

IOT based on Smart Waste Mangement In Smart Cities

Anish Mohan.S, Gokul.L,
Harish.P,
Umashankar.M¹
IV UGStudents, Dept. of ECE
Sri Shakthi Institute of Engineering
and Technology
Coimbatore, Tamilnadu, India

A.Senthilkumar³
Assistant Professor, Dept. of ECE
Sri Shakthi Institute of Engineering
and Technology
Coimbatore, Tamilnadu, India
Email:a.senthilkumar@siet.ac.in

Mr.S.Raja²
Assistant Professor, Dept. of ECE
Sri Shakthi Institute of Engineering
and Technology
Coimbatore, Tamilnadu, India
Email:raja.s@siet.ac.in

Abstract—India which having 4,041 cities and towns, to clean the streets, roads and infrastructure of the country. The main motto of the mission is to clean garbage disposal of all the rural and urban areas of the country. This paper describe if wastage dust is filled (or) decompose waste in garbage disposal side garbage status is upload on web-page. Municipality member login that web-page and went particular area clean the wastage. If person did not clean the wastage before two days notification sent higher officers. IOT, controller & sensor are used. Here IOT module is used to control and monitor the waste and the information will be sent to the particular organization and the common man.

Keywords-garbage ,gas sensor, ultrasonic sensor,smart city,IOT module.

I. INTRODUCTION

IoT or Internet Things refers to the network of connected physical objects that can intervention. It has been formally defined as an “Infrastructure of Information Society” because IoT sanctions us to amass information from all kind of mediums such as humans, animals, conveyances, kitchen appliances. Thus, any object in the physical world which can be provided with an IP address to enable data transmission over a network can be made part of IoT system by embedding them with electronic hardware such as sensors, software and networking gear. IoT is different than Internet as in a way it transcends Internet connectivity by enabling everyday objects that utilizes embedded circuits to interact and communicate with each other utilizing the current Internet infrastructure.

Since then the scope of IoT has grown tremendously as currently it consists of more than 12 billion connected devices and according to the experts it will increase to 50 billion by the end of 2020. With the advent of IoT both manufacturers and consumers have benefited. Manufacturers have gained insight into how their products are used and how they perform out in the real world and increase their revenues by providing value added services which enhances and elongates the lifecycle of their products or services. Consumers on the other hand have the ability to integrate and control more than one device for a more customized and improved user experience.

In this paper, we are going to propose a system for the immediate cleaning of the dustbins. As dustbin is considered as a basic need to maintain the level of cleanliness in the city, so it

is very important to clean all the dustbins as soon as they get filled. We will use infra-red sensors for this system. The sensor will be placed on top of bin which will help in sending the information to the office that the level of garbage has reached its maximum level. After this the bin should be emptied as soon as possible. The concept of IoT when used in this field will result in a better environment for the people to live in. No more unsanitary conditions will be formed in the city. With the help of this system minimal number of smart bins can be used around the whole city and the city will still be much cleaner.

There has been an unprecedented growth in the number of devices being connected to the internet since past few years. All these devices connected to the internet are part of the IoT infrastructure which can communicate with each other. The IoT network consists of embedded electronics, sensors and software that allows these devices to send and receive data among each other. This is why it is beneficial to use such an existing infrastructure for designing the proposed security system. The disadvantages of the existing system are that the employees have to go and check the bins daily whether they are filled or not, it results in high cost.

II. LITERATRURE SURVEY

[1] Rapid increase in volume and types of solid and hazardous waste due to continuous economic growth, urbanization and industrialization, is becoming a burgeoning problem for national and local governments to ensure effective and sustainable management of waste. It is estimated that in 2006 the total amount of municipal solid waste generated globally reached 2.02 billion tones, representing a 7% annual increase

