



## TRASH BOT MONITORING SYSTEM

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### ABSTRACT

*We are living in an age where tasks and systems are fusing together with the power of IoT to have a more efficient system of working and to execute jobs quickly. In the recent decades, Urbanization has increased tremendously. At the same phase there is an increase in waste production. Waste management has been a crucial issue to be considered. This paper is a way to achieve this good cause, due to negligence of authorities and carelessness of the public may lead to long term problems. Breeding of insects and mosquitoes can create nuisance around promoting an unclean environment. This may even cause dreadful diseases. The main objective of the project "Trash Bot" will keep the environment clean and also eco friendly. If the dustbin is not maintained then these can cause an unhealthy environment and can cause pollution that affects our health. Since the technologies are getting smarter day by day to clean the environment, we are designing a smart dustbin by using Arduino Opens and closes its lid if it sees any trash in front of it and the lid of the can will open automatically and will wait for you to feed it more than after a certain delay it'll automatically close. This will help toward health and hygiene. In this project we have designed a smart dustbin using ARDUINO UNO, along with an ultrasonic sensor, servo motor, and battery jumper wire. After all hardware and software connection, now Smart Dustbin program will be run. Dustbin lid will open automatically when someone comes near. Then will wait for the user to put garbage and close it. The main advantage in terms of society is that it will help toward health and hygiene.*

### I. INTRODUCTION

The old-style collection methods of waste used to be sufficient in cities but as there was a significant increase in the amount of produced waste due to the increasing population in cities, these methods turned out to be insufficient. The problems included the filling of reports, timetable, billing which led to the unstable waste collection activities (probably due to the incomplete waste when it was supposed to be collected or probably due to the irregularities in collecting the waste). These encountered issues led to the development of other methods of collection, such as smart waste management collection to solve the problems and reduce times and cost of collection. Although smart waste management collection is completely smart, does not need manual power, and allows a better working environment and it is also much quicker. However, it needs a larger budget and that is why it may be a problem for different countries with smaller budgets.

It developed with the development of technology buy led to the challenge of getting rid of the waste materials. The flow of materials in a technological society and the resulting waste generation are illustrates schematically. Wastes are produces through the mining and manufacture of raw materials, such as the tailings from a mine or the discarded husks from a cornfield. After the stage of eliminating raw materials, more wastes are obtained due to the production and consumption carried out by the community by using the mentioned raw



materials. So the most efficient method to create a better solution for this challenge is to decrease the waste produced. Nevertheless, people carry out more consumption in line with the life standards that they would like to increase. Consequently, new better ways for disposal of wastes are researched.

Among the entire possible hazards originating from the solid wastes, the main hazard to the human health, depending upon the category and characteristic of the solid waste, the health risk maybe of short term or long term. The agro-based solid waste may cause spontaneous fire during warmer seasons. In addition, during monsoon, rapid decomposition may cause odorous gasses and may become breeding ground for various insects. Furthermore, the domestic and municipal solid waste may be properly treated in order to reduce all feasible hazards. The solid wastes when separated, and sorted out, into 12 degradable and non-degradable, either at the source or during dumping, further reduces the risk of hazards and enhances the reuse or recycling process.

The main motivation of this project is the ongoing campaign Swachh Bharat. The clean India movement launched by the Prime Minister Narendra Modi is the largest ever cleanliness drive to clean the streets which in turn improves the infrastructure of the country.

## II. LITERATURE SURVEY

In numerous application fields, for example, home, industry, environment and wellbeing, diverse Wireless Sensor Network (WSN) applications have been created to take care of administration issues with well-informed executions. The architecture is composed of three parts they are long range communication modules, server layer and user interface. The long range communication module contains an installed ARM processor and is programmed by utilizing the implanted open CPU. The server layer acts as a client and WSNs. The server modules make utilization of a daemon, which performs a pre-processing of the information which ensures the consistency of information. The second layer executes the information procurement when the GPRS association is absent. Finally the SMS is send to a passage hub, which has an advanced HTTP connection to get the SMS based information. The user interface gives two approaches they are custom programming customer and web application. A novel prototype and simulation model for real time solid waste Bin monitoring system (Al Mamun, et al., 2014). The architecture consists of three layers. The first group is mounted underneath and bin cover and the other in the bottom of the bin. The middle level of the data is measured by the sensors and sends the information through the Zigbee gateway and GPRS communication module. The upper level consists of a web server and database server. The gateway obtains the data sent by the lower level. It parses the data and stores the data to the local database. After establishment of GPRS connection the control stations pass the information to the upper level that contains servers. The server contains Daemon development which is responsible to make connections with the gateway when a connection request is arrived.

