



Preimplentation Paper of Smart Waste Classification and Management System

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ABSTRACT

Smart Waste Classification and Management System which is proposed to implement a smarter way of conventional waste management using smart sensors to gather data, as well as a citizen reporting system, garbage around the dustbin and stinking condition from containers and garbage bins, and send it to servers in real time. An authorized phone number which are present in Waste Management Centres gather fill-level and other information sent from multiple containers which are situated throughout the area. The whole data, can be used to systematically plan route-map to collect garbage/waste. The information from bins to the authorized number is sent using location and SMS. The entire operation is controlled using esp32 microcontroller. This report showcases a potential design for an IOT gateway that can be used to provide a framework for a smart waste management system.

Key words: IOT, Arduino, Wi-Fi, Automation, Sensors

INTRODUCTION

The summary of cleanliness with respect to garbage management is degrading prodigiously. Proper garbage management techniques are very crucial to stop the garbage menace which has spread everywhere especially in cities like Nagpur. With this condition of the garbage crisis there is a need of applying a method that SOLVES THE garbage problems efficiently.

Therefore, we are developing a Smart Waste Classification & Management System to detect garbage level using IoT based on sensors and web applications. Smart Waste Classification & Management System is a very innovative system which will help to keep the cities clean. This system monitors the garbage bins and informs if the level of garbage collected in the garbage bins is fulfilled for disposal via a web page to the system administrator.

The system uses an IR sensor placed over the bins to detect the garbage level and sends the signal if the bins are fulfilled. Also, a light at the place of the bin will show the status to the near peoples if the bin is fulfilled. If the bin is fulfilled but the waste is not collected yet by the authorities, then a local can also file a complaint using the system which will help in better management of waste and collecting the waste within time. The complete system is real-time means as soon the complaint is registered the system administrator will be informed and the vehicle on the way of that bin will get an SMS to collect the waste. And when the vehicle collects the waste simultaneously a picture is automatically taken and sent to the system administrator. So the complained will be flagged as resolved and the rewards will also be calculated on the proper complaints by citizens. Which will help the cities to stay clean. "In the perspective of the smart cities mission, the objective is to develop cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and

defendable environment with the application of smart solutions”. Smart cities are not only the smart buildings and smart parking areas but “smarter waste management system” is also a crucial issue to be addressed in developing a smart city. The SMART WASTE MANAGEMENT AND CLASSIFICATION SYSTEM which is proposed herein uses smart sensors to gather fill-level data from containers and garbage bins, and send it to an authorised number in real time. The authorised phone number which is situated in Waste Management Centre gather fill-level information sent from multiple containers which are situated throughout a city/locality. The data acquired as above, can be used to systematically plan route map as shown in the below figure 1.2 and to collect garbage.

Many a times, even if the dustbin is not full, it starts slung resulting in extremely rotten smell. This is generally due to the wet waste present in the bin. If the bin is not addressed until it is filled, this lously smell may last for many days and this may individually affect the society. As a avoidance to this, a Wet sensor is provided in the bin. This sensor collects the information about the wet waste present in the bin and if the value is greater than the vestibule level, the message is sent to WMC to address the dustbin. The SWM system proposed here, effectively reduces. The cost involved in collecting the garbage using conventional methods. It also prevents the spreading of garbage in open streets and stinking of bin which may occur due to the wet waste present in the bin, thus maintaining the hygiene of the city/locality making the life healthy and comfortable which is the main objective of smart city.

EXISTING SYSTEM

Reviewed from some different papers to get information about the existing work which have been done Sauro Longhi, Davide Marzoni, Emanuele Alidor, Gianluca Di Bu`o, Mario Prist, Massimo Crisostomo and Matteo Pirro. Proposed, by using sensor nodes which contribute information and status about the bin and also sending the fetch data through DTN (Data Transfer Nodes) which is supported by garbage collector. Instead of basic installation of sensor nodes this bin has a custom prototype. A broadcast sensor network is aiding for controlling bin by collecting data from nodes. The restriction 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.

Shubham Thakkar, R. Narayana moorthi, in this paper using the Near Infrared Reflectance (NIR) spectroscopy we can identify the type of plastic. The disaffect scatter equipment from MSW (municipal solid waste) can be place in a needy area. By Using a disservice 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 Andrei Borozdukhin, Olga Dolinina and Vitaly Pechenkin; this proposed system consists of two parts: software and special signalling equipment.