since 2003 (Global Waste Management Market Report 2007). The segregation, handling, transport, and disposal of waste needs to be properly managed to minimize the risk to the health and safety of patients, the public, and the environment. The economic value of waste is best realized when it is segregated. Currently, there is no such system of segregation of dry, wet and metallic wastes at the household level. This paper proposes an Automated Waste Segregator (AWS) which is a cheap, easy to use solution for a segregation system for household use, so that it can be sent directly for processing. It is designed to sort the refuse into metallic waste, wet waste and dry waste. The AWS employs parallel resonant impedance sensing mechanism to identify metallic items, and capacitive sensors to distinguish between wet and dry waste. Experimental results show that the segregation of waste into metallic, wet and dry waste has been successfully implemented using the AWS. [2]Solid waste management is a challenge for the cities' authorities in developing countries mainly due to the increasing generation of waste, the burden posed on the municipal budget as a result of the high costs associated to its management, the lack of understanding over a diversity of factors that affect the different stages of waste management and linkages necessary to enable the entire handling system functioning. An analysis of literature on the work done and reported mainly in publications from 2005 to 2011, related to waste management in developing countries, showed that few articles give quantitative information. The analysis was conducted in two of the major scientific journals, Waste Management Journal and Waste Management and Research. The objective of this research was to determine the stakeholders' action/behavior that have a role in the waste management process and to analyze influential factors on the system, in more than thirty urban areas in 22 developing countries in 4 continents. [3]Kolkata generates almost 5500 ton of municipal solid waste (MSW) per day. The waste of the city is maintained by Kolkata Municipal Corporation (KMC) and around 80% of this waste is collected by corporation waste management system KMC has introduced the Modern Scientific Waste Compacting Stations (MSWCS) under the Clean City initiative. The MSW thus collected were taken to the nearest compactor station which houses around two to five compactors depending upon the area, in total there are 90 compactors and 30 mobile compactors functioning till date. The number is expected to go up by the end of 2015 to 163 compactors at a cost of INR 152 crore. The previous method of dumping in open Vat was unhygienic and produced odor and vector borne diseases in the vicinity and the people living near were largely affected[4] The main aim to make such a mechanical oriented project is to reduce the scrap volume and use it for recycle purpose properly. Now a day there is widely usage of cans have been done in hotels and canteen and for their storage large volume of space is required. This research paper includes design and structure analysis of can crusher. There are so many researchers who have done work on design and analysis, but still there are so many areas of scope regarding this design and analysis. Microcontroller makes up the backbone for this project. This project involves processes like design, fabrication and assembling procedures. Even though there are many types of the can crusher machine in the

market, the completion of the new model provides a more practical usage than previous one.

III. PROPOSED SYSTEM

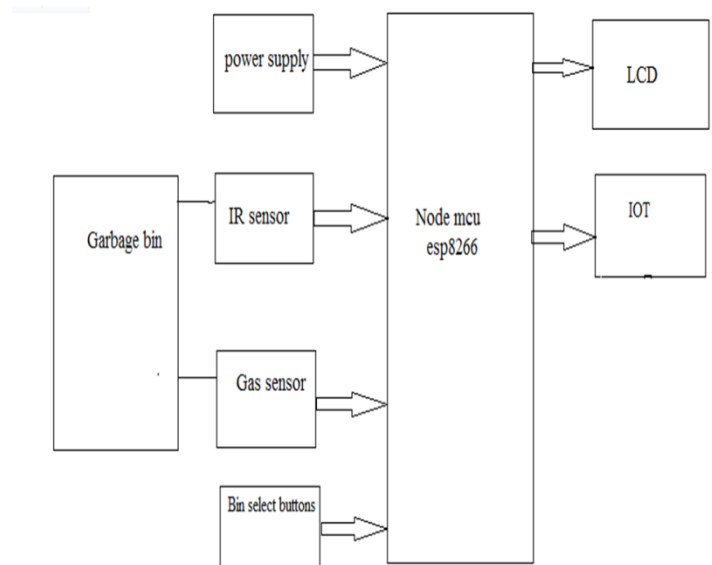


Figure 1: Block Diagram of the proposed system

The block diagram of Garbage monitoring system for smart city using Node MCU and IOT webpage in the figure 2 . As it requires high speed communication is intended to use Node MCU esp8266 is a board based on the Wi-Fi . In this the status will be monitored by webpage.

NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Expressive Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the dev kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson, and spiffs.