A smart waste management with self – Describing objects. The main goals of the system are reducing waste manufacture, check whether the waste being proposed are disposed, re-using and recycling disposed products. In this approach the waste items are identified by its essentials. The collective container waste management system contains an embedding computer system which processes the data. The data is analyzed on both the trash bags. The bag is built on RFID technology to sort out the waste materials.

The authors in the paper [6] have used solid waste management monitoring and planning by making use of the smart-M3 platform. The smart waste collection system contains different types of KPs for the light pole, control center, trucks and mobile devices of users. Each of the models cooperates and gives the part of data complete to the smart space. The model is constructed using the Raspberry PI which has two KPs: they are sensor light pole-KP and Cords light Pole-KP. The sensor light Pole KP updates the query on the smart-space. The sensor light pole- KP updates the sensor data within the smart space. The main advantage of using the system is that waste is collected on a regular basis. The resources collected are plastics, glass paper and general waste.

The authors [9] have equipped the smart bins with ultrasonic sensors. The ultrasonic sensor measures the level of the dustbin that is being filled up. The containers are portioned into three levels of garbage. Each and every time when the garbage crosses the level, the sensor receives the data. The data collected from the sensor are sent to the garbage analyzer through the GSM. The main drawback of the system is there are three ultrasonic sensors in the container which in turn increases the cost of the dustbin that is being designed. The sensors can also be damaged based on the rough action of the users. In order to overcome this drawback the SGS (smart garbage system) model is proposed to reduce the amount of food that is being wasted.

The author in the paper [10] represents the exchange of information using wireless mesh networks. In addition to the wireless network, mesh network and router are present to analyze the information. SGBs include various IoT devices which in turn increases the battery life through the two types of energy efficiency operations they are stand-alone and cooperation based operation. The proposed model measures this food waste could be decreased by 33%. The author in the paper [11] built a framework which consists of a camera.

The camera is placed at each end of the garbage collection point. The camera will take snapshots of the garbage at continuous intervals of time. A threshold value is set which compares the output obtained from the camera and the sensors. Finally the weight of the garbage can is calculated from the level of the garbage in the bin and from the load cell sensors. The information collected from the sensor is processed and the threshold level is checked. The major drawback of the system is convenient to use but economically the model is not reliable.

### III. ARCHITECTURE

The following figure 3.1 represents the architecture diagram of the Trash bot monitoring system. It is an IOT based monitoring system that will bring a new and smart way of cleanliness. Here we use Arduino for code execution. Dustbin will open its lid when someone/object is near at some range then it will wait for a given time period then it will close automatically. Here the lid will close when you don't want to use it and it will only open when it is required. TRASH BOT, it works smartly or we can say that it is an automatic dustbin. It works like when you come in front of this dustbin it will open automatically with the help of a servo motor so there is some sensor work to detect the object in front of the dustbin. Our aim is also to make it cost effective so that many numbers of people can get the benefit from this. And it should be usable to anyone and helpful for them. To complete our project, we require some software as well as some hardware. The main advantage of using TRASH BOT will automatically open and close the lid. So, there is no foul smell near the bin. Moreover, there are no chances of trash being spread out in the street. Trash Bot cannot be stripped down by the animals. Since the lid of the bin is closed there is no breeding of mosquitoes thus avoiding the chances of diseases like Malaria. The TRASH BOT provides the information about the amount of trash that is being collected in the trash bin. The authorities can plan which bin should be collected first and which should be collected next. This reduces the manpower, fuel emissions and a lot of time.

