

# Waste management and monitoring using web applications

Ashok Kumar

Department of ECE, JBIT, Dehradun

Ashok71986@gmail.com

## Abstract

Many times, in our city we see that the garbage bins or dustbins placed at public places are overloaded. It creates unhygienic conditions for people as well as ugliness to that place leaving bad smell. To avoid all such situations we are going to implement a project called IoT Based Smart Garbage and Waste Collection bins. These dustbins are interfaced with microcontroller-based system having IR wireless systems along with central system showing status of garbage, on mobile web browser with html page by Wi-Fi. Hence, the status will be updated on to the html page. Major part of our project depends upon the working of the Wi-Fi module; essential for its implementation. The main aim of this project is to reduce human resources and efforts along with the enhancement of a smart city vision.

## 1. INTRODUCTION

“There are few things certain in life – one is death, second is change and the other is waste.” No one can stop these things to take place in our lives. But with better management we can prepare ourselves. Here we will talk about waste and waste management. Each of us has a right to clean air, water and food. This right can be fulfilled by maintaining a clear and healthy environment. What is waste? A “anything that does not create value” However scientifically speaking there is no waste as such in the world. Almost all the components of solid waste have some potential if it is converted or treated in a scientific manner. The aim of this study is to analyse the evolution of the municipal solid waste management system of Dehradun city. The state capital has scored low in a countrywide cleanliness index, bagging 316th position out of 400 cities surveyed. For further I have been taking some homework of the last findings and research that have been done for this .AS...

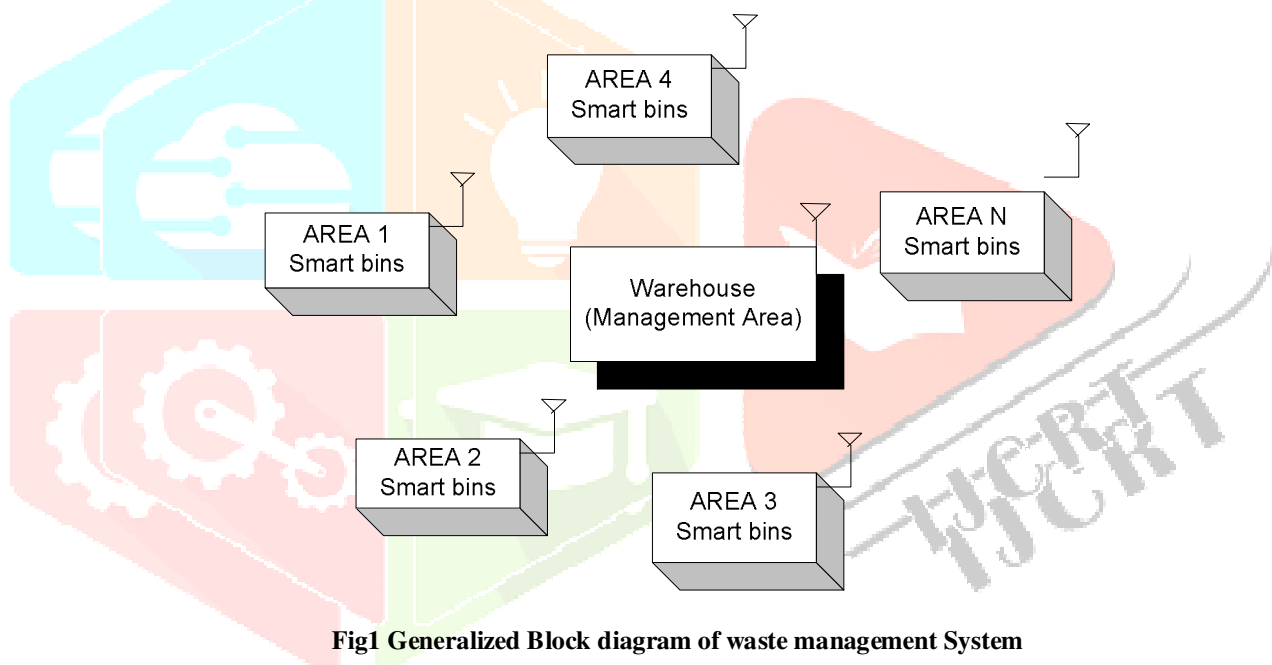
Ibáñez -Forés, Valeria, et al The aim of this study is to analyse the evolution of the municipal solid waste management system of João Pessoa (Brazil), which was one of the Brazilian pioneers cities in implementing door-to-door selective collection programmes. the main aim of this paper was to see the basic change in environmental state after this process of door top door collection process.[1] Kibler, Kelly M., et al. An estimated 400,000 tonnes of food is wasted every year by households. To address the complex food waste problem, we therefore propose a “food-waste-systems” approach to optimize resources within the FEW nexus. Such a framework may be applied to devise strategies that, for instance, minimize the amount of edible food that is wasted, foster efficient use of energy and water in the food production process, and simultaneously reduce pollution externalities and create opportunities from recycled energy and nutrients.[2]