The Internet of things (IoT) is the network of physical devices, vehicles, home appliances, and other items embedded with electronics, software, sensors, actuators, and network connectivity which enable these objects to connect and exchange data. Each thing is uniquely identifiable through its embedded computing system but is able to inter-operate within the existing Internet infrastructure.

The ac voltage, typically 220v rms, is connected to transformer, which steps that ac voltage down to level of the desired dc output. A diode rectifier then provides a full wave rectified voltage that is initially filtered by simple capacitor filter to produce a dc voltage, resulting dc voltage usually has some ripples or ac voltage variation.

The basic concept of IR(infrared) obstacle detection is to transmit the IR signal(radiation) in a direction and a signal is received at the IR receiver when the IR radiation bounces back from a surface of the object.

The gas sensor is the one type of transducer which produces the voltage signal depends on the gas level. Then the voltage signal is given to inverting input terminal of the comparator. The comparator is constructed by the operational amplifier LM 741.

The serial peripheral interface (SPI) bus is a synchronous serial communication interface specification used for short distance communication, primarily in embedded systems. The interface was developed by Motorola and has become a de facto standard. Typical applications include SecureDigital cards and liquid crystal displays. SPI devices communicate in full duplex mode using a master-slave architecture with a single master. The master device originates the frame for reading and writing. Multiple slave devices are supported through selection with individual slave select (SS) lines. Sometimes SPI is called a four-wire serial bus, contrasting with three-, two-, and one-wire serial buses. The SPI may be accurately described as a synchronous serial interface, but it is different from the Synchronous Serial Interface (SSI) protocol, which is also a four-wire synchronous serial communication protocol, but employs differential signaling and provides only a single simplex communication channel.

A liquid-crystal display (LCD) is a flat-panel display or other electronic visual display that uses the light-modulating properties of liquid crystals. Liquid crystals don't emit light directly. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

IR SENSOR

The basic concept of IR (infrared) obstacle detection is to transmit the IR signal (radiation) in a direction and a signal is received at the IR receiver when the IR radiation bounces back from a surface of the object.

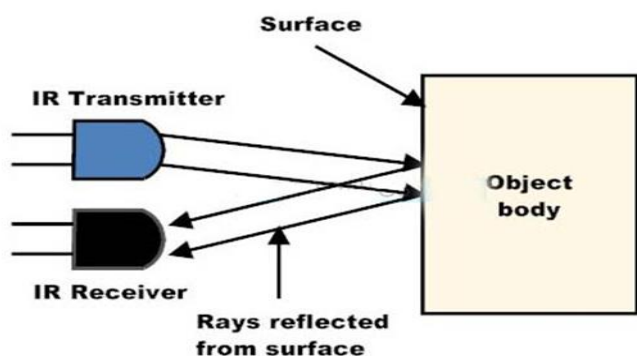


Figure 2 : Obstacle Sensing Circuit or IR Sensor Circuit

Here in the figure the object can be any thing which has certain shape and size, the IR LED transmits the IR signal on to the object and the signal is reflected back from the surface of the object. The reflected signals are received by an IR receiver.

The IR receiver can be a photodiode / phototransistor or a ready made module which decodes the signal.

IR Transmitter

Infrared Transmitter is a light emitting diode (LED) which emits infrared radiations. Hence, they are called IR LED's. Even though an IR LED looks like a normal LED, the radiation emitted by it is invisible to the human eye. The picture of a typical Infrared LED is shown below. There are different types of infrared transmitters depending on their wavelengths, output power and response time. A simple infrared transmitter can be constructed using an infrared LED, a current limiting resistor and a power supply. The schematic of a typical IR transmitter is shown below.

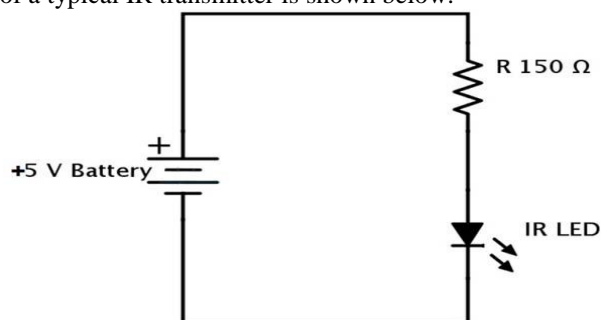


Figure 3: circuit diagram of IR transmitter

When operated at a supply of 5V, the IR transmitter consumes about 3 to 5 mA of current. Infrared transmitters can be modulated to produce a particular frequency of infrared light. The most commonly used modulation is OOK (ON – OFF – KEYING) modulation. IR transmitters can be found in several applications. Some applications require infrared heat and the best infrared source is infrared transmitter. When infrared emitters are used with Quartz, solar cells can be made.