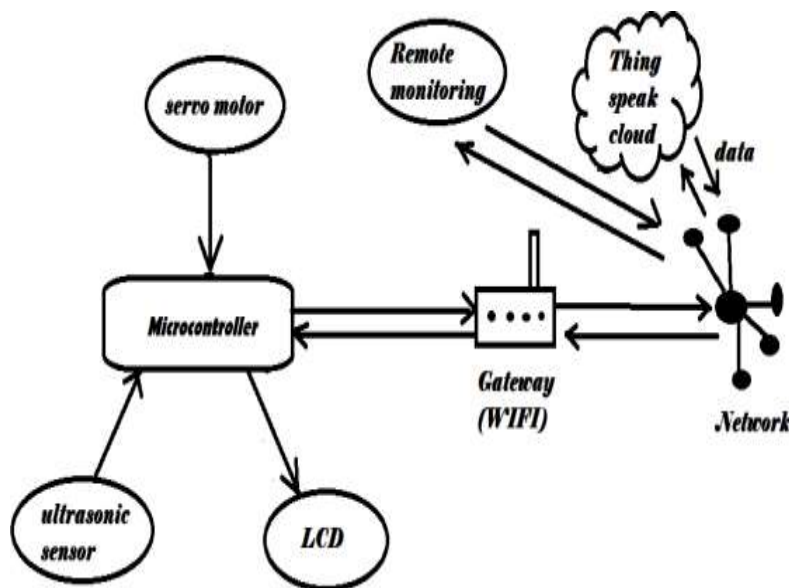


Figure 3.1 Architecture diagram of Trash Bot Monitoring System

### IV. MODULE DESCRIPTION

The software requirements are **Arduino IDE**. It is a text editor mainly used for compiling the code to check if any errors are present. Finally the code is uploaded to the Arduino.

The hardware requirements are **Arduino UNO, Ultrasonic sensor, servo motor, LCD, jumper wires, Dustbin, buzzer and WIFI modules**.

#### 4.1 ARDUINO UNO

The following figure 4.1 represents the pin diagram of the Arduino UNO. There are 32 pins available. The 22 pins are associated

with input and output. The 14 pins are IO pins which are configured to the application. The application is connected using the pinMode, digitalWrite and digitalRead functions. There are 6 analog input pins. The analog pins provide 10 bit resolution where the data can be read using analogRead () function. The analog pins convert the analog value into digital value which can be read from the processor. The digital IO pins are capable of producing 8-bit PWM signals. The crystal oscillator helps the Arduino in handling the time issues. The voltage regulator helps the Arduino in controlling the voltage and stabilizes the Dc voltage used by the processors.

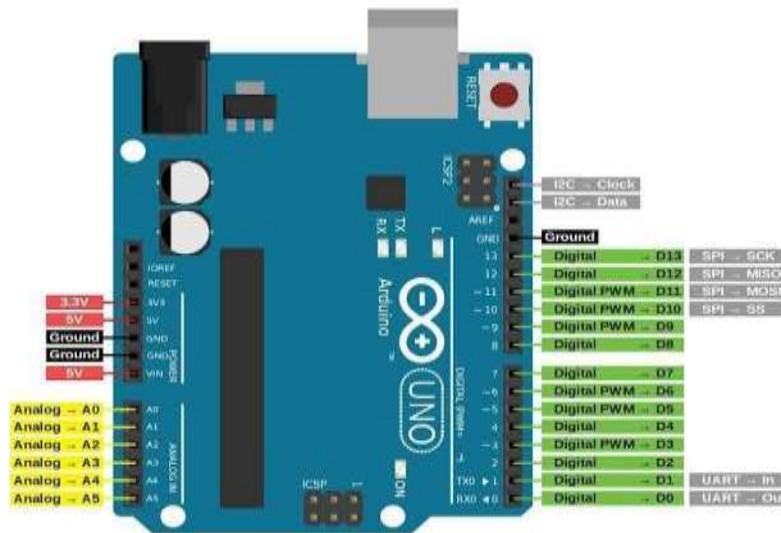


Figure 4.1 Pin diagram of Arduino Uno

## 4.2 SERVO MOTOR

The following figure 4.2 represents the servo Motor. The Servo motor is a small device that can be positioned to specific angular position by sending the servo a coded signal. The servo motors are small but they are extremely powerful. The servo motors are small and do not consume much energy. The motors contain a control circuit, motor and gears. The servo motors have three wires – power, ground and signal. The power wire is connected to a 5v pin on the Arduino board. The ground is connected to the ground pin on the board. The signal pin is connected to the PWM pin on the board.

