

DESIGN AND IMPLEMENTATION OF COST EFFECTIVE AUTOMATIC SMART TRASH CAN MANAGEMENT SYSTEM BASED ON INTERNET OF THINGS

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ABSTRACT

Nowadays automatic systems are being preferred over manual system to make life simpler and easier in all aspects. But due to the overflow of garbage, bacteria and viruses are increasing to form unhygienic environment. So that it causes different types of diseases like malaria, typhoid and bad odour. To overcome all these difficulties, we need to monitor the levels of garbage in a periodic manner. In our project we are implementing smart trash can management system based on IOT. Initially the level of the garbage is measured using ultrasonic sensors and this is notified to corporation department automatically and then we are implementing separation process in bin itself by using the metal detector for separating metals and non-metals in garbage, this avoids corrosion because it is separated in bin instantly. Once the garbage bin is filled, the bin will be locked and further SMS will be sent automatically to the corporation department. Then the garbage collecting drivers will receive the SMS automatically and they will reach to the specified location and open a bin by using RFID. We are using Arduino for managing the communication between the bin and cloud using sensors to identify levels of garbage at bin and remove all the garbage. Whenever bin is filled with garbage then only corporation will come and collect garbage. It reduces transport fuel cost and save the time. The proposed system helps in monitoring garbage's in an cost efficient manner.

Keywords: IOT, RFID, Arduino

1. INTRODUCTION

With the already prevailing diseases, the open containers are proving to be a breeding place for germs. Traditionally, ¹⁻³municipalities operate on weekly routes to pick up trash and recyclables on designated days, regardless of whether the containers are full or not. Our project aims to optimize waste collection and ultimately reduce fuel consumption. When the bins are placed at a particular position Smartphone is required to detect its particular latitude and longitude only once. This reduces the cost of overall system; as GPS will not be required then. Basically, it will shoot sonar waves to know how much stuff is inside the container. We will also measure temperatures inside the container. Data collected from the sensors are sent over a cellular network (GPRS) for analysis and displayed on Ubidots web platform for customers. A list of containers to be collected can then be sent to drivers to plan an efficient route. The project will also include real-time monitoring of the civic body's garbage ²⁻⁵vehicles using RFID. The vehicle owner has to flash his RFID card so that who and when and at what time garbage bin were emptied. It will help to curb laziness of the municipality's garbage collectors. Essentially, this project

is about collecting the most amounts of materials in the least amount of time to reduce costs and emissions along the way. Furthermore, this project is supposed to work with any type of container and any type of waste, including mixed materials, paper, glass, metals and fluids. Thus, there will be saving in fossil fuel ⁶due to optimized route for collecting garbage and also thus transportation cost. This prototype which gathers data from the sensors attached to the Linkit ONE development board, transmits the data through a wireless communication channel (GPRS), and provides visualization using cloud services on any GPRS/Wi-Fi enabled device.

2. EXISTING SYSTEM

In the existing system they have used four separate bins to fill the trash. People has to separate the trash like metals, non metals, paper, plastics, wood, cloth etc and put in the different bins. So people ⁷work is more in the existing system. Due to the overflow of garbage, a bad odour can be created in the area. The various diseases can be caused by the bacteria, virus that are formed in the bins. This process leads to the more network cost and thus make the network process more costly.

2.1 DRAWBACKS

- In a single location instead of four bins for four different types of garbage one large bin can be placed which segments the garbage by itself.
- Manual work is more.
- Network cost and Network process are high.
- It leads to various diseases and causes bad odour.

3. PROPOSED SYSTEM

In our project we are implementing single garbage. All the trash is thrown in the single garbage itself. The separation process is done by using the metal detector to separate the metals and non metals. This avoids corrosion so the people work can be reduced. Telegram mobile application can be used for the sending of messages to the driver to collect the trash as soon as the bin got filled.

3.1 ADVANTAGES

- The garbage will be collected on time to time basis.
- There would not be any bad smell around the bin.
- Real time notification to collect the garbage after the separation process.
- Saving on fuel consumption, thus reducing the threat to the environment.

4. LITERATURE SURVEY

[1] Smart Garbage Management in Smart Cities using IoT proposed a method as follows. The level of garbage in the dustbins is detected with the help of ultrasonic sensors system, and communicated to the

authorized control room through GSM system. Arduino microcontroller is used to interface the sensor system with GSM system. A GUI is also developed to monitor the desired information related to the garbage for different selected locations. This will help to manage the garbage collection efficiently. Level detector consists of IR sensors which is used to detect the level of the garbage in the dustbin. The output of level detector is given to microcontroller. Four IR sensors are used to indicate the different levels of the amount of the garbage collected in the dustbin which is placed in public area. When the dustbin is filled up to the highest level, the output of fourth IR receiver becomes active low. This output is given to microcontroller to send the message to the Control room via GSM module. At receiver, control room is present where all the activities are managing.

