# IOT BA.SED SMART WASTE MANAGEMENT SYSTEM

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**ABSTRACT-** Rapid increase in volume and types of solid and hazardous waste as a result of continuous economic growth, urbanization and industrialization, is becoming a burgeoning problem. Now a days, the trend is clear that the use of computing technology has been taken place to improve waste management by providing electronic system by utilizing integration of different sensing and communication technologies for identification at bin level . 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).

**Index Terms -** *Ultrasonic sensor, Weight Sensor, Arduino Garbage Collection, Smart bins, Internet of Things*

## I. INTRODUCTION:

Today big cities around the world are facing a common problem, every city is grappling with increasing waste but only 5% of waste is recycled. Sort out process can be done by developing an electromechanical system using microcontroller and operational amplifiers. If waste is not properly collected, it will be illegally disposed of and this will pose a serious environmental and health hazards. Waste generation rate (kg/cap/day) is expected to increase to 0.6 in 2025.IR detects some sorts of material is being put on the system tray, Moisture sensor and Proximity sensors are being used. Weight sensor, Metal sensor and Glass sensors are being used to detect the weight of the material and the type of the material.

## II. LITERATURE SURVEY:

The various papers referred in this survey are:

### 1) BEST IOT BASED SMART WASTE MANAGEMENT SYSTEM : Navale Pallavi, Gosavi Kirti, Bankar Nikita, Prof.K.D.Dere

In this paper, an ultrasonic sensor is used which is placed under the dustbin lid. When the level reaches to the threshold value, an alert will be sent to the respective Municipal Government authority person. Then that person can send the collection vehicle to collect the full garbage bins or dustbins The bin end consists of devices like ultrasonic sensor, microcontroller, GSM/GPRS shield. Ultrasonic sensor which is placed on the top of bin collects the data and transmit to server side through GSM/GPRS shield. At sever end all information is stored on to database.

### 2) SMART BIN: INTERNET-OF-THINGS GARBAGE MONITORING SYSTEM : Mustafa M.R, Ku Azir K.N.F

In this paper, a system based on Internet-of-Thing (IoT) that allows the waste management to monitor based on the level of the garbage depth inside the dustbin. The system let users being alert the level of garbage on four types of garbage; domestic waste, paper, glass and plastic The system consists the ultrasonic sensor which measure the garbage level and an ARM microcontroller which controls system operation.

### 3) Efficient IOT Based Smart Bin for Clean Environment : Murugaanandam S, Ganapathy V and Balaji R

In this paper, the smart bin system is used which is very useful in preventing overflow of dustbins and accumulation of wastes around the dustbin. This prototype model monitors the bins and provides details about the level of garbage collected in the garbage bins via sensors & Internet. This system uses an Arduino device with a power supply. Ultrasonic Sensors placed over the bins lid to detect the garbage outside bin. IR Sensor is used to sense nearby garbage if any Sensors are used to lock the bin automatically, when the bins are filled and when rain is detected.

*4) IOT Based Smart Garbage Monitoring and Alert System Using Arduino*
*UNO : K.Harika, Muneerunnisa, V.Rajasekhar, P.Venkateswara Rao , L.J.N*
*SreeLakshmi*

In this paper, generally a Dustbin is having three levels that are listed as follows EMPTY level, HALF FILLED level and FILLED level are to be considered. Where an Ultrasonic Sensor is placed on the top of the Bin then it can able to measure the level of Garbage filled in the dustbin. The condition of a bin is sent via message by using GSM(Global System for Mobile) module and along with GPS(Global Positioning System) coordinates, which can gives the exact location of that particular bin to the respective Municipal Authority Office And by using Wi-Fi Module NODE MCU ESP8266 Municipal Officer can see the dust bin status anywhere through internet using the respective web site.

### III. PROBLEM STATEMENT:

With increasing population the scenario of cleanliness with respect to waste management is degrading tremendously. The over flow of garbage in public area creates the unhygienic conditions in the nearby surrounding. It may provoke several serious diseases amongst the nearby peoples. It also degrades the valuation of the area. The economic value of the waste generated is not realized unless it is recycled completely. Several advancements in technology has also allowed the refuse to be processed into useful entities such as Waste to Energy, where the waste can be used to generate synthetic gas (syn gas) made up of carbon monoxide and hydrogen. The gas is then burnt to produce electricity and steam; Waste to Fuel, where the waste can be utilized to generate bio fuels.

