



SMART GARBAGE MONITORING AND COLLECTION SYSTEM USING INTERNET OF THINGS

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ABSTRACT: Technology plays key role in making human life heal their and easier. We are using technology to make human being life healthy and safe. In world human begin are producing 2.12 Billion tone of waste each year. So improper disposed garbage may cause problem for living things and our environment. This paper present smart garbage monitoring and collection system using internet of things (IOT) is an innovative system. Basically it is working on Arduino controller; here we are having a two dustbin for dry garbage and wet garbage. This two type of garbage will be detected by moisture sensor and respectively dustbin will open or close automatically. IR sensor is placed inside the dustbin to detect the level of garbage. When a garbage level is at threshold level then it will gives a call & message through GSM module to garbage collective person and the level will be indicated at a web server with the help of a IOT module. In this way in our paper we are representing how will help to keep cities clean and follows "SWACHH BHARAT ABHIYAN".

KEYWORDS: IOT, Arduino, GSM module, IR sensor, Moisture sensor.

I. INTRODUCTION

We can define garbage as unwanted material or unless material thrown away by human beings. It can found in homes, school, collages, hospitals, cities etc. The waste has become a source of a pollution and illness. The kind of waste are different like lead, mercury, plastic, wet garbage, dry garbage are very harmful. It may occur various types of diseases. There is very little awareness regarding proper waste disposed therefore our world is facing environmental issues. Every year we dump a massive 2.12 billion waste globally each year. In India on 2 October 2014 Indian Prime Minister Mr. Narendra Modi announced clean India mission launched by government of India. This mission covers 4,041 cities and infrastructure of country. In this paper we have initiate a mission regarding waste monitoring and clearing system. This paper present real time the smart garbage monitoring and collection system using IOT, GSM, Aurdino.

The Internet of Things (IoT) is a recent communication paradigm that envisions near future, in which the objects of everyday life will be equipped with microcontrollers, transceivers for digital communication, and suitable protocol stacks that will make them able to communicate with one another and with the users, becoming an integral part of the Internet [1].

1.1 Indian Garbage Statistics

377 million people are living in 7,935 towns/cities. India is a vast country divided into 29 States Annually, about 12 million tons of inert waste are generated in India from street sweeping and C & D waste in the landfill sites. In India, governed Municipal Waste Rules, 2000 implementation is a major concern of urban local bodies across our country. Bad waste management can easily result in air pollution and soil contamination. It is learnt from the primary survey done in various state, a city in Assam that garbage accumulation causes 41% of the air pollution [1]. They cause air pollution which generally leads to various respiratory problems like COPD, asthma etc. Breeding of mosquitoes and houseflies occur mainly in garbage which are a major cause for various diseases like malaria, dengue, chikungunya etc. To avoid such hazard to environment human being the smart garbage monitoring and collection system using IOT. This system is required.

1.1.1 Biodegradable Waste: Food and kitchen waste, green waste, etc.

- Recyclable Material: The recyclable materials are, paper, glass, bottles etc
- Inert Waste Matter: C & D, dirt, debris, etc.
- Composite waste: Waste clothing, Tetra packs, waste plastics such as toys.

1.1.2 Toxic Waste: There are waste like expire medicine, e-waste, paints, chemicals, light bulbs, fluorescent tubes, spray cans, fertilizer and pesticide containers, batteries, etc. MSW in India has approximate 40–60% compostable, 30–50% inert waste and 10% to 30% recyclable. Nitrogen content (0.64 ± 0.8 %), Phosphorus (0.67 ± 0.15 %), Potassium (0.68 ± 0.15 %), and C/N ratio (26 ± 5 %). Change in the physical and chemical composition of Indian MSW with time.