Global food loss and waste amounts to between one-third and one-half of all food produced. Loss and wastage occurs at all stages of the food supply chain or value chain. In low-income countries, most loss occurs during production, while in developed countries much food – about 100 kilograms (220 lb) per person per year – is wasted at the consumption stage. On account for this situation Cristóbal, Jorge, et al. addresses the situation in which a decision-maker has to design a food waste prevention programme considering the limited economic resources in order to achieve the highest environmental impact prevention along the whole food life cycle.[3] Richter, Beate, and Wolfgang Bokelmann et al .in this we have seen the approach towards the waste on the level of households food uses and waste that is been done by individual to minimize it a concept of “Mean-End-Chain” analysis is been studied.[4] Abdelradi, Fadi.et al. now in this we were able to identify the reason of the food waste been caused by the help of peoples of Egypt and also by the data been developed that brings many factors considered in the recent literature in one model to be tested using structural equation modeling. With this new policies and campaign were held .[5] De Menna, Fabio, et al . this was an methodological concept as life cycle costing (LCC ) by which techniques for food waste management and valorization routes were been identified [6]. Mihai et al. The paper examines the biowaste management issues across rural areas of Romania in the context of poor waste management infrastructure in the last decade (2003–2012).in this mainly the losses that has been caused related to

irrelevant management of bio waste in rural areas and home composting [7]. Wanyama, Tom. et al. Using Industrial Internet of Things to Support Energy Efficiency and Management: Case of PID Controller in this we have learn to combine the PID controller to that of IOT to further more incorporate with the energy efficiency and management of the system[8] . Trab et al. this concept of “product class-based storage (pCBS)” has been incorporated by the help of RFID-IOT-warehouses[9].Raina et al. in this they have collected info of bins status and shows with the help of wifi modues and the web browser html page. By this they reduce the cause of infection due to the dump overloads conditions in the dumps areas.[10] Kaur, Manpreet et al. This paper also presents information related to IoT, smart city, waste management system problems, and solutions.[11].

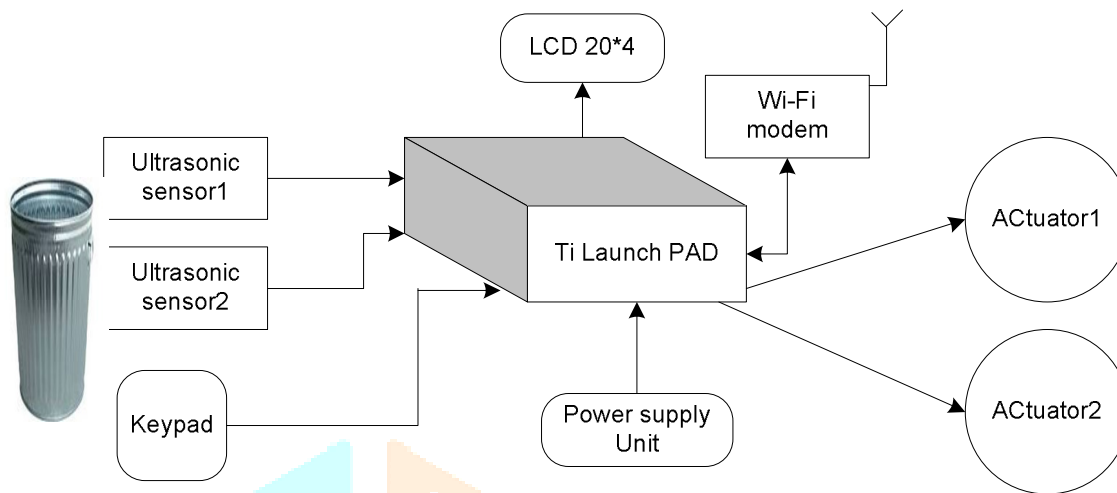
Now taking in consider all these research we come to a new concept in which our main aim is to divide the city in sectors and then placing these(IOT) bins their now as we get the messege of the bins full then one of the vehical go and collect it and put it to the ware house .Now these ware house should be at places where we have huge land areas for the irrigation purpose . so as we partition the waste in biodegradable or non biodegradable .After further processing on them It can be use as manure for irrigation purpose and the other portion as take the plastics (nonrecyclable) for different use like making of roads etc .