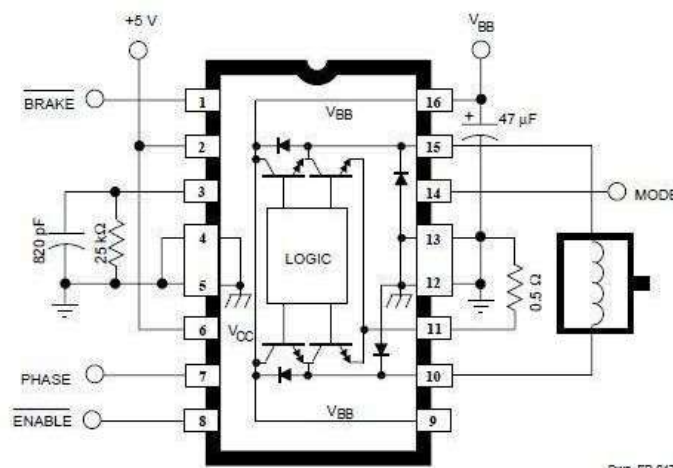


Figure 4.2 Pin Diagram of Servo Motors

### 4.3 ULTRASONIC SENSOR

The following figure 4.3 represents the Ultrasonic sensors. The ultrasonic sensor is used to measure the distance between an obstacle and sensor. The ultrasonic sensor provides non-contact range detection. The range detection provides high accuracy and stable readings between the range 2 cm to 400 cm. Therefore the ultrasonic sensor is not affected by any black materials or sunlight. The sensors come along with the transmitter and the receiver module. The ultrasonic sensor contains two parts they are trigger and echo pulse. The ultrasonic sensor sends out the sound wave called the trigger. The bounced back sound wave is the echo port.

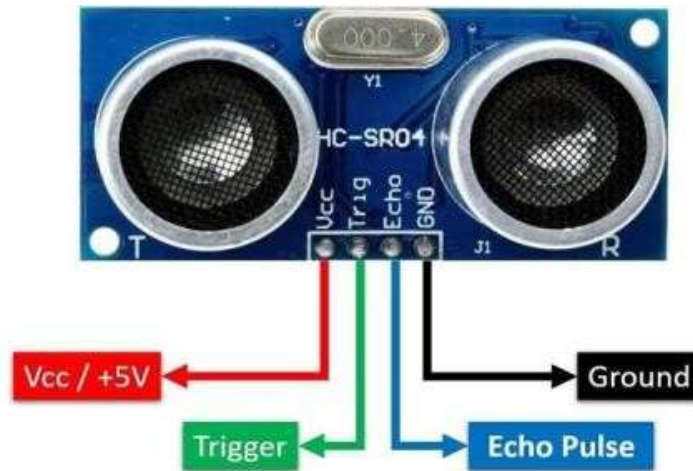


Figure 4.3 Ultrasonic sensor

### 4.4 WI-FI MODULES

The following figure 4.4 represents the Wi-Fi modules. The Wi-Fi module can be easily integrated with the Arduino board via a serial port. Wi-Fi modules contain 8 pins in total. RX and TX are mainly used for communication. RX is used for receiving data. TX is used for data transmission. It comes with 32-bit tensilica microcontroller antenna switches. It supports APSD which is mainly used for VoIP applications and Bluetooth interfaces. It contains an onboard regulator which provides 3.3v consistent power to the board.

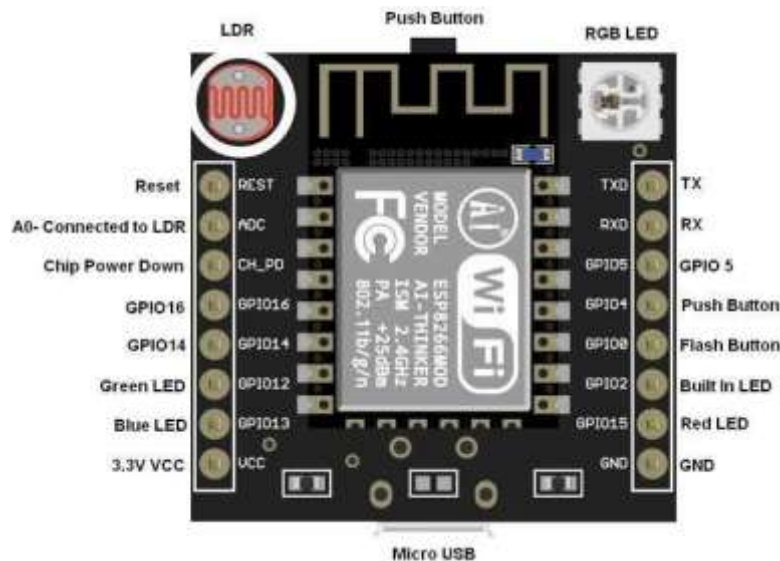


Figure 4.4 Wi-Fi Modules

#### 4.5 LCD

The following figure 4.5 represents the LCD module that is used to display the content in place where there is less efficient display such as cathode ray tubes. LCD contains the following pins: they are register pin, read/write pin, enable pin and 8 data pins. The register pin allows either to select the data register or instruction register. The data register contains the data that goes on the display screen. The instruction register checks the instruction and decides what to do next. The read/write pins perform either reading or writing operation of the data. The enable pin writes the data to the registers. The 8-data pins may be in the high or low state. The 8 data pins will perform either reading the values from the register or writing the values inside the register. In addition to that we have a contrast pin, power supply pins and LED backlight.