Table No. 1: Indian Garbage Statistics

Sr. No	States	Municipal Solid Waste (TPD) 2000	Municipal Solid Waste (TPD) (2011)	Growth (TDP)	Sr. No	States	Municipal Solid Waste (TPD) 2000	Municipal Solid Waste (TPD) (2011)	Growth (TDP)
1	Andhra Pradesh	4376	11500	7124	10	Meghalaya	35	285	71300
2	Assam	285	1146	861	11	Orissa	655	2239	24200
3	Delhi	4000	7384	3384	12	Punjab	1266	2794	12100
4	Gujrat	NA	7379	7379	13	Puducherry	69	380	45100
5	Karnataka	3278	6500	3222	14	Rajasthan	1966	5037	15600
6	Kerala	1298	8338	7040	15	Tamilnadu	5403	12504	13100
7	Madhya Pradesh	2684	4500	1816	16	Tripura	33	360	99100
8	Maharashtra	9099	19204	10105	17	Utterpradesh	5960	11585	9400
9	Manipur	40	113	73	18	West Bengal	4621	12557	17200

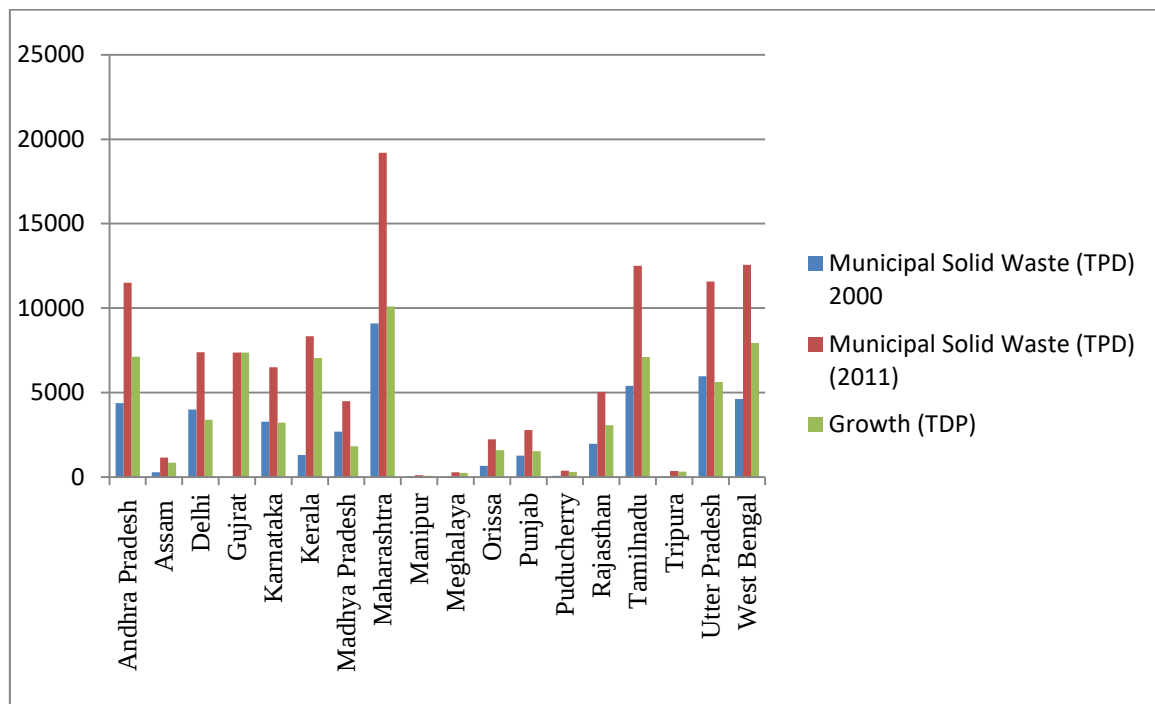


Figure No. 1: Graphical Representation of Indian Garbage Statistics

In above figure shows the growth in garbage in various states of India in 2000 and in blue color shows a municipal solid waste (TPD) 2000 and also in red color shows municipal solid waste (TPD) 2009 - 2011.