At receiver, control room is present where all the activities are managing. This system assures the cleaning of dustbins soon when the garbage level reaches 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 contractor. This system also helps to monitor the fake reports and hence can reduce the corruption in the overall management system. This reduce the total number of trips of garbage collection vehicle and hence reduce the overall expenditure associated with the garbage collection. It ultimate helps to keep cleanness in the society.

In this disadvantage is no fully mobile depots i.e before waste transferred to the garbage tips.

[2] A dustbin is interfaced with microcontroller based system having IR wireless systems along with central system showing current status of garbage, on mobile web browser with html page by Wi-Fi. Hence the status will be updated on to the html page. There by to reduce human resources and efforts along with the enhancement of a smart city vision. Considering the need of modern technology, the smart garbage bin can expensive but considering the amount of dustbin needed in India, there for they used based sensors to reduce its cost and also make it efficient in applications. And at the sender side they used only a Wi-Fi module to send and receive data. But because of the use of weight sensor for detection of amount of garbage in dustbin.

It will only detect the weight of waste; not how much level it is of. The message can be sent directly to the cleaning vehicle instead of the contractor's office.

In this drawback is it will not determine the level of waste in dustbin.

[3] The researches done on waste collection in developing countries from 2005 to 2011 and considers challenges for developing countries in waste collection sphere. The research focuses on determination the stakeholders actions/behavior and evaluation of influential factors defining their role in waste collection process. The models in the survey were Considering system approaches for solid waste collection in developing countries is presented. The research compares the history and the current practices, presented from 1960s to 2013. The output of the survey is drawing a conclusion that developing and implementing solid waste collection approaches in developing countries are of a great importance.

The main issue is that waste collection does not include innovation that IoT can provide. Models do not use real time information of the waste collection, although some approaches use advanced scheduling and routing via exploiting modern ICT algorithms. Information about bins status was not considered as part of waste collection. All the reviewed surveys do not propose a model that will use IoT technology for Smart Cities, though they consider different approaches for waste collection.

The drawback in this is the waste collection does not include IOT innovation

[4] This paper is proposed an advanced Decision Support System (DSS) for efficient waste collection in Smart Cities. The system incorporates a model for data sharing between truck drivers on real time in order to perform waste collection and dynamic route optimization. The system handles the case of ineffective waste collection in inaccessible areas within the Smart City. Surveillance cameras are incorporated for capturing the problematic areas and provide evidence to the authorities. The waste collection system aims to provide high quality of service to the citizens of a Smart City.

Mainly, these customers are private companies that are involved in waste collection, owning waste trucks, organize work of drivers, get contracts from municipalities and pass wastes to recycling organizations or city dumps. Second main target is developing a system, which makes possible mutually beneficial communication between all the stakeholders involved in the chain of supplying goods and utilizing solid waste in smart city. This paper presented a novel cloud-based system for waste Collection in smart cities. The system aims to provide services for different kind of stakeholders involved in this area - from city administrations to citizens. Still, the design focuses mostly on providing SaaS services to commercial waste management companies.

