information from sensors through wireless network, achieving identification and informational exchange in open computing network and achieving transparent management of system. Things that we are using in our daily life are becoming smart with the current technologies but it isn't enough until we link them to act with the changing environment and additionally make their own inter-network, that is, machine-to-machine communication. The objective of key providers was to reduce the server rental cost by accessing through the efficient and inexpensive ESP8266 chip to the cloud platforms on which dynamic server provisioning to reduce the server rental cost which was the key objective for content providers.

Gardening - Adding automated plant watering system to your garden or agricultural field, you will help all of your plants reach their fullest potential as well as conserving water. Using sprinklers drip emitters, or a combination of both, we can design a system that is ideal for every plant in our yard. For implementation of automatic plant watering system, plants are dependent on conventional breeding - watering, and provide the right amount of sun to sustain life and growth.

Fire detection - Most of the alarms these days have a way that you can hook up your smoke alarms to them. That way if a fire is detected, the alarm will sound alerting you to the danger. It will also alert the security company to the danger so they can call for help for you. This could save your family's lives.

Anti-Intrusion – The IR sensor detects any kind of change in its range. So, if the door opens when the sensor is activated the sensor and the data is got to the app and email if there is unauthorized access. The sensitivity of the sensor can be changed to vary the range and the maximum range can be up to 2 meters.

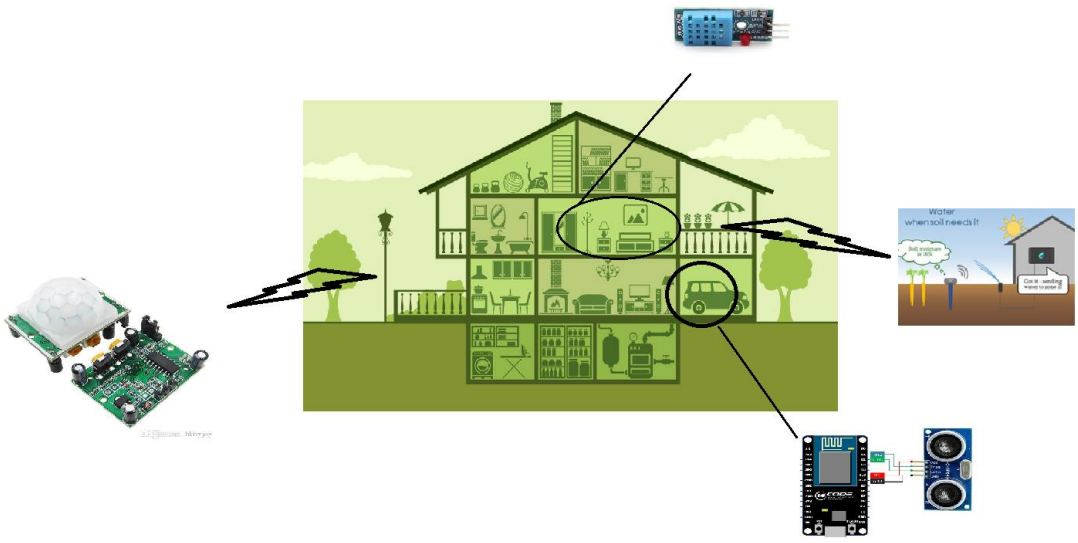

Figure-1: General figure of Home automation with some sensors

The objective of our project is to make this all so cost effective, easy, accurate and secure. We are making a unified control system to manage all the smaller parts by using a node along internet.

1.2 OVERVIEW

The study says that home automation segment has seen a rapid advancement and with that advancement, the evolution and development of new and improved technologies. With advancement of Automation Technology, life is getting simpler and easier in all aspects. In today's world, Automatic systems are being preferred over manual systems. Internet of Things is the latest emerging internet technology and has got its origin from home automation. The pivotal difference between standard home automation devices and IoT devices is that the IoT devices can transfer and share data over the existing network framework. Also, IoT devices are capable of being controlled remotely over the internet. Present technologies have to rely on different protocols for communication. Also, some proprietary and some standard like Wi-MAX, Ethernet, Bluetooth, Z-Wave, Fiber Optics. The major problem with all these protocols is that they are not suited with each other. This paper uses basic and most extensively used standard like IEEE 802.11 (Wi-Fi).

The proposed structure is simple and can be installed very faster by having a minimum knowledge and contains various sensors reading much data in real time graphing the data. The sensors used are Soil moisture sensor(LM239) module, IR sensor, Ultrasonic sensor, DTH11. The other components consist of Relay module, Led's etc.

1.3 PROBLEM STATEMENT

Smart homes are a boom now a days and depending on the home, environment and importance Owing to the rapid growth in technology, the devices in the recent past are becoming smart. The real world devices are being equipped with intelligence and computing ability so that they can configure themselves accordingly. Sensors connected to embedded devices along with the low power wireless connectivity is facilitates to remotely monitor and control the devices. This forms an integral component of Internet of

Things(IoT) network. Internet of Things can be considered as a network of devices that are wirelessly connected so that they communicate and organize themselves based on the predefined rules. However, these devices are constrained in terms of their resources.

1.3 OVERVIEW OF REPORT

The report starts with certificate, acknowledgement and abstract. The abstract represents a page summary of our project highlighting its salient features. We have made sure that every item in the report has a page number to it.

Chapter 1 is “Introduction”. It states the Goals and objective, overview of technical area and report, problem statement, our proposed solution and, primary requirement of our circuit and how we achieved it.

Chapter 2 is “Literature Survey”. In this section, we have seen the different aspects in which our project could have been made.

Chapter 3 is “Steps in Circuit Designing”. In this chapter constitutes the Block diagram, circuit diagram, PCB layout and its working description, the various components.

Chapter 4 is “Implementation and Results”. This chapter constitutes the Programming, working of circuit, and the result we finally obtained.

Chapter 5 is “Conclusion and Future Work”. In this section we discuss the future scope of our project.

Chapter 6 is “Bibliography” in which we have given the references from where we acquired all the suitable data for this report and datasheets referred.