II. LITERATURE SURVEY

In first paper, “Garbage and Street Light Monitoring System Using Internet of Things”, Publish by Prof. R. M. Sahu, Akshay Godase, Pramod Shinde, Reshma Shinde in International journal of innovative research. In this paper bin set the Organized By Siddhivinayak Technical Campus, School of Polytechnic & Research Technology, Shegaon.

public place then Camera set for garbage bin location. The camera captured image of garbage bin. Radio Frequency Identification (RFID), GPS and GIS send image for work station. The System are use controlling hut. This controlling hut are SMS technology. The GPS and GPRS mapping server analyzing data of location [1].

In second paper, “Waste Bin Monitoring System Using Integrated Technologies”, Publish by Kanchan Mahajan, Prof. J. S. Chitode. In International Journal of Innovative Research in Science, Engineering and Technology. In this paper zig bee and Global mobile communication system (GSM) used. The sensors are place in the garbage bins placed at the public place when the garbage reaches the level of the sensors. When garbage at threshold level gives sms through GSM. The technology use by Zig bee, Global mobile system (GSM), ARM 7 Controller. The range of communication of the zig bee is almost 50 meter [2].

In third paper , “An Overview For Solid Waste Bin Monitoring System”, publish by “Md. Shafiqul Islam, M. A. Hannan, Maher Arebey, Hasan Basri. In Journal of Applied Sciences Research, The waste management is built around several element. Waste item, domestic bin, trash bags, collective containers and collecting vehicles. Use the waste identification for sorting process.. Smart vehicular and Trash Bag. They only identify RFID tags garbage bins, Low data speed, high cost. The zig bee and GSM system wold be able to monitor the solid waste collection process. This technique overcome some disadvantages which are use of minimum route, low cost, fuel use, clean environment [3].

In fourth paper, “SMART DUSTBIN”, this paper publish by Twinkle Sinha, K. mugesk Kumar, P. Saisharan. In International Journal. The compressing plate consists of a side hole through which the leaf switch is suspended upside down. Technology use Piston, Switch, microcontroller, the single directional cylinder, smart dustbin. Only use for smart dustbins, they are not provide garbage collection. Smart Dustbins can prevent the accumulation of the garbage along the roadside to a great extent thereby controlling the widespread of many diseases [4].

In fifth paper, “Energy Efficient Intelligent Street Lighting System Using ZIGBEE and Sensors”, Publish by Richu Sam Alex, R Narciss Starbell. In International Journal of Engineering and Advanced Technology. In this paper a LASER diode a mirrored resonant chamber is used to reinforce the light waves so that the light emitted by the device is at a single frequency and of the same phase. A photo detector is a device that converts light signals into electrical signals, which can be amplified and processed. The initial planned route is saved so that when real-time data is received only portion of the planned path may be changed [5].

The sixth paper, “Efficient Garbage Disposal Management in Metropolitan”, this paper publish by Narendra Kumar G., Chandrika Swami, and K. N. Nagadarshini. In Cities Using VANETs Journal of Clean Energy Technologies. In this paper IR transmitter consists of LED which send the IR beam. In this technology Infra-red sensor, Microcontroller, Global System for Mobile, graphical user interface (GUI) were used Global System for Mobile (GSM). They only use GSM network. Power and internet supply continue on Smart garbage management system using IR sensor, microcontroller and GSM module. This system assures the cleaning of dustbins soon when the garbage level reaches its maximum [6].

III PROPOSED SYSTEM

The IOT Garbage Monitoring system is a very innovative system which will help to keep the cities clean. This system monitors the garbage bins and informs about the level of garbage collected in the garbage bins. In the proposed system, the level of waste in the dustbins is detected with the help of IR sensor. Moisture sensor is used to measure the weight of the garbage. When the moisture sensor sense the moisture in garbage then the door of Wet bin is OPEN. If the moisture sensor not sense the moisture in garbage then the door of Dry bin is OPEN.

The system puts on the buzzer when the level of garbage collected crosses the set limit. Thus this system helps to keep the city clean by informing about the garbage levels. By using IOT it gives the online notification to the work station and also with the help of GSM we inform the work station by using call. Microcontroller is used to interface the sensor system with GSM system. This will help in managing the garbage collection efficiently.