## 2. HARDWARE AND SYSTEM DEVELOPMENT



**Fig1 Generalized Block diagram of waste management System**

The above shown is the structural diagram of the our project .In this we establish the different areas in Dehradun as a sub units and then its been connected to a hub were the whole process of recycling is been forwarded.



**Fig 2 Architecture of Smart Bin using Wi-Fi modem**

In present day the dustbin is overflow, the proposed system will help to avoid the overflow of dustbin. and dustbin that can automatically open the lid when it detects the people who want to throw out their trash. These dustbins are been design in such a manner that according to the waste category its been dump in two different compartments one for organic and the other for inorganic waste . It will give the real time information about the level of the dustbin. It will send the message immediatly when the dustbin is full with the help of wifi modem /GSM modules to the ware house their the message been transfered to the particular area garbage collector from where the garbage is been collected out and been further dumped in to the recycling hub area . From where the further processing is been done on that garbage to make it in use in one or the another manner.

**Ti Launch PAD**-The MSP-EXP430G2 LaunchPad Development Kit is an easy-to-use microcontroller development board for the low-power and low-cost MSP430G2x MCUs. It has on-board emulation for programming and debugging and features a 14/20-pin DIP socket, on-board buttons and LEDs & BoosterPack Plug-in Module pinouts that support a wide range of modules for added functionality such as wireless, displays & more.

**power supply unit (or PSU)**: it converts mains AC to low-voltage regulated DC power for the internal components of a computer. Modern personal computers universally use switched-mode power supplies. Some power supplies have a manual switch for selecting input voltage, while others automatically adapt to the mains voltage.

**Ultrasonic sensor**: Ultrasonic sensor will be used to detect the level of garbage filled in the dustbin. The level of garbage will be depicted in terms of distance between the sensor and garbage in dustbin. This module has 4 pins- VCC (5V), Trig, Echo and GND. Trig have to be used to send out an ultrasonic high level pulse for at least 10µs and the Echo pin will then automatically detect the returning pulse. Sensor will calculate the time interval between sending the signal and receiving the echo to determine the distance. Working frequency of ultrasonic sensor is 40Hz. Max range and min range is 4m and 2cm and measuring angle is 15 degree.

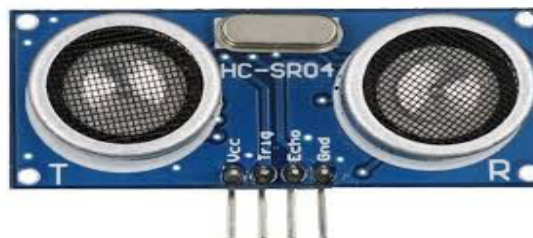


Fig 5: Ultrasonic sensor

**Wifi modem:** Modem stands for Modulator/Demodulator and that is the primary role of the device but only wireless. While Wi-Fi routers are devices that perform the same functions of a normal router only wirelessly. Wi-Fi routers can connect two LANS or WANs, LAN and WAN, or LAN and the internet. Now by the help of these wifi modules we can easily get in touch with the garbage picking van so that as we get the signal we can operate our system to just collect that stuff on time .

**GSM Module:** These modules consist of a GSM module or GPRS modem powered by a power supply circuit and communication interfaces (like RS-232, USB 2.0, and others) for computer. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, or it can be a mobile phone that provides GSM modem capabilities. Its basically used for the identification of area at the instant without any delay .

