

# Smart Garbage Monitoring System Using IoT

SHURUTHI.M<sup>1</sup>, T. SWARNAMUGHI<sup>2</sup>, G. SWATHI<sup>3</sup>, K. KAMALA<sup>4</sup>

<sup>1,2,3,4</sup> ECE Department, Valliammai Engineering College, Tamilnadu, India.

*Abstract -- The aim for a developing nation is the smart city. Crucial effects on the health of living beings are being caused by the environmental pollution. Improper waste management and transports creates huge pollution in the atmosphere which are harmful to both living and non-livings creatures and to the layers of the atmosphere. The improper waste management has been continuing over years to disturb the environment and also has adverse effects on it. The detection and monitoring of wastes in the locality are such a difficult process being carried and faced by the corporation. Hence it is not possible with our ancient day's technologies because of the need of more human effort, time and cost. The proposed system is an advanced method in which waste management is easy to handle. IoT is an emerging technology with an increasing range of applications leads to development of new advanced technologies and methods for the enhancement of IoT environment. In this system, objects are connected and controlled by the internet. Smart Garbage monitoring system using IoT is an effective design which will help the cities to keep the environment clean.*

*Indexed Terms: Wi-Fi, ultrasonic sensor, GPRS module, Buzzer, Arduino UNO*

## I. INTRODUCTION

IoT based Garbage Monitoring system is a very innovative system which helps in keeping the city clean. This system monitors the garbage bins and informs about the level of garbage collected in them via a SMS and Live Update using IoT. The system uses an ultrasonic sensor which is placed over the bins to detect the garbage level and compare it with the garbage bins depth. The system makes use of Arduino UNO board, IoT Module for sending data. The system is powered by a 12V transformer. The SMS consists of text related to all garbage bins and Location of bins (latitude and longitude). The system has an Monitor continuously monitoring the garbage with the help of Arduino board.

## II. LITERATURE REVIEW

The literature surveyed some different papers to get information about the existing work which have been

done Sauro Longhi, Davide Marzioni, Emanuele Alidor, Gianluca Di Bu` o, Mario Prist, Massimo Grisostomi and Matteo Pirro[2] proposed, garbage collector supported by using sensor motes which is providing information and status about the bin and also sending the retrieved data through DTN (Data Transfer Nodes). This bin has a custom prototype instead of basic installation of sensor nodes. The whole system is designed for allowing heterogeneous sensor for communication. A wireless sensor network is helped for controlling bin by gathering data from motes. The limitation here is that the information about the bin is not directly transferred to the server or to the client; it needs to be sent through the Data Transfer Nodes [1]. Shubham Thakker, R. Narayanamoorthi, in this paper [3], using the Near Infrared Reflectance (NIR) spectroscopy we can identify the type of plastic. The alienated dissipate equipment from MSW (municipal solid waste) can be place in a needy area. By Using a dissenter material which can be mix into a uniform material. The entire process is repeated every hour. The fermentation mechanism took place in a sealed atmosphere, where bacteria converted into undividable enzymes which results in biogas [2]

Andrei Borozdukhin, Olga Dolinina and Vitaly Pechenkin, [4] this proposed system consists of two parts: software and special signaling equipment. The equipment is placed on the side walls of the bin which consists of two parts: one is the receiver-transmitter and sensor. Sensor is used to indicate the level of the bin which is connected to the transmitter that transmits a signal of fullness of the bin to the receiver at the server host. A manager is appointed at the server side whose job is to find the shortest route and intimate it to the truck driver to collect it in a short interval of time [3].

Thompson A.F, Afolayan A.H, Ibidunmoye E.O projected work about the internet-based platform for the organization and monitoring of waste collection, discarding and carrying etc. This is comprised of the

client, server and storage. The client is the device which can access the pages and forms used by web application e.g. PDAs, phones, laptops etc. the desktop is a program that launches the application and makes it performs over the internet. In this, the back-end system is the web server and database management system that supervise the data used by the function to monitor the movement of data between user and system. The limitation of this paper is that it only shows the location of the bin in the web page [4].

### III. EXISTING SYSTEM

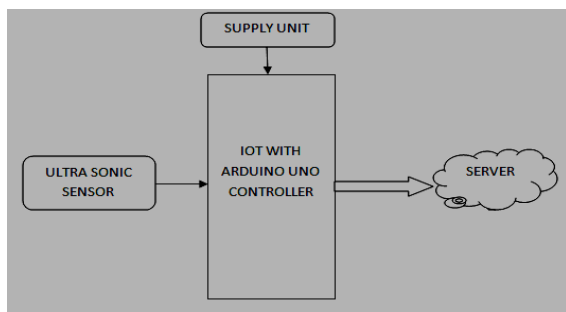
In existing-Implementation of real time waste management system using GSM system. These systems use automation technique reduces human efforts. Ultrasonic sensor is provided for detection of garbage levels and passes signal to the microcontroller which is finally given to the GSM system. GSM module sends message to the authorized person.