IV. HARDWARE REQUIREMENTS AND WORKING PRINCIPLE

4.1 Block Diagram

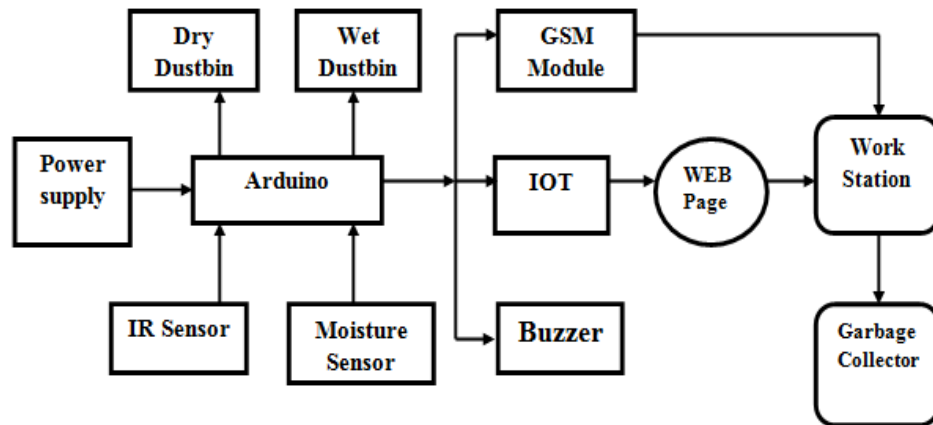


Figure No. 2: Block Diagram of Smart Garbage Monitoring System

The function of a power supply is to convert high electric current to a small electrical current or load using step down transformer. The 12V power supply is given to a system. The power supply given to an arduino, IR sensor and moisture sensor both input are given to Arduino and two output dry dustbin and wet dustbin. Now there are two condition first is if the garbage is wet then the moisture sensor will sense the moisture and wet dustbin door will open automatically for 30 second same way if it is dry garbage then the dry dustbin door will open automatically due to moisture sensor. Now from them if any one dustbin will get full then at a same time Buzzer will get ON and due to GSM message as well as call will send to garbage collective person or municipal office. IOT online notification will send on web page to collect garbage.

4.1.1 Arduino

Arduino was born at the Ivrea Interaction Design Institute. Arduino Uno is a microcontroller board based on the ATmega328 and it is brain of system. It is open source, computer hardware and software device. It sense and control objects in the physical world. Its required 5V power supply. It is basically microcontroller. In this paper Arduino is use as a brain, also all the system which were operated on arduino.

4.1.2 GSM Module

GSM is a global system for mobile communication. It operates either the 900MHZ to 1800MHZ frequency band In this project GSM is used for sending message and call to garbage collective person from municipality office .when the garbage will be at threshold level then the GSM will work .

4.1.3 IOT

The internet of things it is a network of physical device, vehicles, homes appliances and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these object to connect and exchange data. The IOT is an internet of things (IOT). Here ESP8266 Module is used and as well as it is a wireless network. It is a WIFI Module. ESP is 3.3v device and never connect to 5V it will get damage.

4.1.4 IR Sensor

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. An infrared sensor circuit is one of the basic and popular sensor module in an electronic device.

4.1.5 Moisture Sensor

This Moisture Sensor can read the amount of moisture present in the water surrounding it. This Moisture Sensor can be used to detect the moisture of soil or judge if there is water around the sensor. Soil moisture sensors measure the lumetric

water content in soil. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture.

4.2 Working

4.2.1 The Garbage Collection

The IR sensor are used to detect the Garbage using the following working principle as illustrated in the below figure,