CHAPTER-2

LITERATURE SURVEY

Chapter -2

LITERATURE SURVEY

2.1 INTRODUCTION

Vishwateja Mudiam Reddy & Naresh Vinay in their paper “Internet of Things Enabled Smart Switch”[1] designed a system which integrates the cloud and web app. With the help of flip-flops, logic gates and a processor, the switches could be controlled. The proposed model was intended for reducing the cost of these systems which was the main barrier in the wide adaptation of this technology.

Khusvinder Gill & Shuang-Hua Yang[2] created a common home gateway for ZigBee and Wi-Fi. This enabled remote control using a simple user interface. The system was cost effective and had good security inside the house.

Salma and Dr. Radcliffe[3] with an aim of increasing the popularity and reach of home automation designed a system that used the Novel Network Protocol. It gave the option of controlling the commercial devices through a mobile or laptop. An additional network device was used for remote access instead of a microcontroller.

A flexible and simple system with an ability to integrate with very fewer efforts for off the shelf products was created by Carelin and I. Jacob Raglend[4]. The system used ZigBee for home controlling and GSM for remote access. It did not provide any GUI and also it was prone to security threats as anyone could access the system.
Rozita Teymourzadeh, Salah Addin Ahmed[5] designed a GSM based system for home automation. Using the GSM protocol, it became possible to access the system by using the Short Message System (SMS). The system also gave feedback to the user about the current state of any desired object.

Iván Froiz-Míguez, Tiago M. Fernández-Caramés, Paula Fraga-Lamas and Luis Castedo [6] explained about MQTT systems and designed the IoT home automation for Fog

Computing Applications and compared them to their previous models and explained their advantages from others.

In the paper [7] the project consisted of master and slave architecture. Where the NodeMCU is used as slave and Raspberry pi as a master component that receives data and transmits it to master for calculation and analysis.

2.2 SURVEY

There are many microcontroller systems in the market that can be used to control various sensors and general electronic applications. But they are not used individually since the connections become tedious and complicated. So, most of the projects are based on the embedded boards that contains all the general components used embedded on a single chip. The usage of such board has exponentially increased over the period of time. Evidently, every second smart phones with sophisticated functionalities are released out in the market. It infers that internet users in accordance with the booming smartphone use are multiplying vigorously day by day. Thus, connecting everything possessed by a human to the internet and subsequently monitoring and further controlling through smartphones is the ultimate goal of this project. The data is collected by the chip on the board by using GPIO pins present on the board. In the IoT based boards like Raspberry pi, Bolt, NodeMCU, etc. there is a inbuilt Wi-Fi module that works on the IEEE 802.11standands that helps to send data remotely to a server connecting to the internet. The most famous inbuilt Wi-Fi chip used is ESP8266. ESP8266 (currently ESP8266EX) is a chip which is a highly integrated Wi-Fi SoC solution where in the Internet of Things industry, the users overcomes the efficient power usage efficiently, design and performance also provides networkable foundation of networkable foundation for facilitating end-point IOT developments. The vendors repeatedly created the ESP8266 chip at their cores includes multitude of modules. As well as the Olimex, Adafruit, Spark fun, WeMos, ESPert (ESPresso) all make various modules. ESP8266 can act either as the slave to a host MCU or as a standalone application. When it acts as a host, it promptly boots up from flash. The high-speed cache helps to increase the system performance and the system memory gets optimized.

2.3 Working of Home Automation

In our system there are various sensors that are installed around the home to detect any intrusion and to monitor various parameters like water level in garden of house. The data from the sensors is sent to respective transducer modules to convert the sensor data into the transducer. The data will then be collected by the central microprocessors from the GPIO pins and then transmitted to the ESP8266. The data till now works on the physical layer. The data from the Wi-fi module will be transmitted through internet following the standard protocols of IEEE802.11. The data then will be sent to the server using the network that the device is connected to. The data can be sent to servers like Thinkspeak, Firebase etc by using Api key application. The api key acts as a directory link as if where the data is to be saved. This data can then be manipulated by using Matlab, etc. These processes help to trace the data lively and display real time analysis.

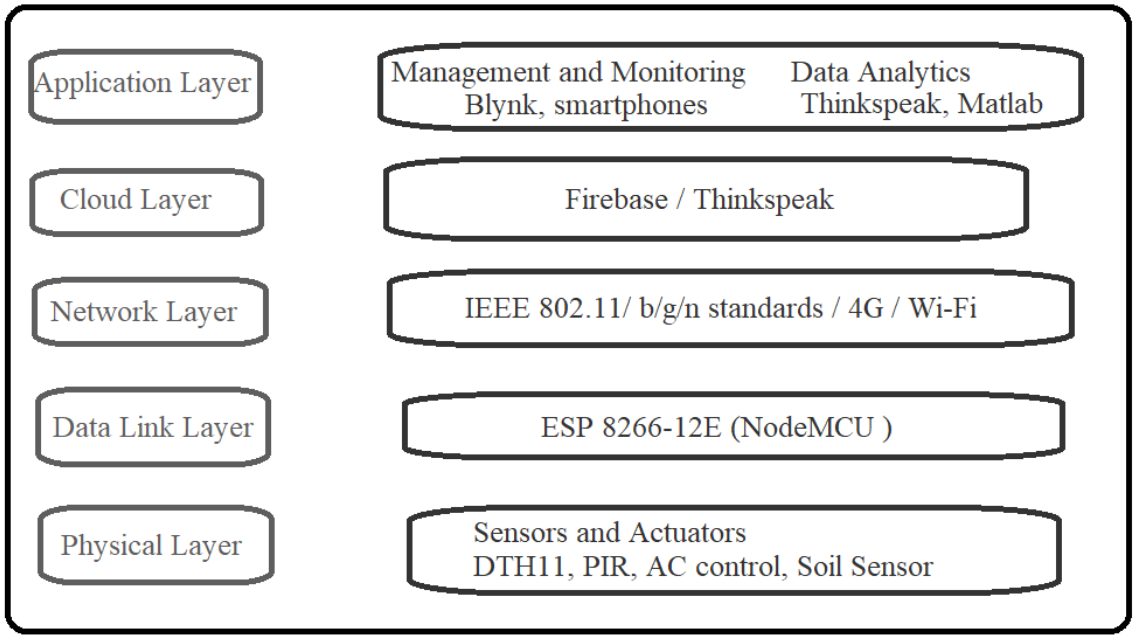

Table-1: Table describing different layers involved in this project

The parts of this work when divided can be categorized into these layers as shown above. The cloud layer is where the api keys are used and ZigBee, Esp8266 etc all work under IEEE standards. The visible part comes under physical, Datalink and application layer. All the processing though comes under cloud layer. Here, the data is analyzed and processed.

