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## Solid Waste Management and Electricity Generation Using IOT

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**ABSTRACT:** The gathering and transfer of waste in a satisfactory way influences condition to end up greener and more secure. Henceforth, advancement of waste is essential for day to day life. The major heart of the issue in the waste management is that when the trash bin at public places gets overfull and when it is not cleaned immediately causes foul odor, which becomes outbreaks of contagious diseases. Various resources can be made out from the waste that we collect. This can be done by the use of IoT, which is the emerging technology that delivers many smart solutions. An ultrasonic sensor is been fitted at the trash bin which monitors the bin. Once the bin becomes full it intimates the nearby truck driver by sending notification via GSM. Thus, the garbage waste will be collected by the truck driver. To make optimize use of these waste, the collected waste will be decomposed and after some duration of time, the pH value of the waste will be checked using fertilizer sensor. If the range falls between 5.5 to 7 it will be used as a fertilizer for plants. The paper waste is incinerated and by using peltier sensor electricity is produced. Providentially, IoT provides solution for efficient resource optimization.

**KEYWORDS:** IoT, Ultrasonic sensor, Peltier sensor, Fertilizer sensor, GSM.

### I. INTRODUCTION

Resource management is essential to reduce waste administration costs and improve the efficiency of materials. IoT has proven to provide an optimal service by providing notifications whether the trash is full or not. Many times, these garbage causing several problems to the surrounding. It causes bad smell and these bins becomes home to many diseases that are spread by mosquitoes. Hence, the ultrasonic sensor are fixed to the bin to monitor the bin and provide status whether it becomes full or not. The status is sent as notification via GSM to the municipal authority or nearby truck driver. On receiving the notification, the truck driver collects the garbage from the bin. The sensors which prove to improve the waste management are Ultrasonic sensor, RFID and Arduino UNO to check the level of the bin and provide notification to municipal officer whether the bin is full or not. The RFID is utilized to distinguish the canister and sends the ID number to the city officer. An alert flag generated to send the message. Android application is interfaced with web server to convey the message from metropolitan officer to truck driver. The warning is sent via Wi-Fi. Another approach is that the GOOGLE API is utilized to give the constant waste accumulated information to bin. Fire Sensor is utilized in case of any crisis of getting fire in the bin. Waste Management gives incineration of waste composting, recycling to giving proficient use of the waste. In addition to this project is to clean the trash can with the force of water when the bin is empty. The bin will open and close when a person is nearby<sup>[1]</sup>.

### II. RELATED WORK

In [2] authors have proposed a solution for solid waste management system. Large amount of waste is generated day by day in today's world. By 2025 it would rapidly increase and efficient method and decisions must be taken to manage the



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waste. In [3] authors have led to an approach of managing the waste in a well organized way. The IoT based alert system is used to generate the alarm signal to the municipal officer. Arduino UNO is interfaced with Ultrasonic sensor to estimate the level of the bin. RFID is used for the verification and identity of the bin. Android application is linked with webserver for communication from the municipal officer to the nearby truck driver. In [4] authors proposed a model for real time data sharing between truck drivers for efficient route optimization and waste collection. Thus the ineffective waste collection in inaccessible areas is managed. Surveillance cameras are incorporated for capturing the problematic areas and provide affirmation to the authorities. In [5] authors put forward a new method of separation of dry and wet waste separately which would be useful for recycling composting, and incineration. The separation is done through moisture sensor. The GSM provides the current location of the bin and is shared to the municipal officer for further process. In [6] authors had led to an approach of using Arduino Nano, Ultrasonic sensor, NodeMCU and Flame sensor which are interfaced with Android application through Web Server to put forth an inventive dustbin which will quantify the status of the dustbin. In [7] authors provides a scheme on smart waste management using Wireless Sensor Networks (WSN) and IoT (Internet of Things). The garbage bins are utilized with sensors and are networked together using WSN. The Garbage Collector Agent is responsible for collecting the waste. In [8] authors have described an IOT enabled bins. These bins, use RFID tags for tracking of the wastes linked with a web-based online system and according to the weight of waste added, the server calculates the points and updates in the database.

## III. PROPOSED SYSTEM

### A. SUPERVISING AND INTIMATING :

Ultrasonic sensor measures distance based on transmitting and receiving ultrasonic signals. They vibrate at a frequency above the range of human hearing. It uses a single transducer to send a pulse and to receive the echo. The bins are equipped with the ultrasonic sensor to solve the problem of overflow of the bin. It identifies the level of the bin whether it becomes full or not and intimates the nearby truck driver.

### B. ANALYSIS AND LOCATION :

Weight sensor is fixed at the bottom of the bin which provides detail (height and quantity) regarding the bin. A load cell (weight sensor) is a type of transducer which is used to convert a force acting on it into a measurable output, anything which needs to be weighed probably uses a load cell to do so. The location (Latitude and Longitude) of the overflowed bin is shared to the truck driver via GSM.

### C. WASTE DECOMPOSITION :

Fertilizer sensor depicts find the pH value in the compost. By obtaining the compost with accurate pH value can be used as a fertilizer for plants. The waste collected from the garbage is composited to obtain humus which is used as a fertilizer.

Methods to compost Biodegradable waste : Select a composting container and layer the organic materials inside the container. Maintain a moist, covered and well turned compost pile. Add green manure and bury new materials ten inches down and turn the compost.