IR RECEIVER

Infrared receivers are also called as infrared sensors as they detect the radiation from an IR transmitter. IR receivers come in the form of photodiodes and phototransistors. Infrared Photodiodes are different from normal photo diodes as they detect only infrared radiation. Different types of IR receivers exist based on the wavelength, voltage, package, etc. When used in an infrared transmitter – receiver combination, the wavelength of the receiver should match with that of the transmitter. A typical infrared receiver circuit using a phototransistor is shown below.

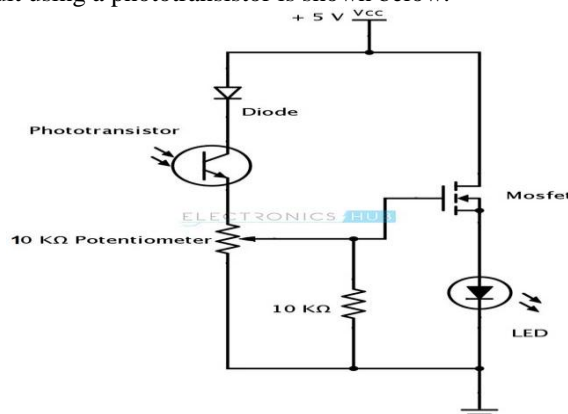


Figure 4: circuit diagram of IR receiver

LCD Display

A liquid crystal display is special thin flat panels that can let light go through it or can block the light. (Unlike an LED it does not produce its own light). The panel is made up of several blocks, and each block can be in any shape. Each block is filled with liquid crystals that can be made clear or solid, by changing the electric current to that block. Liquid crystal displays are often abbreviated LCDs. Liquid crystal displays are often used in battery powered devices, such as digital watches, because they use very little electricity. They are also used for flat screen TV's. They work well by themselves when there is other light around (like a lit room, or outside in daylight). The LCD uses technology called electro-optical modulation. This means it uses electricity to change how much light passes through it.

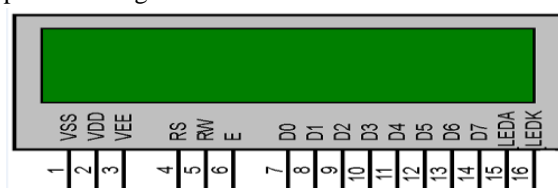


Figure 5: LCD Display

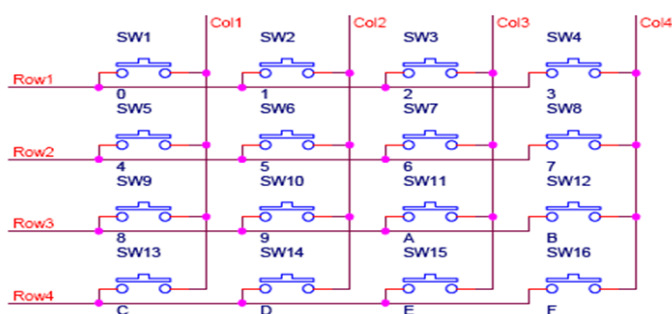


Fig. 6: 4X4 matrix keypad

There are many methods depending on how you connect your keypad with your controller, but the basic logic is same. We make the columns as i/p and we drive the rows making them o/p, this whole procedure of reading the keyboard is called scanning. In order to detect which key is pressed from the matrix, we make row lines low one by one and read the columns. Let's say we first make Row1 low, then read the columns. If any of the key in row1 is pressed will make the corresponding column as low i.e. if second key is pressed in Row1, then column2 will give low. So we come to know that key 2 of Row1 is pressed.