**Actuator:** An actuator is a motor that converts energy into torque which then moves or controls a mechanism or a system into which it has been incorporated. it is categorized by the energy source they require to generate motion. Basically these are the motor which are been attached to the microcontroller so that it can easily open the flap 1 or flap 2 of the dustbin according to the user input through user.

**LCD 24\*2 Display:** A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in colour or monochrome.

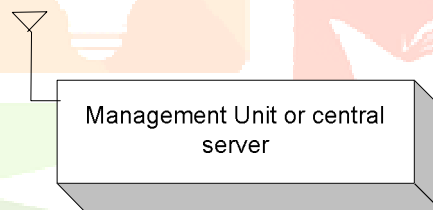


Fig 4 Management system/Central control Unit

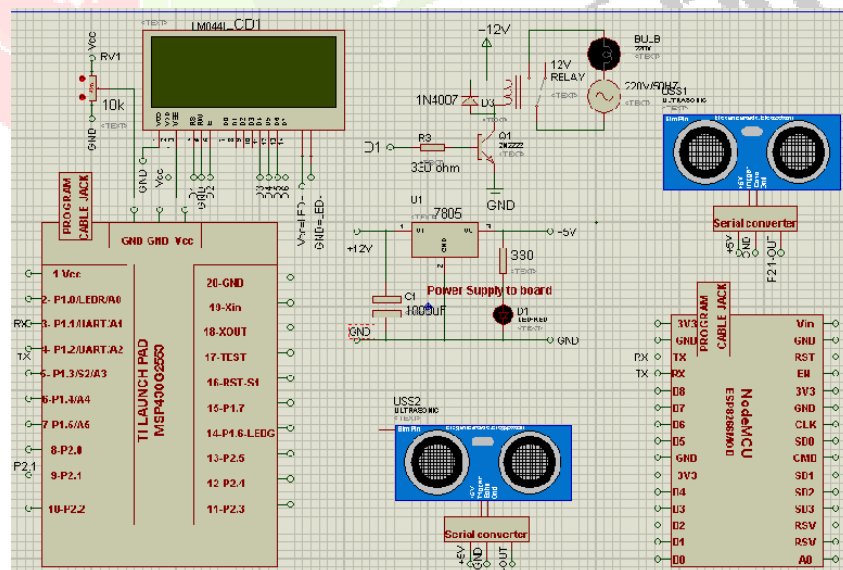


Fig 5(a) schematics of Smart Bin using Wi-Fi modem

### 3. SOFTWARE DEVELOPMENT

Fig5 shows the flow chart of the system using NodeMCU/ESP8266 and GPRS modem. Initially the system initialize the sensors and serial communication in the microcontroller. The data form location will be send using either NodeMCU or GPRS device.