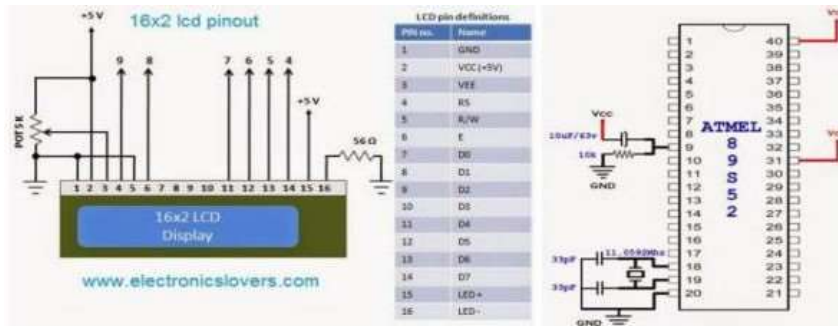


Figure 4.5 Pin diagram of LCD

#### 4.6 THING SPEAK

The thing that speaks is an open source Internet of things. Thing speak contains an API to store and retrieve the data using the HTTP protocol. Thing speak is mainly used for the tracking of locations in the application, and updates the status in the social networking applications. Thing speaking accounts need to be created. Once the login is created we need to go to the channel. Under the channel settings we need to give the title of the application and description in the project in the “name” and “description” field. In order to view the output i.e. the level of the waste in the dustbin we need to click on the API key. API key is copied and pasted in the program. Then finally the output can be visualized in the private view. The figure 4.6 represent the creation of thing speak account



Figure 4.6 Thing speak account Creation



### V. RESULT ANALYSIS

The following figure 4.7 represents the capacity check and the person entry check. The ultrasonic sensor starts sensing for the range of human motion. When it senses the human motion nearing the bin it will open the lid of the dustbin using the servo motor. The lid will be open for some time and it will automatically close.

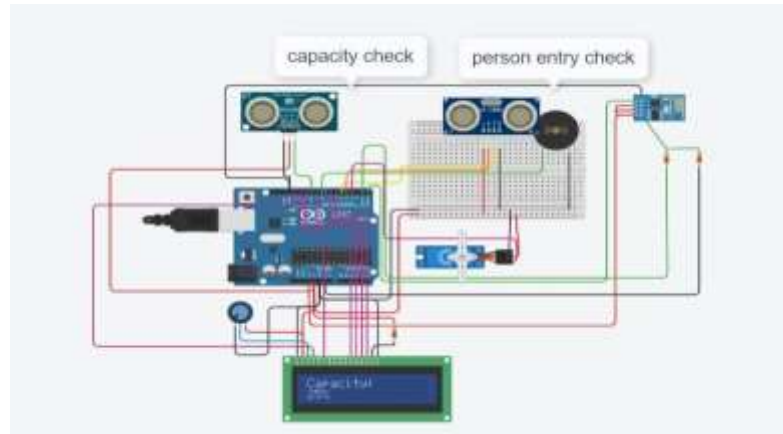


Figure 4.7 Capacity Checks and person entry

The following figure 4.8 represents the capacity status of the trash bin. As the trash bin is starting to get full the (Weight Sensing Sensor) will track the amount of waste that is being present in the bin. There is also an LCD which will show the amount of trash inside the bin for the people so that they can dump their garbage in the bin. When the trash bin is full the buzzer will give an alarm indicating that the trash bin is full.