Gas Sensor

The MQ-2 is a flammable gas and smoke sensor detects the concentrations of combustible gas in the air and outputs its reading as an analog voltage. The sensor can measure concentrations of flammable gas of 300 to 10,000 ppm. The MQ-2 gas sensor is sensitive to LPG, i-butane, propane, methane, alcohol, Hydrogen and smoke. They are

used in gas leakage detecting equipment's in family and industry and in portable gas detector.

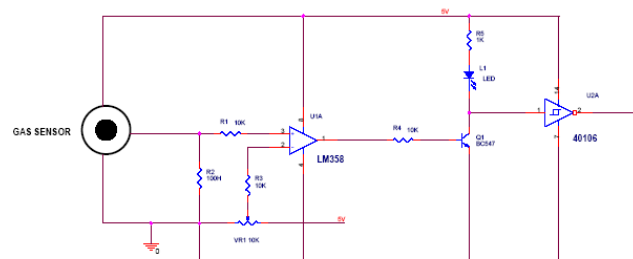


Figure 7: schematic diagram of gas sensor

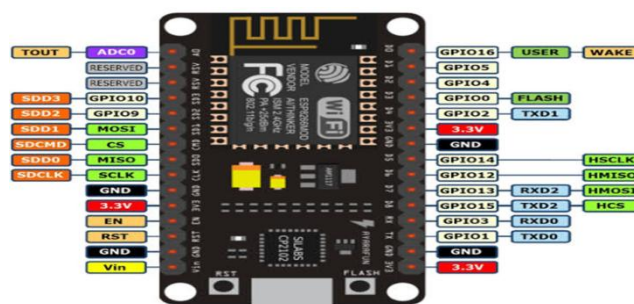


Figure 8: pin diagram of node MCU ESP8266

PHP

PHP is a server-side scripting language designed for web development but also used as a general-purpose programming language. As of January 2013, php was installed on more than 240 million websites (39% of those sampled) and 2.1 million web servers. Originally created by rasmus lerdorf in 1994,[5]the reference implementation of php (powered by the zend engine) is now produced by the php group, while php originally stood for personal home page, it now stands for php: hypertext preprocessor, which is a recursivebackronym. PHP code can be simply mixed with html code, or it can be used in combination with various templating engines and web frameworks. Php code is usually processed by a php interpreter, which is usually implemented as a web server's native module or a common gateway interface (cgi) executable. after the php code is interpreted and executed, the web server sends the resulting output to its client, usually in the form of a part of the generated web page; for example, php code can generate a web page's html code, an image, or some other data. Phphas also evolved to include a command-line interface (cli) capability and can be used in standalone graphical applications. The standard php interpreter, powered by the zend engine, is free software released under the php license. php has been widely ported and can be deployed on most web servers on almost every operating system and platform, free of charge. Despite its popularity, no written specification or standard existed for the php language until 2014, leaving the canonical php interpreter as a de fact standard. since 2014, there is ongoing work on creating a formal php specification. During

the 2010s php as a platform has matured significantly, largely by influence from other software communities and projects such as npm. In addition to standard library improvements, the work of php-fig in the form of psr-initiatives, composer dependency manager and the packages repository have been a significant factor.

Development and Community

PHP includes various free and open-source libraries in its source distribution, or uses them in resulting PHP binary builds. PHP is fundamentally an Internet-aware system with built-in modules for accessing File Transfer Protocol (FTP) servers and many database servers, including PostgreSQL, MySQL, Microsoft SQL Server and SQLite (which is an embedded database), LDAP servers, and others. Numerous functions familiar to C programmers, such as those in the stdio family, are available in standard PHP builds.

ARDUINO IDE

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuine hardware to upload programs and communicate with them. Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino.

IV. RESULTS AND DISCUSSIONS

An advanced system for garbage monitoring system was developed which overcomes the demerits of the existing technologies of smart cities. It can be ensured that the system developed can be implemented on a large scale due to promising results. IOT modeling for accessible and inaccessible areas help in the easy implementation of the smart cities.