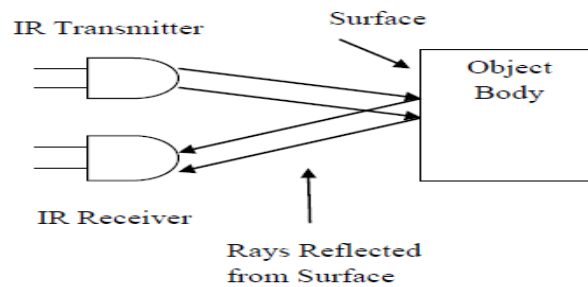


Figure No. 3: Working Principle of IR Sensor

The Arduino use to give input signal to IR sensor transmitter (Tx) the IR sensor has one transmitter (Tx) and receiver (Rx). If there is any garbage the waves are disturb and received by the receiver and send signal to Arduino that there is obstacle/garbage then IR sensor sense the garbage if the garbage is present then the moisture sensor sense the moisture in garbage if the moisture is present in garbage then open the door of wet bin and if moisture is not present in garbage then open the door of dry bin.

4.2.2 The Garbage Detection

First of all we start the process of garbage detection. Then there is a one level detector sensor which is detects the level of the garbage in the bin. If the bin is 80% full then we will inform to work station by using IOT and GSM. If we using the IOT then there we used **Blynk** app and there is one more method which is GSM. By using GSM we can call the work station and inform them about the garbage. If the bin is 80% full then there is buzzer is ON and after 4 sec it will OFF. By using this process we can inform the work station about the garbage which is collected in the society.

V. FLOWCHART

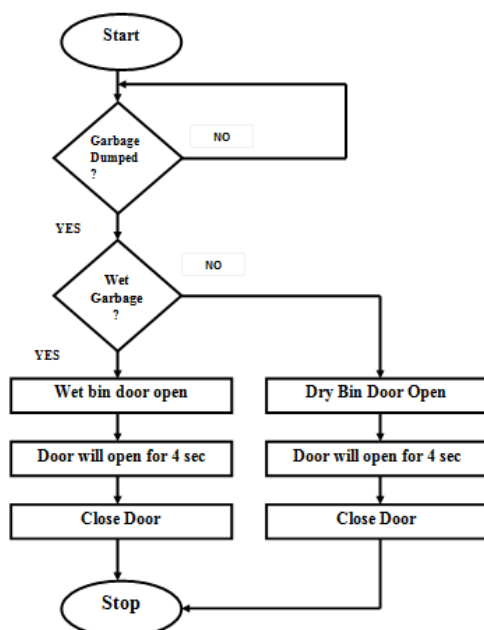


Figure No. 4: Garbage Detection

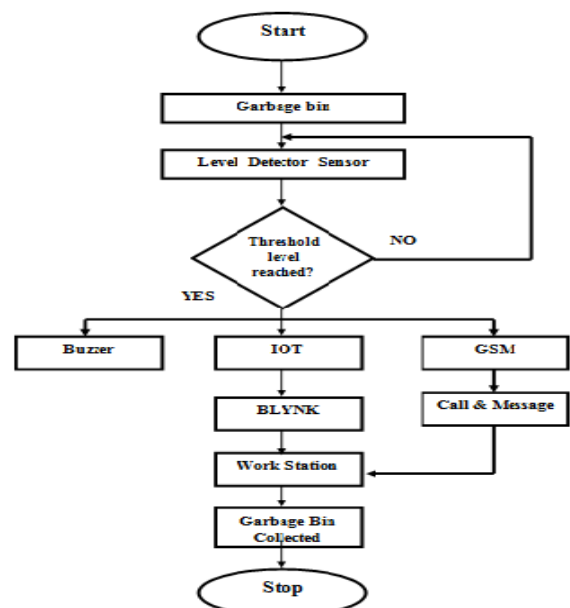


Figure No. 5: Garbage Collection

VI. SOFTWARE REQUIREMENTS

Blynk is platform with IOS and Android apps it is used for control Arduino, Raspberry Pi and likes over Internet. It's digital dashboard where we can build a graphic interface for our project simply dragging and dropping widgets. we install the Blynk Arduino Library, which helps generate firmware running on ESP8266. Download the latest release from <https://github.com/blynkkk/blynk-library/releases>, and follow along with the directions there to install the required libraries. "Create New Project" in the app. select the Hardware type. After this, select connection type. In this way project we have to select Wi-Fi connectivity.