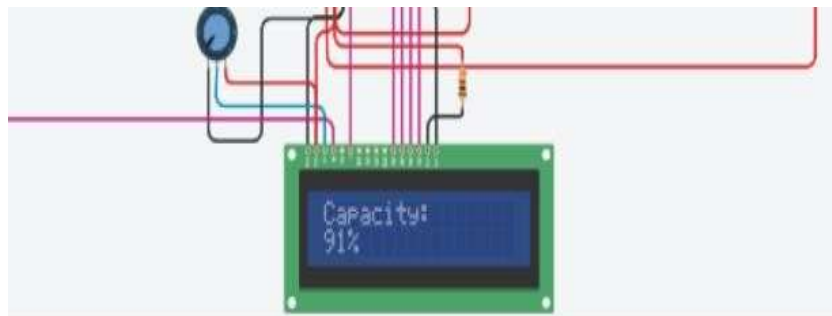


Figure 4.8 Capacity status of Trash Bin

The following figure 4.9 represents the capacity of the bin in the graphical format. The graph is plotted against the capacity to fill against the date and time.

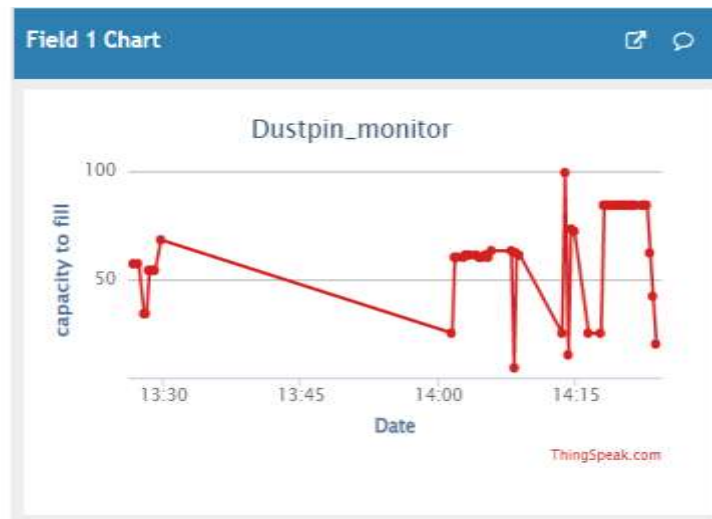


Figure 4.9 Graphical Representation of Trash bot

## VI. CONCLUSIONS

This “TRASH BOT MONITORING” will help the society and environment to be much healthier and safer. This model is developed in such a way that it is cheap and affordable for many people.

## VII. FUTURE ENHANCEMENT

The advantage of the system is that it reduces pollution. The problem like dustbin getting over flow or animals, birds trying to take the waste from the dustbin can be overcome. Future enhancement can be done by separating the dry waste, wet waste and collecting the plastics separately. In order to implement the above concepts we need two sensors in addition they are methane and smell sensors which in turn can reduce the requirement of manpower.

## REFERENCES

1. A. Bahga and M. Vijay, *Internet of things: A hands-on approach*, New Delhi, India: Universities Press, pp. 20-29, 2015.”
2. D. Singh, G. Tripathi and A. J. Jara, "A Survey of Internet-of- Things: Future Vision Architecture Challenges and Services", *Proc. IEEE World Forum on Internet of Things 2014*, pp. 287-292, 2014.
3. Sagnik Kanta, Srinjoy Jash and Himadri Nath Saha, "Internet of Things Based Garbage Monitoring System", *IEEE Conference*, pp. 127-130, 2017.in
4. S. Vinoth, T. Senthil Kumar, A. Krishna Kumar and Kumar and Mahantesh Mathapati, *Smart Garbage Monitoring and Clearance System using Internet of Things*, *IEEE*, pp. 184-189, 2017.
5. S.S. Navghane, M.S. Killedar, Dr.V.M. Rohokale, *IoT Based Garbage and Waste Collection Bin*, May 2016.
6. Ghose, M.K., Dikshit, A.K., Sharma, S.K. A GIS based transportation model for solid waste disposal – A case study on Asansol municipality. *Journal of Waste Management*.
7. Guerrero, L.A., Maas, G., Hogland, W.: *Solid waste management challenges for cities in developing countries*. *Journal of Waste Management*.
8. Alexey Medvedev, Petr Fedchenkov, Arkady Zaslavsky, Theodoros, Anagnostopoulos Sergey Khoruzhnikov, *Waste Management as an IoT-Enabled Service in Smart Cities*.
9. Meghana K C, Dr. K R Nataraj, *IOT Based Intelligent Bin for Smart Cities*
10. Kasliwal Manasi H., Suryawanshi Amit kumar B, *A Novel Approach to Garbage Management Using Internet of Things for Smart Cities*.
11. Vishesh Kumar Kurrel, *Smart Garbage Collection Bin Overflows Indicator using Internet of Things*.