The hardware is placed on the bin which contains of two parts: one is the receiver-transmitter and sensor. Sensor is used to specify the level of the bin which is connected to the transmitter that transmits a signal of completeness of the bin to the receiver at the server host. A manager is designate at the server side whose job is to find the shortest route and dense it to the truck driver to collect it in a short interval of time. Thompson A.F, Afolayan A.H and Ibidunmoye E.O completed work about the web-based platform for the organization and observation of waste collection, discarding and carrying etc.

PROBLEM STATEMENT

A big opposition in the urban cities is waste management. The garbage collecting control in traditional waste management system which doesn't know about the level of garbage in dustbin, if the dustbins gets full by garbage then it gets drowned as well as ensorcelled out from the dustbin leading to unsanitary condition in cities.

People throw garbage on that dustbin which is already drowned. Sometimes due to unclean dustbins bad smell appears also toxic and unhygienic gases are produced which is way to support to the air pollution and to some injurious diseases which is easily transmittable. It is very bad view of the city. Use of traditional system result in ineffective time and money disburse system.

OBJECTIVE

- Garbage level detection
- Display bins fulfillment to locals.
- Display the bin fulfillment to system administrator.
- The main objective is that make a system which classifies waste and manages waste smartly.
- Complaint tracking system
- Complaint resulting and reward system
- Processing on the images of collected garbage

- Acknowledging the citizen that the complaint is resolved.

PROPOSED SYSTEM

According to the need of latest technology waste can be smartly managing hence we have come up with the smart dustbin but it becomes expensive. We overcome this disadvantage by making the use of esp32 which have small size and there is no need of external WIFI connectivity this makes efficient application.

In this architecture small device is placed on the dustbin. This waste management system makes the dustbin to work smart. The main aim of the system is to monitor the garbage and make India clean. The device consists of different components such as Infrared sensor, power supply, esp32, etc. This device detects the current status and other information these details information displayed on the web page. Through the internet device with sensor connected to web application shows the detail information such as current status of garbage, time, date, day of cleaning and also it shows percentage of garbage waste and it also shows in how many percentage of the smart dustbin is clean. This system helps to monitor and decrease the efforts. Another characteristic we add scanning of the code when the worker makes the dustbin empty and sends the photo automatically the superior got the update that the garbage is picked up after the worker reaches the destination, he can verify by taken photograph and this will confirm that garbage is properly reach. Due to this monitoring it become too easy and work of cleaning garbage becomes more efficient and smarter for the complainer citizen.

REQUIREMENTS

A. Battery

This is General purpose 9V Original HW marked charger less Battery for all your project and application needs. As we happening the use of this battery in our testing lab for various resolve, we can insure you the best quality, long life and openness of this battery among all options accessible in the market at this cost.

Its Universal 9V battery size and connecting points;

it is convenient in many DIY projects as well as real-life applications and they can easily be replaced and put; the same as you could an AA battery or an AAA battery.



Fig. 1 Battery used in Project

B. ESP32

The ESP32 CAM is a diminutive module based on ESP32 chip and OV2640. You can in spite of program the ESP32CAM through the ESP-IDF by installing the ESP32 Core



Fig. 2 ESP32 cam

The ESP32CAM appoints the ESP32 with everything necessary to program, run and develop on the simple chip. Additionally, the board reserved the MPU6050, BME280 and an analogy MIC. ESP32-CAM can be generally used in many IOT applications. It is acceptable for home smart devices, industrial wireless control, wireless monitoring, QR wireless identification, wireless locating system signals and other IOT applications. Use this cheap, fast and powerful microchip to connect to the internet. Build IOT projects that work. Open-Source Library. Check Price.

C. Infrared sensor



Fig. 3 Infrared sensor

Infrared barrier prevention IR Sensor Module (Active Low) has a pair of infrared transmitting and receiving tubes. When the pass on light waves are reflected back, the reflected IR waves will be received by the receiver tube. The boarded comparator connections do the processing and the green indicator LED comes to life.

The smart IOT dustbin detects a person using IR sensor, if person is detected involuntarily it will open the cap of the dustbin and if person moves away from the dustbin then the dustbin automatically close the cap of the dustbin using stepper motor.