CHAPTER – 03

Hardware Components

Chapter -3

HARDWARE COMPONENTS

3.1 PARTS

Any kind of large circuit or embedded board is made up of smaller components. This work consists of the following components. All these components bought together make the useful device system.

3.1.1 NodeMCU

NodeMCU is an eLua based firmware for the ESP8266 WiFi SOC from Espressif. The firmware is based on the Espressif NON-OS SDK 2.2.0 and uses a file system based on spiffs. The code repository consists of 98.1% C-code that glues the thin Lua veneer to the SDK.

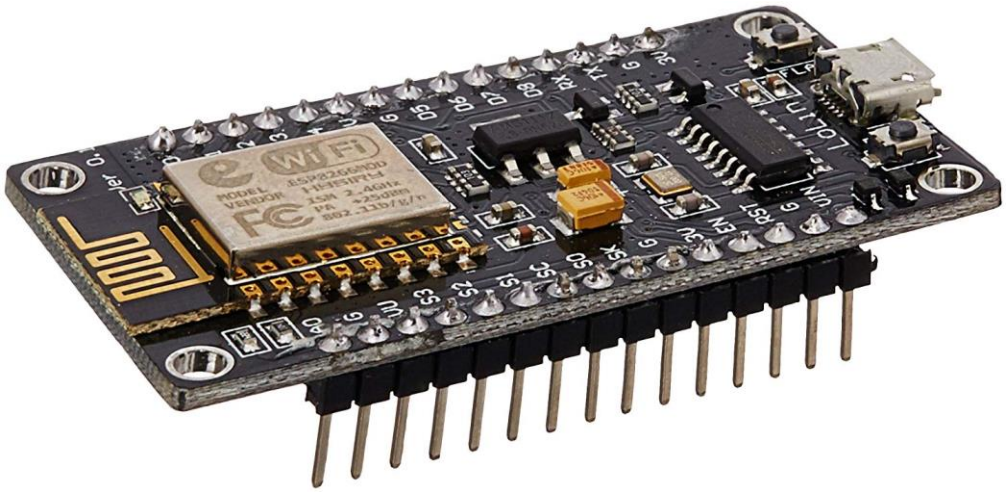

Fig 2 : Diagram showing NodeMCU

The NodeMCU *firmware* is a companion project to the popular NodeMCU dev kits, ready-made open source development boards with ESP8266-12E chips. The ESP8266 was developed by the Shangai-based company Espressif Systems, an IC manufacturer focused on the development of RF chips, particularly Wi-Fi.

There are several modules in the market that use the ESP8266 chip, they are named ESP-NN, where NN is a number 01, 02, ... 12, sometimes followed by a letter. These modules typically carry the ESP8266 SoC, flash memory, a crystal, and in most cases, an onboard antenna.

- Easy to program wireless node and/or access point
- Asynchronous event-driven programming model
- Firmware available with or without floating point support (integer-only uses less memory)
- Up-to-date documentation link at references [8] with docs in zip format.

To run the code written for NodeMCU we must require some extra libraries which are downloaded in Arduino IDE. It is also available in GitHub club. The library is shown as in figure-1.

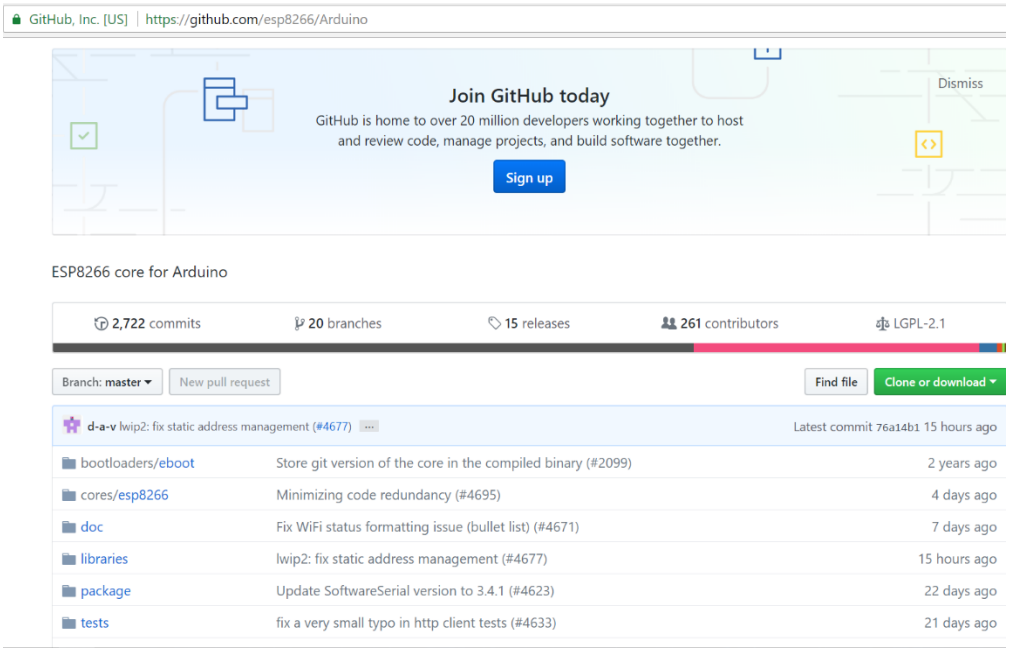

Fig 3: Photo of GITHUB showing NodeMCU Libraries

The GitHub is an online repository containing various libraries, files, codes, system files for to run the specific online software. It has wide range of options like linking to another GitHub post like it helps us to continue the work as if taking along the previous work without doing it all again. Thus, it helps in saving time and completing our work faster.