### IV. PROPOSED SYSTEM:
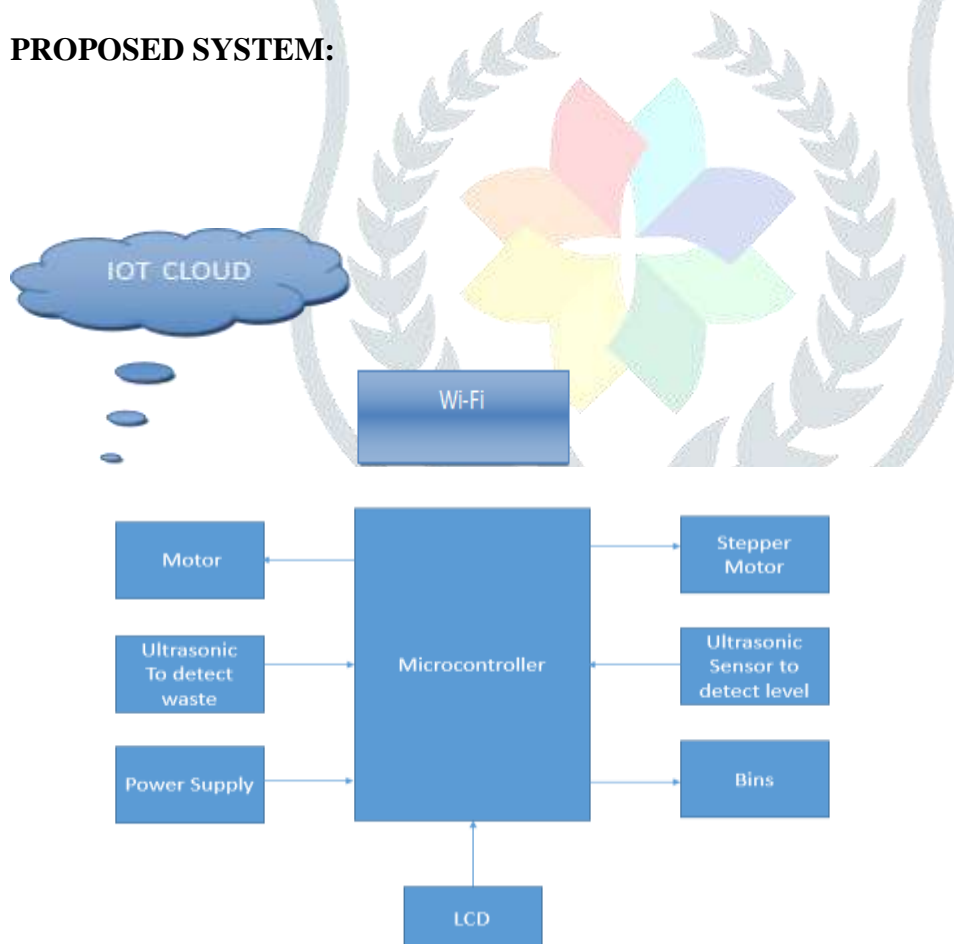


When the waste enters the mechanism the waste is detected and the validation process starts The microcontroller, all the motors, and sensors gets active. The waste is moved under the camera placed to capture image using a conveyer belt. The camera captures image and classifies into the type of waste it is. If the waste is metal waste then before the conveyer starts and the motor turns on and allows the waste to fall on bin, Metal collecting bin comes under by using stepper/Servo motor. Once the angle is set , we allow the detected waste to fall on the bin. Similar process is carried out for wet and dry waste The segregation can be enhanced to plastic and non plastic by using the datasets of other types of waste.