The module features a 3wire interface with Vac, GND, and an OUTPUT pin on its tail. Upon reflectance, the output pin gives out a digital signal (a low-level signal). The onboard present helps to fine-tune the range of operation, the effective distance range is 2cm to 80cm.

D. Wi-Fi Module



Fig. 4 Wi-Fi module

The ESP 01 ESP8266 sequential WIFI Wireless Transceiver Module is a independent SOC with unified TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is accomplished of either hosting an implementation or offloading all Wi-Fi networking functions from another application processor.

Each ESP8266 module happen pre-programmed with an AT command set firmware, meaning, you can simply look this up to your Arduino device and get about as much Wi-Fi-ability as offers (and that's just out of the box)! The ESP8266 module is an exceedingly cost-effective board with a huge, and ever-growing, community.

E. LED

It is a 3mm Red DIP LED. An LED is a two-lead semiconductor light source, which emits lights when switch on. When a suitable voltage is applied to the LED terminal, then the electrons are able to re-join with the electron holes within the device and release energy in the form of photons. This effect is known as electroluminescence. The colour of the LED is deciding by the energy bandgap of the semiconductor.

HOW IT WORKS?

In this system there are following Modules:

1. Admin
 2. Supervision
 3. User
 4. Vehicle Geo
 5. Vehicle driver
 6. Reports
- 1. Admin**

The admin is responsible for all the operations and tasks. He can activate or deactivate a user. Adding of supervisor can only be done by admin. Admin can approve leaves of supervisors by his login. Admin can Weekly or monthly reports of supervisors, workers, vehicles, drivers and the no of dustbins collected.

2. Supervision

The supervisor can resolve the complaints by citizens / users. After a complained is filed the supervisor get to know after his login that what exactly is the complaint and can also sent the message to vehicle driver to collect the garbage on the daily or required route. If the issue is not resolved by side of worker, then he must write acknowledge by his login about the status as well as acknowledgement. After successful cleaning of the dustbin of which complaint is received the automated message is sent to the citizen about status of complaint. And the issue is also marked as solved. With the captured image of scenario.

According to the need of latest technology waste can be smartly managing hence we have come up with the smart dustbin but it becomes expensive. We overcome this problem by making the use of esp32 which have small size and there is no need of external WIFI connectivity this makes efficient application.

3. User

The user is the citizen who is the main factor of the Smart waste management system. Because cleanliness of the city and environment is required. If the area / dustbin / or public place is not cleaned, then the user can scan the QR code on the dustbin to register a complaint or can use Website to register a complaint by selecting the route or the dustbin number. After the resolution of complaint or After successful cleaning of the dustbin of which complaint is received the automated message is sent to the citizen about status of complaint. So that the status can be tracked easily.



Fig. 5

4. Vehicle Geo

This is an automated module where the geo location of the vehicle is automatically sent to the Smart waste management system. And the supervisor and admin can see the vehicle location. The location coordinates are sent by the mobile of vehicle driver. And when a complaint is registered the message is sent to the driver with the route, dustbin number.



Fig. 6

5. Vehicle driver

This module mainly deals with the driver and other workers for effective work management and to determine their salary. Where the assigned tasks need to be done via worker/ driver. If not, then the supervisor may handle the situation to make the workplace better. This module is based on the work done as well as the report module.



Fig. 7

6. Reports

This module generates the weekly/ monthly reports of work as well as workers, drivers, supervisors work. Before release only the admin can view all reports. But reports of vehicle complaints and workers can be seen by supervisors for making the workplace better.

SR	Name	Task done	Payment
1	Raj	Yes	+500
2	Yash	No	-100
3	Juhi	Yes (complaint)	+700
4	Ram	Yes (complaint)	+700

Fig. 8

In this architecture small device is placed on the dustbin. This system makes the dustbin to work smart. The main goal of the system is to observation the garbage and make India clean. The device consists of different components such as Infrared sensor, power supply, esp32, etc... This device detects the current status and other information this detail information displays on the web page.