The part of libraries for NodeMCU that are in GitHub are to be included into Arduino IDE to let the software detect the board and libraries that are compatible with NodeMCU.

Pins:

There are various nomenclature used by the programmers to code. Most of the coders use this numbering phenomenon to name the port of the esp8266:

D0 = GPIO16;; D1 = GPIO5;; *D2* = GPIO4;; D3 = GPIO0;; D4 = GPIO2;; D5 = GPIO14;; D6 = GPIO12;; D7 = GPIO13;; D8 = GPIO15;; D9 = GPIO3;; D10 = GPIO1;; LED_BUILTIN = GPIO16

3.1.2 Documentation:

The entire NodeMCU documentation is maintained right in online repositories The fact that the API documentation is maintained in the same repository as the code that provides the API ensures consistency between the two. With every commit the documentation is rebuilt by Read the Docs and thus transformed from terse Markdown into a nicely browsable HTML site at [8].

- How to build the firmware
- How to flash the firmware
- How to upload code and NodeMCU IDEs
- API documentation for every module

NodeMCU when compared to Arduino is better since the NodeMCU has good number of GPIO pins and also has a inbuild Wi-Fi module and also provides 5v output using one of its pins. It is also compact size. There is also another advanced board Raspberry pi, which is very famous but costly when compared to NodeMCU. Since, our motto is to work with minimum cost we are using NodeMCU. The Raspberry pi is like a total package of computer embedded in a single chip. It has Ram, Wi-Fi, camera and display docks, ethernet ports, USB ports, Bluetooth etc, all in a single chip. But all these are not necessary in our case. So, we have a single chip with WIFI along with IC components on the chip, that serves our motto right as required.

3.1.3 Pin Diagram and Block Diagram of NodeMCU and Ic used:

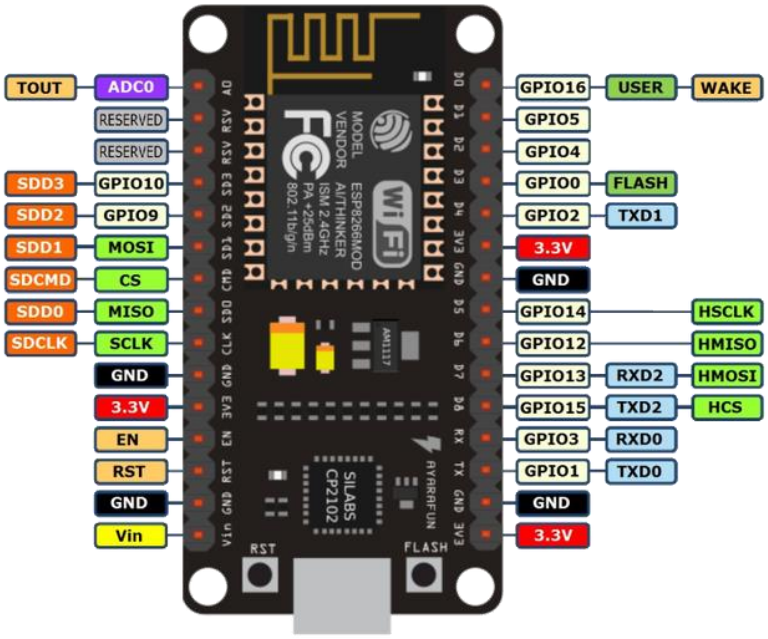

Fig 4: The Block diagram showing Gpio and special pins of NodeMCU

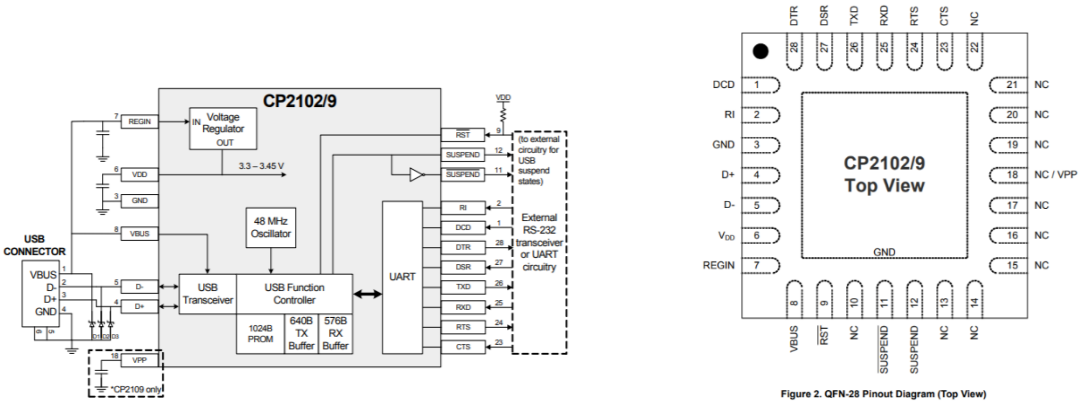

Fig 5: Pinout and Block diagram of cp2102 IC Pin diagram used in NodeMCU.

As shown in above figures NodeMCU has 8 effective GPIO pins, one analog pin and a total of 3 voltage pins. These all constitute to make the system working. The cp2102 is the heart of this NodeMCU that processes all the data and responds accordingly. And the block diagram shows the memory and register distribution among the IC.