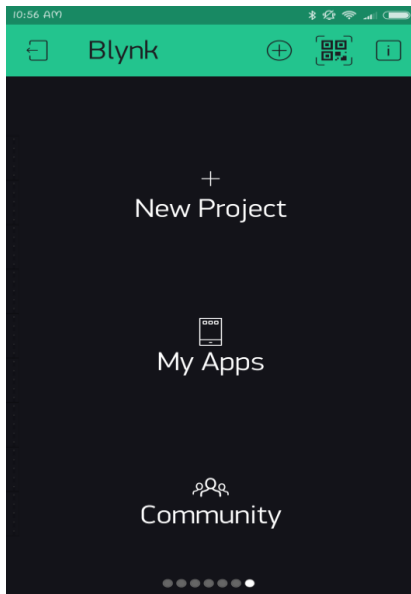


Figure No. 6: Blynk Software Window

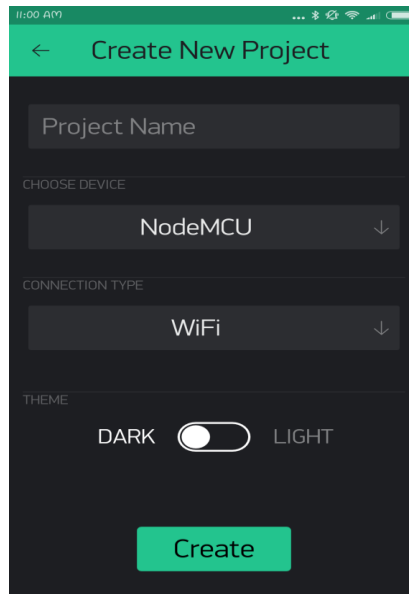


Figure No. 7: Create New Project

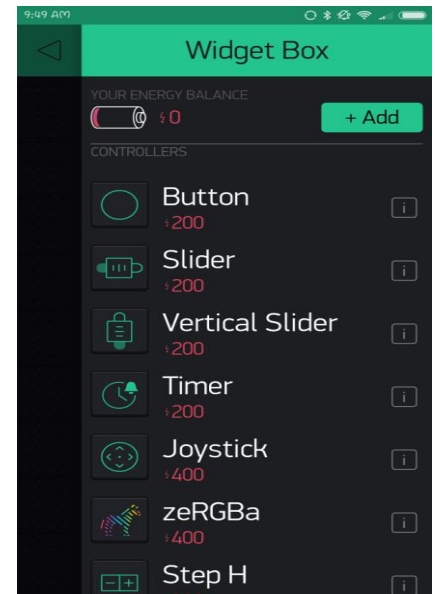


Figure No. 8: Select Different Keys for Various Purpose

VII. ADVANTAGES, LIMITATIONS AND APPLICATIONS

7.1 Advantages

1. Accurately the level of garbage bin is detected with IR sensor collected in the garbage bins.
2. To keep our Environment clean & green.
3. It avoids soil contamination and air contamination.
4. Many times garbage dustbin is overflow and many animals like dog or goat enters inside or near the dustbin. This creates a bad scene. Also some animals are also trying to take out garbage from dustbin.

7.2 Limitations

The limitation in the circuitry or system is that if the stick is at particular distance from the surface or ground floor then the pit detection operation output is continuously given though there is no pit.

7.3 Applications

1. This project can be used in the "SMART CITY".
2. This project is helpful in the government project of "SWACHH BHARAT ABHIYAN".

VIII. CONCLUSION

With the help of smart garbage monitoring and collection system we conclude that the fuel energy of transport medium is saved as well as we know which dustbin only has to clean, also the air pollution is controlled with the use of automatic dustbin opening and closing and also the problem of garbage pickup and thrown away by animals is overcome.

It can automatically monitor the garbage level & send the information to collection truck. The technologies which are used, good enough to ensure the practical and perfect for solid garbage collection process monitoring and management for green environment.

IX. FUTURE SCOPE

The proposed system is operating on the power supply powered by battery. In future we can go for the system powered by solar energy from solar panel by controlling all components through solar energy.

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