**FLOWCHART:**



*DATA FLOW DIAGRAM:* A data flow diagram is the graphical representation of the flow of data through an information system. DFD is very useful in understanding a system and can be efficiently used during analysis. A DFD shows the flow of data through a system. It views a system as a function that transforms the inputs into desired outputs. Any complex systems will not perform this transformation in a single step and a data will typically undergo a series of transformations before it becomes the output. With a data flow diagram, users are able to visualize how the system will operate that the system will accomplish and how the system will be implemented, old system data flow diagrams can be drawn up and compared with a new systems data flow diagram to draw comparisons to implement a more efficient system. Data flow diagrams can be used to provide the end user with a physical idea of where they input, ultimately as an effect upon the structure of the whole system. In the perspective of application development Data Flow Diagram (DFD) is a special chart type which lets graphically illustrate the "flow" of data through various application component. So the Data Flow Diagrams can be successfully used for visualization of data processing or structured design.



*SEQUENCE DIAGRAM:* A sequence diagram in a Unified Modelling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It shows the participants in an interaction and the sequence of messages among them.
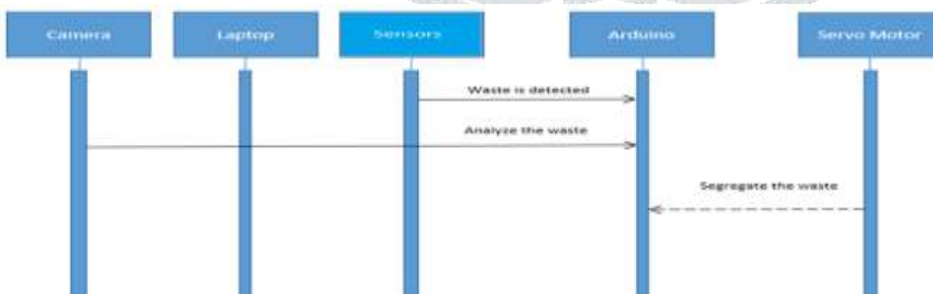


**Other Specification:**

**ADVANTAGES:**

- It helps to manage and segregating of garbage without spoiling the environment.
- It avoids spreading of disease due to improper accumulation of garbage.
- The easiest way of recycling.
- Efficient and reliable.
- Manual operations has been reduced to major extend.

## RESULTS AND DISCUSSION

The following are the results which obtained from this work:

- Waste Level detection inside the dustbin
- Transmit the information wirelessly to concerned
- The data can be accessed anytime and from anywhere
- The real-time data transmission and access
- Avoids the overflows of Dustbins

This IoT based waste management is very useful for smart cities in different aspects. We have seen that, in cities there are different dustbins located in the different area's and dustbinsget over flown many times and the concerned people do not get information about this. Our system is designed to solve this issue and will provide complete details of the dustbin located in the different area's throughout the city.

## V. CONCLUSION:

Proposed project will be successfully implemented for the segregation of waste into metallic, dry and wet waste at a domestic level. The system can segregate only one type of waste at time with an assigned priority for metal, wet, dry and glass waste. The experiment will be conducted for wet, dry, glass and metallic wastes.

Monitoring the fullness of bins through the use of sensors, it is possible to achieve a more efficient system than the current existing. Our idea of "Smart waste management system", mainly concentrates on Monitoring the waste management, providing a smart technology for waste system, avoiding human intervention, reducing human time and effort and which results in healthy and waste ridden environment.

The proposed idea can be implemented for smart cities where the residents would be busy enough with their hectic schedule and wouldn't have enough time for managing waste. The bins can be implemented in a city if desired where there would be a large bin that can have the capacity to accumulate the waste of solid type for a single apartment. The cost could be distributed among the residents leading to cheaper service provision

**REFERENCE:**
[1]. Navale Pallavi, Gosavi Kirti, Bankar Nikita, Prof.K.D.Dere, "Best IOT Based Smart Waste Management System". IOSR Joural Of Engineering(IOSR JEN). PP 33- 36.
[2]. Mustafa M.R and Ku Azir K.N.F, MATEC Web of Conferences 140, 01030(2017) ICEESI 2017
[3]. Murugaanandam S, Ganapathy V and Balaji R. "International Conference on Communication and Signal Processing", April 3-5, 2018, India.
[4]. K.Harika, Muneerunnisa, V.Rajasekhar, P.Venkateswara Rao, L.J.N SreeLakshmi "International Journal of Innovative Research in Computer and Communication Engineering", 2018.