3.1.4 Soil Moisture Sensor: -

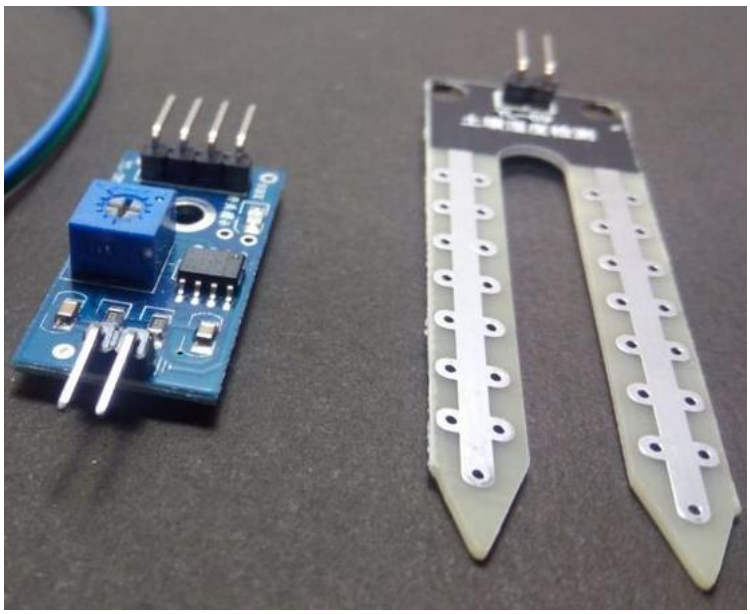

Fig 6 : Photo showing soil moisture sensor

The Sensor kit consists of:

- Operating voltage:3.3V~5V
- Detector Board x1
- Detector Module x1
- 1x5 dupont cable 20cm

The Soil moisture sensor uses Hygrometer to measure the soil humidity. It consists of two parts. The first part being the sensor and the other one is LM393 module. The LM393 module has 2 outputs, one digital (D0) that can be set-up using the potentiometer that exist on it and an analog one (A0). This module can be sourced with 3.3V, what is very convenient when working with an NodeMCU. It's important to highlight that the correct is to connect the Sensor VCC to a Digital Pin as output, so the LM393 will be powered only when we need a read. This is important not only to save power, but also to protect the probes from corrosion. The Lm393 module acts as a transducer receiving the sensor data and converting it into electrical signals. This way it is understandable by the microcontroller.

3.1.5 DTH11

Fig 7: DTH11 sensor

The DHT11 is a basic, ultra-low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). It's fairly simple to use, but requires careful timing to grab data. The 4 pins of DTH 11 are generally changed into three pins since the 3rd pin is commonly connected to ground pin.

3.1.6 Submersible Water Pump & Relay Module

The submersible pump works from 3-6v. It is a very good option for household gardening and small scale uses. It has a Traditional red and black wire indicating the positive and negative respectively. But since the NodeMCU or Arduino gives PWM outputs, the motor doesn't work directly to pins. So, we have to use a relay or motor driver circuit.

Fig 8: Submersible water pump photo

3.1.7 Ultrasonic Sensor

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. The HC-SR04 IC works by recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object. It also contains an oscillator for timing. Thus, calculates the time interval between echo. It has four pins two voltage pins, trigger and echo.

Fig 9: Photo of Ultrasonic sensor

3.2 Software Requirements

The Coding used for the NodeMCU t run as we require and to send the data online is to be give through Arduino IDE. The software requirements for this project are:

1. Arduino IDE
2. NodeMCU(ESP8266) library
3. Knowledge of c/c++ programming.
4. Active Internet connection.

Also, the coding done can be added to GitHub since it can further be reused and helpful to many others understanding the working of NodeMCU clearly.

3.3 Operational Characteristics: -

All of the components and devices we are using work at room temperature properly. The NodeMCU has following operational characteristics same as ESP8266.

Parameters		Conditions	Min	Typical	Max	Unit
Storage Temperature Range			-40	Normal	125	°C
Maximum Soldering Temperature		IPC/JEDEC J-STD-020			260	°C
Working Voltage Value			3.0	3.3	3.6	V
I/O	V_{IL}/V_{IH}		-0.3/0.75V_{IO}		0.25V_{IO}/3.6	V
	V_{OL}/V_{OH}		N/0.8V_{IO}		0.1V_{IO}/N	
	I_{MAX}				12	mA
Electrostatic Discharge (HBM)		TAMB=25°C			2	KV
Electrostatic Discharge (CDM)		TAMB=25°C			0.5	KV

Fig 10: Operational characteristics of NodeMCU

The NodeMCU can be used at various places of the house. But, in the industrial area it is mandatory to look for the place it is used since at places where heat is involved in industries we can not use NodeMCU since it leads to error and corruption of the IC.

The maximum ratings of Ultrasonic sensor are:

		MIN	MAX	UNIT
Supply voltage		–0.2	35	V
Output voltage		–1	6	V
Output current			10	mA
Maximum Junction Temperature, $T_J$max			150	°C
Storage Temperature, T_{stg}	TO-CAN, TO-92 Package	–60	150	°C
	TO-220, SOIC Package	–65	150	

Fig 11: Operational characteristics of Ultrasonic sensor.

The ultrasonic sensor works on the principle of SONAR and RADAR system which is used to determine the distance to an object. An ultrasonic sensor generates the high-frequency sound (ultrasound) waves. ultrasound signals refer to those above the human hearing range, roughly from 30 to 480 kHz. For ultrasonic sensing, the most widely used range is 40 to 70 kHz. The frequency determines range and resolution; the lower frequencies produce the greatest sensing range.