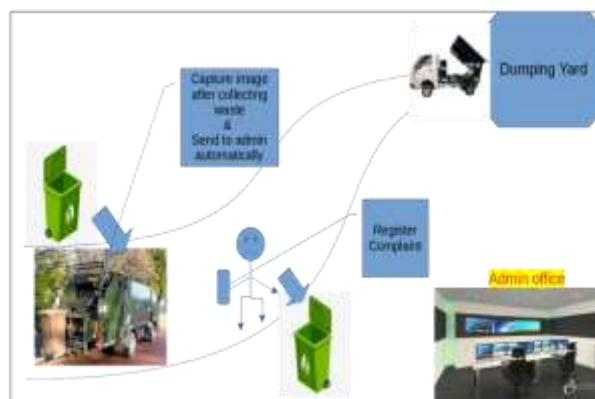
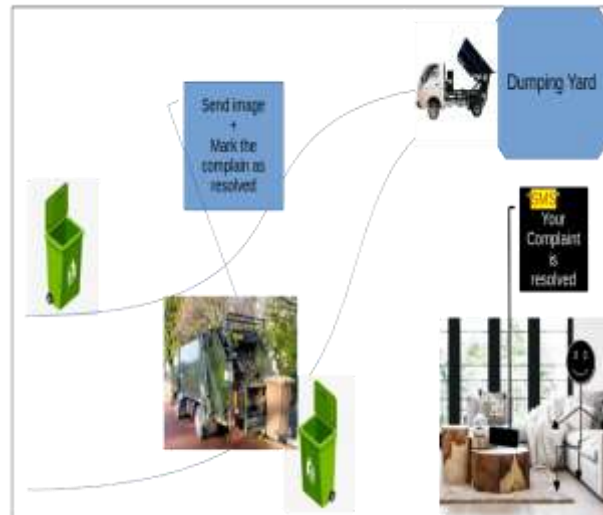


Fig. 9

This system helps to monitor reduce the efforts. Another feature we add scanning of the code when the worker makes the dustbin empty and sends the photo automatically the superior got the update that the garbage is picked up after the worker reaches the destination, he can verify by taken photograph and this will confirm that garbage is properly reach. Due to this observation it become too easy and work becomes more effectual and smarter. And then to the crank citizen.

**Fig. 10**

The Arduino software is used for the evolution and execution of the partial system proposed in this report. Arduino is an open-source instance platform based on simple-to-use hardware and software. These boards are important to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - operating a motor, turning on an LED, publishing something online. You can tell your Arduino board what to do by sending a set of identification to the microcontroller on the board. So you can use the Arduino programming language such that based on Wiring, and the Arduino Software that is IDE, based on Processing.

FUTURE SCOPE

1. Servers can be maintained at the NMC to collect the information from the dustbin instead of a phone number.
2. Each level of the dustbin can be recorded instead of just recording the filled level.
3. Whenever a dustbin is filled, a GPS locator can be used to locate another dustbin which is nearer to the user to make the waste disposal convenient to prevent the waste lying on the open streets.
4. The complaining system can be improved to real-time tracking with increased speed of resolution.

CONCLUSION

This paper shows the achievement of smart waste classification and management system using IR sensor, microcontroller. This system convinces the cleaning of dustbins soon when the garbage level extends its maximum. If the dustbin is not cleaned in specific time, then the record is sent to the higher authority who can take appropriate action against the concerned vehicle. This system also assists to observe the fake reports and hence can decrease the corruption in the overall management system. This grows the total number of trucks of garbage collection vehicle and hence reduce the overall disbursement equate with the garbage collection. It eventually helps to keep cleanliness in the society. Therefore, the smart waste management system makes the garbage collection more capable.

By using this procedure, the collection of waste in the city becomes easier. It helps in bringing down air pollution, traffic flow, man power, time and money. With the help of proper technology (GPS & SOFTWARE APPLICATIONS) we can mentor the trucks in selecting the shortest path for garbage collection. This system can add an edge to the cities focus to get smart and people-friendly.

We have introduced an intelligent waste management system. The system planning is completely IOT based sensors. It is capable for measuring the waste level in the waste bins and later send this data (through Internet) to a server for storage and processing. This data assist to compute the optimized collection routes for the workers. This paper shows technical way to control the garbage. Smart dustbins can be implemented by manufacturing the use of sensors. The accurate data from real time collected by the system. The smart dustbin prototype can be used in any conventional dustbin and make the Waste Management easier and efficient.

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