### IV. PROPOSED METHODOLOGY

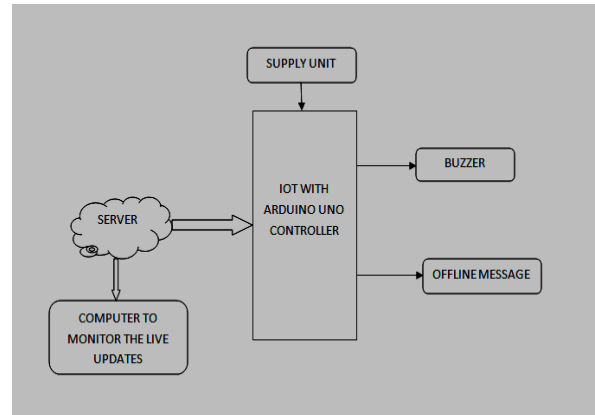
System is divided into two units, slave unit and master unit. Slave unit is placed in the garbage bin and the master unit is placed at the control room. The working objects of the slave unit are Arduino Uno, ultrasonic sensor, IoT module. The entire unit is kept at the top of the dustbin. The ultrasonic sensor time lagging between the sent and received sound signal is used to determine the distance to the object. It continuously checks the level in the dustbin. The wastages reach the specified threshold values, ultrasonic sensor gives indication to the Arduino UNO. IoT is connected with the Arduino Uno for passing the message with live location (latitude and longitude).

### V. BLOCK DIAGRAM

Transmitter Side



Receiver Side



can give any microcontroller access to your

### BLOCK DIAGRAM EXPLANATION

The system makes use of Arduino microcontroller, LCD screen, Wi-Fi modem for sending data. The scheme is powered by a 12V transformer. A web page is being built to obtain the status of the garbage level to the user monitoring it. The web page gives a graphical view of the garbage bins and climaxes the garbage collected in color in order to show the level of garbage collected. The LCD monitor shows the condition of the trash level. The scheme indicates a signal when the level of trash composed crosses the threshold limit. This scheme aids to remain the city spotless by updating about the trash levels of the bins by providing graphical representation of the bins via a web page. The IoT Module is a self-contained SOC with combined TCP/IP decorum stack that Wi-Fi network. The IoT Module is talented of either hosting an submission or unburdening all IoT networking functions from another application processor. IoT Module comes pre-programmed with an AT command customary firmware. The IoT module is an extremely price effective board with an enormous, and ever increasing, community.

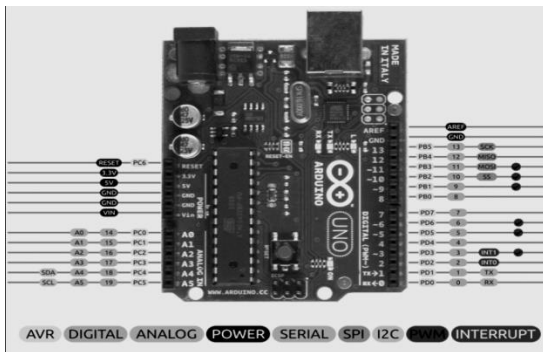
### VI. WORKING PRINCIPLE

Microcontroller receives information from the sensor and processes on it. It compares the received data with the threshold level and output is generated accordingly. The generated output is transferred to Wi-Fi IOT. The IoT transmit the data to Server. The received Data's can view using the PHP web page. The stored data's is used to process the receiver side IoT.

Receiver side IoT receives the data's and turn on the alarm automatically.

6.1 Arduino microcontroller:

Arduino is an open-source platform that is used for developing electronics projects. Arduino consists of microcontroller and software/IDE that runs on the computer, to write and upload computer code to the physical board. The Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board can simply use a USB cable. The Arduino uses a simplified version of C, making it easier to learn to program. Arduino provides a standard form that breaks out the functions of the micro-controller into a more accessible package.



6.2 Ultrasonic sensor:

Ultrasonic sensors are also called as transceivers but more generally they are called as transducers since it works on a principle similar to radar or sonar. Its evaluate attributes of a target by interpreting the choose from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the it. Finally, it also calculates the time interval between sending the signal and receiving the echo to determine the distance to the object.



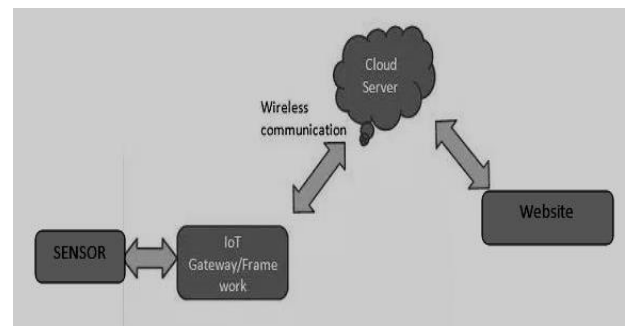
6.3 Adapter:

A transformer in which these condary voltage is less than its primary voltage is called a step-down transformer. The number of turns on the primary of the transformer is greater than the number of turns on the secondary side of the transformer, i.e.,  $T_2 < T_1$ . The step-down transformer voltage turn ratio is 2:1. The voltage turn ratio determines the magnitude of voltage transforms from primary to secondary windings of the transformer. It converts 230 volt to 12volt.



6.4 IoT:

The IoT provides internet connections beyond common devices like desktops , laptops, computers and smart phones to a diverse range of devices and everyday things that utilize embedded technology for communicating and interacting with the external environment via the Internet.



VII. CONCLUSION

The optimization of solution for the waste management is decided upon the results of the correct data obtained from the filling and the level of waste in the bins located at different places of the society. The

proposed system is the optimum concept to implement and gives best solution for the major issue of managing waste properly in terms of indicating its level to the control room and an alert message to the cleaner's mobile. This system alerts the irregular cleaning of the dustbins by sending alerts to the concerned individual at regular intervals. In addition to this it also aids to contract the need for high human practices in the garbage maintenance of the municipality and pollution monitoring system.

#### VIII. FUTURE SCOPE

In our project, the following enhancements can be made.

- 1.This project is made for demo concern, it can be taken to product level
- 2.It can be made durable, by making it compact and cost effective
- 3.Two bins can be placed to collect wet and dry waste separately. Wet waste can be decomposed and also biogas can be made out of it.

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