CHAPTER – 04

STEPS OF CIRCUIT DESIGNING

Chapter -4

STEPS IN CIRCUIT DESIGNING

4.1 BLOCK DIAGRAM

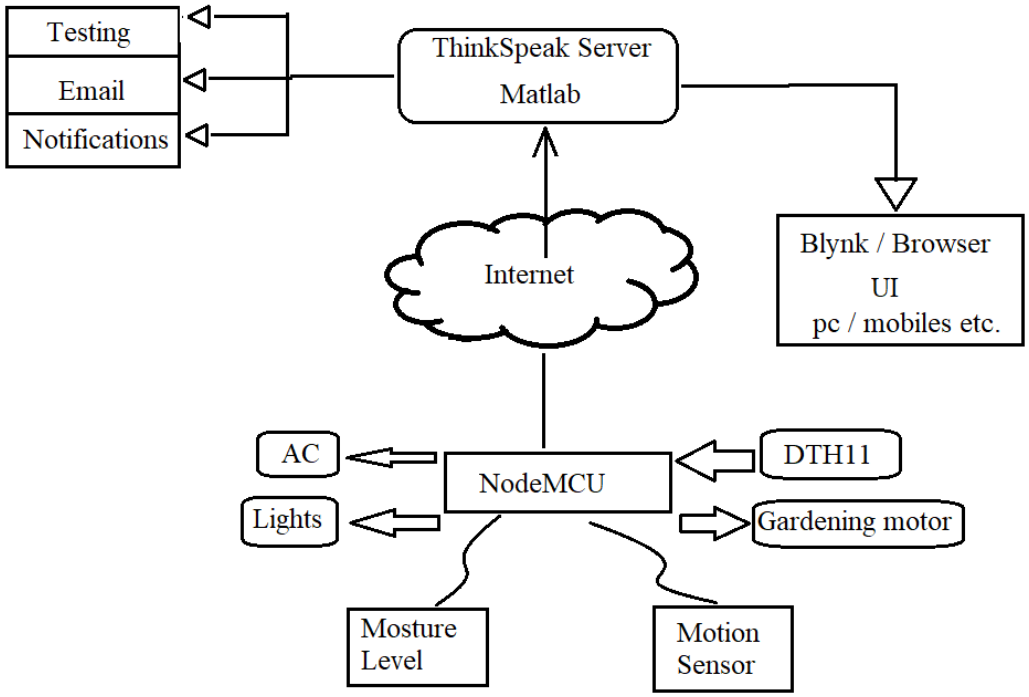

Fig 12: Block diagram representing circuit design

The first part is the sensing and data acquisition part. This is done by placing sensors or devices, also called things, at several locations throughout the home to measure and gather desired information such as temperature, humidity, or lux.

The second part of the system is the data processing. Sensors provide data in raw form. These data are sent to the processor through a mode of transmission, wired connection or wireless. The processor then translates the data into comprehensible values. These values are transmitted to a device to be controlled automatically and/or to a user interface. The last part of IoT automation is the internet. Most systems use a server to upload data after processing, so it can be accessed by the user. The internet also helps to monitor data and

manually control devices remotely. By automatically executing several commands, automation systems can help to save time, provide a better quality of life in homes, and save energy. These data communication technologies are popular because of their low power consumption, and simplicity to implement. Additionally, Wi-fi has the advantage of mobility, making it more widespread in most systems. Wi-fi technology consumes more energy than alternatives such as Bluetooth or ZigBee. The power consumption can be reduced by lowering the frequency of data uploading.

4.2 Data Processing

The data collected in a home automation system is usually processed and managed by a microcontroller such as Arduino, Raspberry Pi, and NodeMCU. Another option is to use the NodeMCU. It is an Arduino based microcontroller but with the addition of the ESP8266 Wi-Fi chipset. This microcontroller has a memory of 128kB and a 4MB storage. It is mostly used for a single IoT application, or to eliminate the need for a central processing unit. Since each part of the system can upload data to the server individually, this also lowers the complexity of the coding and the connection chain [2]. The biggest advantage of the NodeMCU over the other alternatives is the significantly low price for a controller that can connect to the internet directly using Wi-fi, without the need for any additional peripherals of modules. An issue is that the NodeMCU board has only one analog input, which limits its applications to as single data monitoring system. However, this drawback can be compensated for by using the ASD115, which is an analog to digital converter that has four analog input pins and has a higher conversion resolution of 16-bits.

4.3 Data display and User Interface:

The interaction between the user and the system can be done in several ways. One option is to use an application. There are many simple means to create a mobile or a web-based app to display data, even with a limited knowledge of programming. Another control option is through mobile GSM where the user can send commands in codes by SMS to the microcontroller. This control method requires a special GSM module added to the circuit. This method can also be applied using emails [3].

4.2.1 **Blynk**

The graphical interfaces in smart phones and tablets are designed in the form of android and iOS applications by putting buttons, graph-plotter, LCD and sensor-value display. The user can simply download the app, log in and then monitor and control her entire home appliances. The interface should enable the user to look at the device status and regulate them. Similarly, UI embodies a web portal for inspecting the status and controlling them from desktop PCs and laptops. Web portal is designed by making webpages from where the user can log in and access the status of her entire home appliances and control them through desktop PCs.

Basically, control of turning ON or OFF the whole system is at owners hand. As the system gets powered up, it searches for the preset SSID (Service Set Identifier) and connects automatically to the Internet otherwise remains offline and performs the automated-controlling job that doesn't require commands from the owner. Sensors accumulate disparate ambient-conditions and transmit them to the Microcontroller which processes the data transmitted by each sensor separately and then concurrently send the acquired data to the web server. The readings of each sensor can be accessed by the user from any place at any time. Additionally, all the sensors data are logged per second for future data analysis purpose. Data-logging is done both in microSD card and in the server. The system operates in two modes automatic mode and manual mode. When it is set at automatic mode, all the home appliances like fan, heater etc. are automated to operate as per the surrounding environmental conditions sensed by the sensors. On the other hand, when it is set at manual mode, the user can locally or remotely monitor and control each of the home appliances via her smart phone or from her office desktop PC. To recapitulate, the surveillance and control of entire household appliances is under her finger tip.

The security issue is not compromised since the protocol used is 802.11i. This protocol promises security at its best by following encryption. The application helps securing the data by account details and 128-bit encryption key. So, the data can only be accessed in the devices that constitutes original account details. So, when we constitute the data with respective column number the data will be organized in the column.