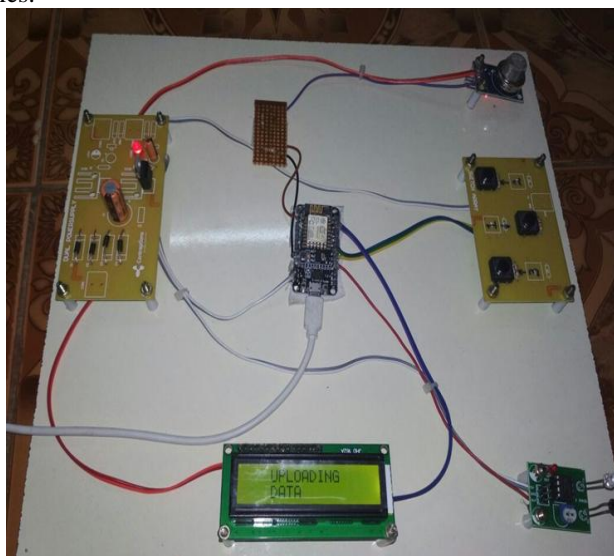


Figure 9:Proposed system Hardware Kit



Figure 10:Output of Webpage

V. CONCLUSION

By implementing this project we can able to monitor the level of garbage in the dust bins placed at public places, according to that we can collect garbage of particular which will avoid overflow conditions and helps to reduce pollution as well as different hazards of health. This system will reduce the wastage of fuel by reducing number of trips of garbage collection vehicle. The disposal of garbage is done efficiently in this system. The IR sensors measure the level of the garbage. Once the threshold level is reached it will immediately send message to the authorized person. Once the waste is thrown it is immediately send message that the dustbin is started to collect the waste. The message started message is sent to the person through Webpage. In this each garbage can will be allocated with the ID number such that the message will be sent to the authorized person via Webpage. Once the threshold level is reached it will immediately send message to the authorized person that the garbage level is overloaded .The user friendly android app provides necessary platform for the public to connect with municipal corporation.

While dealing with more number of dustbins in city level we can use video processing, which will improve the reliability of circuit. Also we can add GPS modem to this project hence; it will help to track the position of dust bin. We can create new application also for garbage monitoring which will show overview of dustbin. Apart from this, differentiation can be made between dry trash bin and wet trash bin collecting plastic dry waste and biodegradable waste respectively. To implement this methane and smell sensors can be used. This helps in distinguishing the waste at the source and hence reducing the requirement of manpower.

VI. ACKNOWLEDGMENT

The author wish to thank HoD, principal and management of Sri Shakthi Institute of Engineering and Technology, Coimbatore for providing an excellent environment to complete this project in an efficient manner.

VII. REFERENCES

- [1]. Prof. R.M.Sahu, Akshay Godase, Pramod Shinde, Reshma Shinde, “Garbage and Street Light Monitoring System Using Internet of Things” INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN ELECTRICAL, ELECTRONICS, INSTRUMENTATION AND CONTROL ENGINEERING, ISSN (Online) 2321 – 2004, Vol. 4, Issue 4, April 2016.
- [2]. Twinkle sinha, k.mugesh Kumar, p.saisharan, “SMART DUSTBIN”, International Journal of Industrial Electronics and Electrical Engineering, ISSN: 2347-6982 Volume-3, Issue-5, May2015.
- [3]. M. Aparajitha, K. Bhanupriya, B. Smitha Shekar, and G. Narendra Kumar, “Performance evaluation of IEEE 802.11p for vehicular traffic congestion control (2011)”, Journal of Information and Communication Technologies, vol. 1, issue 6, November 2011 M. Young, The Technical Writer’s Handbook. Mill Valley, CA: University Science, 1989 .
- [4]. Narendra Kumar G., Chandrika Swami, and K. N. Nagadarshini, “Efficient Garbage Disposal Management in Metropolitan”, Cities Using VANETs Journal of Clean Energy Technologies, Vol. 2, No. 3, July 2014.
- [5]. Raghumani Singh, C. Dey, M. Solid Waste Management of Thoubal Municipality, Manipur- a case study Green Technology and Environment Conservation(GTEC 2011), 2011 International Conference Chennai 21-24.
- [6]. Anitha A, Kalra S and Shrivastav 2016 A Cyber defense using artificialhome automation system using IoT International Journal of Pharmacy and Technology 825358-64.