### D. ELECTRICITY GENERATION:

Peltier sensor is an instrument that transfers heat from one side of the device into electricity. It can be used as a heater or cooler. The heat produced from the incineration of paper waste is converted into electricity. The Arduino UNO (microcontroller) is an open source electronic platform based on hardware and software. It is able to read inputs.

## IV. PSEUDO CODE

Waste level monitoring.

Step1: Initialize the long variables for calculating the distance and weight which is used to give the level of garbage in the bin.

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- Step 2: Using Ping pin and Echo pin the duration is calculated.
- Step3: By using the below formula the distance is calculated  

$$\text{distance} = (\text{duration}/2) / 29.1$$
- Step 4: Thus the level of the bin is identified and printed and available space is viewed using the cloud remotely.
- Step 5:The fertilizer sensor is used to find the range of values of the decomposed waste
- Step 6:If the range is between 5.5 to 7 then the optimized waste is used for plants as food.
- Step 7:peltier sensor is used to glow a bulb of around 1 Volt.

## V. RESULTS

The smart waste management system portrays whether the waste is disposed of or not. In this paper , the paper waste which is disposed of can be utilized to produce power utilizing peltiersensor.The biodegradable waste is upgraded by plants.

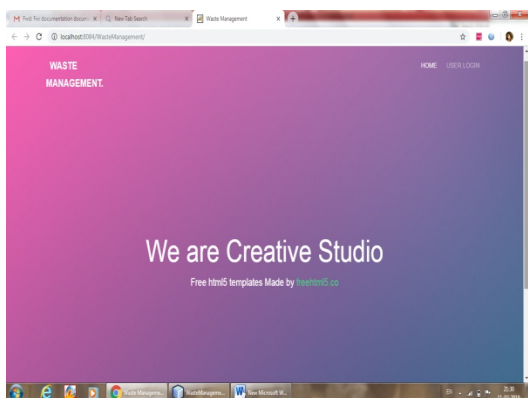


Fig .1 home page

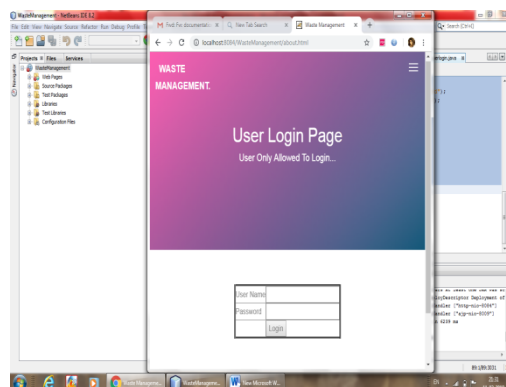


Fig 2.User Login page

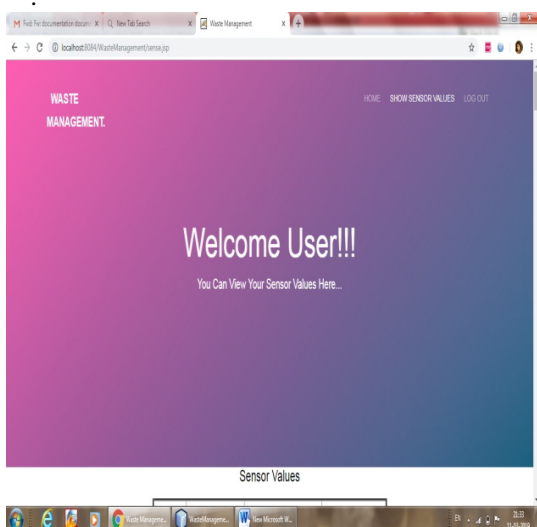


Fig 3. Login page of sensor

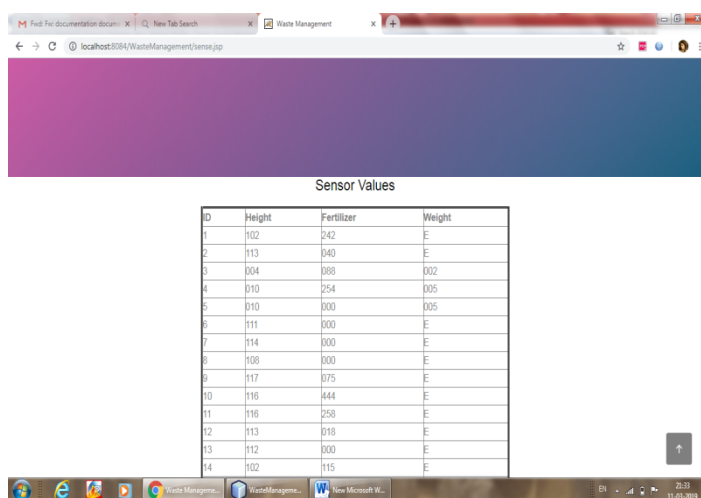


Fig 4.Sensor values of the waste



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## VI. CONCLUSION AND FUTURE WORK

The objective of our project is to stay town clean and hygienic. Due to overflowing of waste in city becomes unhygienic and also leads to deadly diseases.so we use garbage collection vehicle to collect waste. In real time , using smart dustbin it is monitored whether the dustbin becomes full or not. The compost is obtained by decomposing the bio degradable waste which is used as a fertilizer for plants. Hence, we propose a smart solution by generating electricity from heat by incinerating paper waste . For future enhancement use of biogas which is produced from animal waste (i.e. cow dung) used to power the generator and create electricity.

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