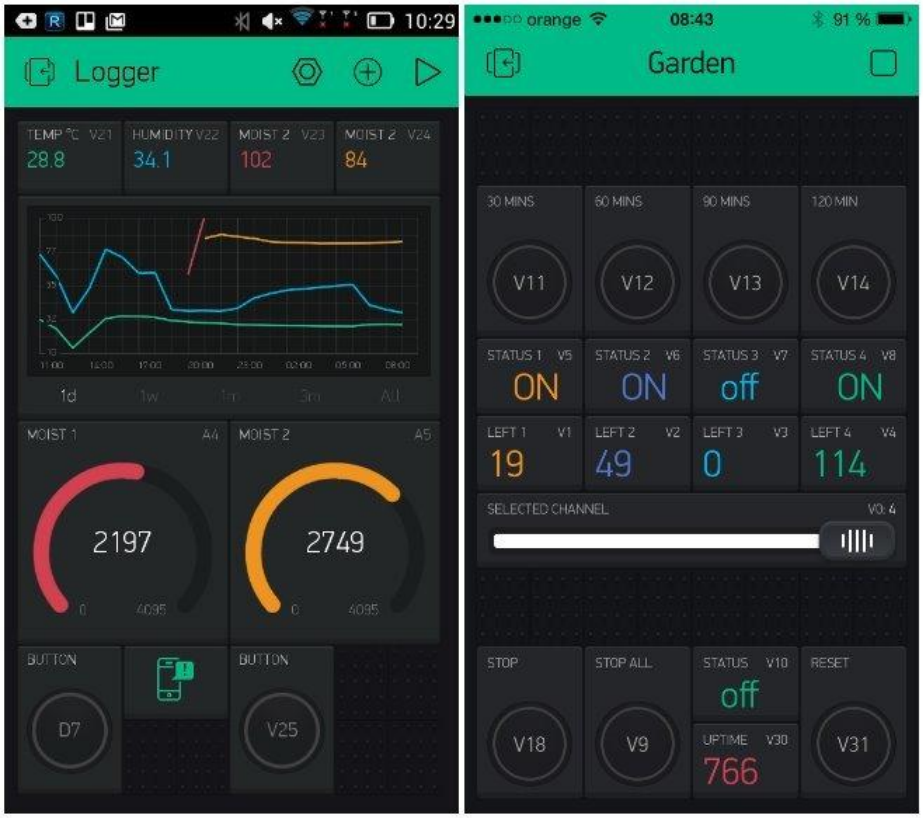

Fig 13: Screenshot showing Blynk Interface

Acquiring data from each node is done using the NodeMCU. The data acquired from all the sensors are continuously uploaded and stored on the EmonCMS platform. The EmonCMS is an IoT cloud server used for logging the data, with an option to display it using dashboards that can be easily designed and adapted to the needs of the user. It is an open-source server that is compatible with several preset hardware modules; such as emonPi and emonTx, and with the option to set up any external nodes or sensors to upload data to it. This is done by using a provided personal API key to the code of the controller. This platform was selected because it was found the most suitable for this project. Additionally, an application is created to get and display the monitored parameters from the server, and to apply the needed control of the devices [3]. In fact, Blynk is used as a mean to display selected monitored data for the users on their mobile phones and tablets. Blynk is an app for IoT applications. It is easy to program with simple codes and the interface is configurable through the app itself. The main advantage of using Blynk is its mobility between platforms and ability to connect to multiple microcontrollers, which are distinguished through authentication tokens.

CHAPTER -5

IMPLEMENTATION & RESULTS

Chapter -5

IMPLEMENTATION AND RESULTS

5.1 PROGRAMMING

The process of developing and implementing various sets of instructions to enable a computer to do a certain task. These instructions are considered computer programs and help the computer to operate smoothly. The language used to program computers is not understood by an untrained eye. Computer programming continues to be a necessary process as the Internet continues to expand. Python is one of those rare languages which can claim to be both *simple* and *powerful*. You will find yourself pleasantly surprised to see how easy it is to concentrate on the solution to the problem rather than the syntax and structure of the language you are programming in. The steps in the programming includes inducing the pins to the respective sensors. Then giving them the start point. Then in a loop we set the Wi-Fi details and data to let the microcontroller continuously collect data and transmit it to server through Wi-Fi details.

5.2 Cayenne app

Cayenne works only with projects based on Raspberry Pi hardware. Bromber says that decision was based on the Pi's popularity, and the expectation that creating connected projects with it should be simple. "It's a huge community. If we can satisfy those people and create something that's easy enough for them, that's the first bar," he says.

Lots of work is going into Cayenne's back end to make the entire process of building an IoT project as smooth and user-friendly as possible. It starts with downloading a mobile app, which automatically detects any Raspberry Pi devices on the local network and installs all the necessary software. But, we can also connect other devices like NodeMCU.

Then you can start connecting sensors, LEDs, actuators, and other gadgets to the Pi. In many cases, they'll be automatically detected by the Cayenne software and will show up in your mobile dashboard right away. Bromber says the team is constantly adding support for new components, and users can add unsupported hardware manually. The Cayenne app even includes tutorials and "breadboard" diagrams to help get things wired up correctly.