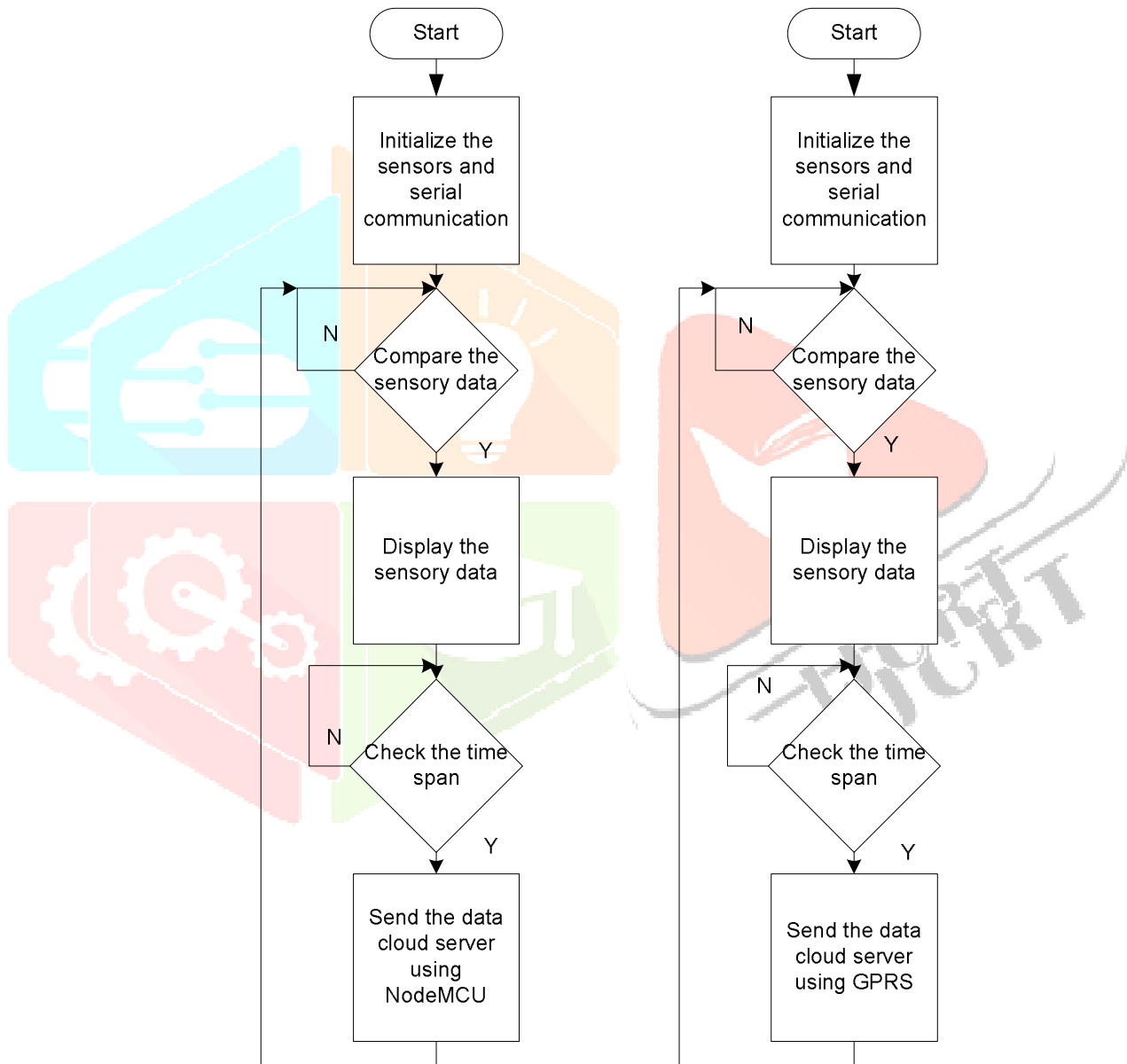


Fig5. Flow chart of the System with NodeMCU and GPRS modem

#### 4. RESULT

In this, the result is displayed in the virtual form. The information about the level of the dustbin and the area where it is located is sent to the municipality office with the unique ID that is given to the dustbin. The waste level inside the dustbin is detected by this system. This will transmit the information to the concerned person wirelessly. Everyone can access the data at anytime from anywhere in the world. Continuous and immediate data transmission. This system will avoid the overflow of dustbin. It will also avoid the emission of toxic gases from the dustbin. Due to this the ratio of health hazard's will be reduced out. So as the land fertility will also get improved as the dumping on land will get in to reduce.

#### 5. CONCLUSION

The objective of the project is for the real time access of information about the dustbin. This waste Management System using IOT has implemented the management of waste in real time using smart dustbin to check the fill level of dustbin to check if it is full or not. This system also helps to monitor the fake reports and hence can reduce the corruption in the overall management system. This reduces the total number of trips of garbage collection vehicle and hence reduces the overall expenditure associated with the garbage collection. It ultimately helps to keep cleanliness in the society. Therefore, the smart garbage management system makes the garbage collection more efficient. Such systems are vulnerable to plundering of components in the system in different ways which needs to be worked on.

#### 6. FUTURE SCOPE

Further in this we can add up the cost management portion and by the virtue of which we can place them in an individual's home. so that they can use them and can manage the day-to-day garbage by their own and as the bin hits on alarm of filling its further recycled and can be used in kitchen garden in homes. That would be a good practice in field of environment safety. Smart dustbin helps us to reduce the pollution. Many times garbage dustbin is overflow and many animals like dog or rat enters inside or near the dustbin. This creates a bad scene. Also some birds are also trying to take out garbage from dustbin. This project can avoid such situations. And the message can be sent directly to the cleaning vehicle instead of the contractor's office

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