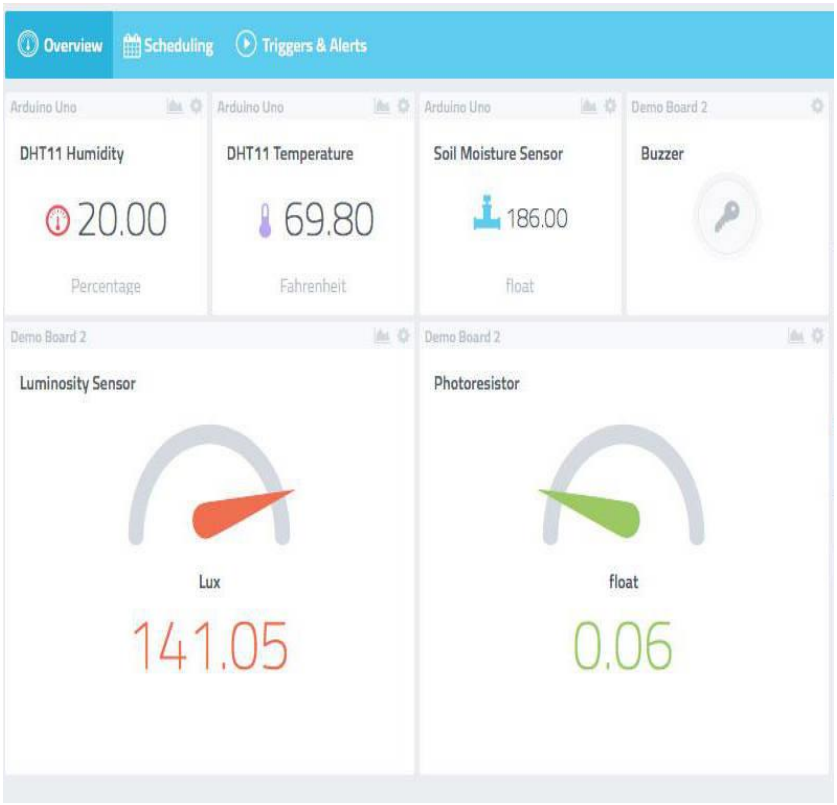

Fig 14: Photo showing sensor data collected in cayenne app

5.3 How it works

Push notification are powerful tools but today this power is unexpressed, Cayenne is thought to make them available for everyone. Main field for which is thought (although not limited to) is IoT. Take a simple scenario: an Arduino based house automation system where it is necessary to notify the user against some events . Today this scenario can be solved with. Start your next IoT project or prototype right from your phone with the Cayenne project builder. Now supporting Arduino, ESP8266, Raspberry Pi, over 100 LoRa-enabled devices, and any hardware brought in via MQTT API. Start your project or prototype in a fraction of the time. The control system through IoT was also implemented and tested. The NodeMCU controller reads periodically one digit command value from one of the EmonCMS nodes. Based on the acquired value (0 or 1) the NodeMCU send a command to the motor controller to open or close the panel cover. In fact, a zero value means that the panel cover must be closed and a unity value means the opposite.

5.4 Implementation and Results

Three different isolated sub-systems : i) relay module system connected to the home appliances to be controlled ii) GPS module and Temperature sensor connected system iii) PIR sensor for motion detection and ultrasonic senor for measuring the water level in the tank were linked to one another via Wi-Fi using NodeMCU controller chip. For user interface, android version of Blynk app with custom designed layout and buttons was used to facilitate monitoring and controlling various connected things. By pressing virtual button on the smartphone, the home appliances can be controlled from any remote location. One advantage of this app is that it can be shared within all the family members of the house. When one member switches ON or OFF an appliance, the action will be apparent to all other members sharing the app. Similarly, real-time as well as historical data of measurements of temperature, humidity, GPS location and distance-measure can be obtained from anywhere using the app. Further, this system can be employed in many places such as banks, hospitals, laboratories, traffic stations, residential apartments, house, streets, poultry farms, greenhouse etc. In a nutshell, this system can be used at multiple fields and areas in order to make them operate smartly.

5.5 Thinkspeak

ThingSpeak is an IoT analytics platform service that allows you to aggregate, visualize, and analyze live data streams in the cloud. With MATLAB analytics inside ThingSpeak, you can write and execute MATLAB code to perform preprocessing, visualizations, and analyses. ThingSpeak enables engineers and scientists to prototype and build IoT systems without setting up servers or developing web software.

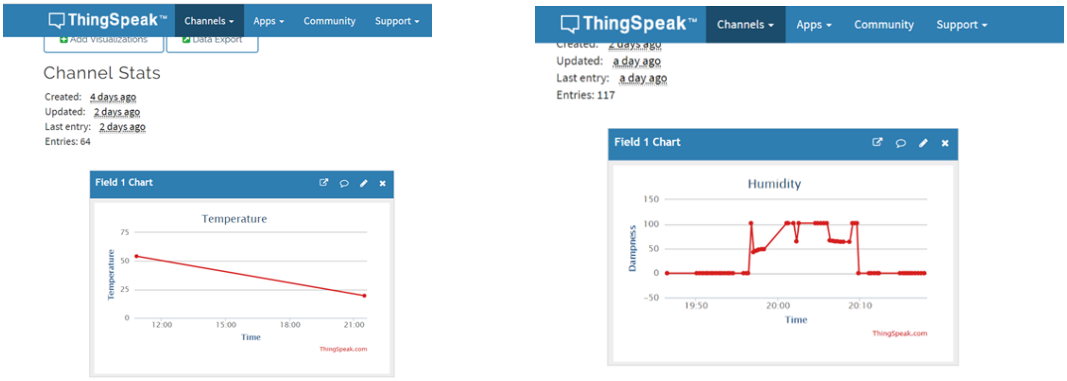

Fig 15: Thinkspeak showing data

CHAPTER -6

CONCLUSION AND FUTURE WORK

Chapter -6

CONCLUSION AND FUTURE WORK

6.1 CONCLUSION

The project we have undertaken has helped us gain a better perspective on various aspects related to our course of study as well as practical knowledge of electronic equipment and communication. We became familiar with software analysis, designing, implementation, testing and maintenance concerned with our project. In the paper low cost, secure, ubiquitously accessible, auto-configurable, remotely controlled solution for securing of homes has been introduced. The approach discussed In the paper is novel and has achieved the target to secure our homes from any place of the world by only remotely using the notifications-based system satisfying user needs and requirements. The basic level of smart parking and remote monitoring has been implemented. The system is extensible and more levels can be further developed using automatic motion detectors so the solution can be integrated with these and other detection systems. In the paper low cost, secure, ubiquitously accessible, auto-configurable, remotely controlled solution for securing of home has been introduced. The approach discussed in the paper is novel and has achieved the target to secure our homes from any place of the world by only remotely using the SMS-based system satisfying user needs and requirements.'

6.2 FUTURE WORK

The future implications of the project are very great considering the amount of time and resources it saves. The project itself can be modified to achieve a complete Parking security System which will then create a platform for the user to interface between himself and his buildings. In the physical security industry, the IP revolution was a long time coming.
But today, IP technology has finally overtaken its analog counterparts in many areas, most notably in CCTV surveillance. As IP continues to become more advanced and widespread, many in the industry are wondering where we go from here. So, we can make this system along with camera modules to enhance the system. Meanwhile, security technology is now being recognized as a must-have for many businesses.

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