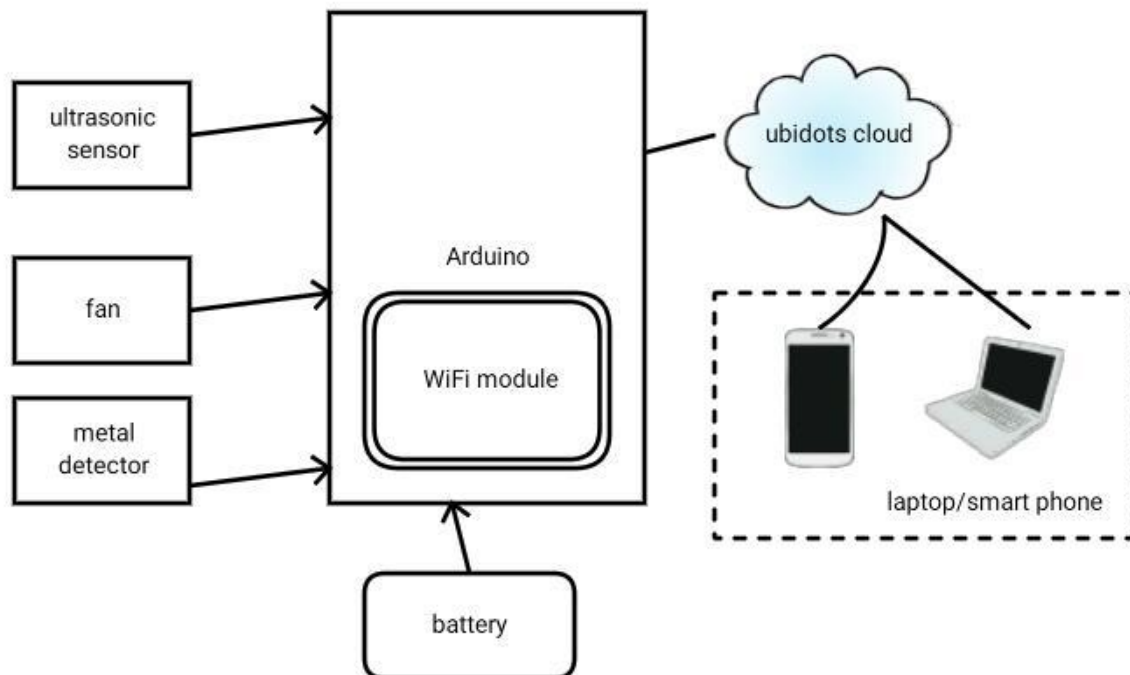
The disadvantage in this is the system handles the case of ineffective waste collection in inaccessible areas within the Smart City.

[5]In this paper Infrared sensor (IR sensor) is used which is a multipurpose sensor, which can detect the level of garbage. IR sensor emits the light, which is invisible to naked eye but the electronic components can detect it. It consists of IR transmitter and IR receiver. The output of IR sensor is acquired by The National Instruments myRIO-1900. It is an input output device which is portable and reconfigurable. USB acts as a connector between the NI myRIO-1900 and host computer. It has connectors A and B that acts as an expansion port and a connector C that act as a mini-system port, they carry the signals and these signals are distinguished by different connector names. Sensor senses level of the bin.

The GUI gives the output of what level of garbage is filled. Sensor senses level of the bin. The graphical representation to access the output of the sensor is as shown below. ¹⁰It gives the output of what level of garbage is filled.clicked, a display opens showing the location of the bin, status of the bin, data and time when the bin gets filled, mobile number and the text to send to the concerned person. But this system does not ensure whether garbage is cleaned or not and transportation cost is another issue.

The disadvantage is transportation issue.

5. SYSTEM ARCHITECTURE



The system architecture gives the detailed view of the application, enables the graphical model of the system, and the externals that they interface with data stores that they use.

WORKING

The application initially contains the trash, which contains three important modules: ultrasonic sensor, metal detector, and WiFi module. The ultrasonic sensor is used to view the levels of garbage thrown, for separation of metal it contains the conveyor belt and uses the metal detector for separation of metal and non-metals and an exhaust fan to separate the weightless objects from the remaining non-metals. WiFi module is used to send the level of garbage as a data to cloud storage. After the trash can is filled, the truck driver will receive the message using the telegram application. We use the LEDs for the indication of levels, which will be placed in the trash can.

6. CONCLUSION

This paper enables the development of a smart garbage monitoring system, which is based on the microcontroller Arduino UNO. It is used in improving the efficiency of solid waste disposal management especially in the flat residential, where the garbage stored at the bins are one of the major concerns in resident owing to its ability to measure continuously the garbage level in the bin and the municipality receives the alert message for immediate collection. The outputs from the conducted tests show all the functionality of the system has performed correctly. The proposed system is suitable to be implemented in all flat residential areas of society, due to its reliability and cost. The main objective of project is to maintain the level of cleanliness in the city and form an environment hygienic which is better for living. By using this system we can check the garbage levels constantly in the dustbins which are placed in various parts of the city. If dustbin has reached the maximum level then the employees can be informed and they can immediately take certain actions to empty it. The employees can check

the status of these bins anytime on their mobile phones. This system can prove to be a very useful if used properly. The system is used as a benchmark by the people for increasing the cleanliness in their respected areas. To check the level of garbage in the dustbins ultrasonic sensor is used ,but in future various other types of sensors can be used with the ultrasonic sensor to get more output and to take this system to next level. Now this system can be used in only particular areas but as soon as it proves its efficiency it can be used in all the big areas.

7. FUTURE ENHANCEMENT

In this model we can include a temperature sensor in order to sense the temperature of container in order to avoid chemical explosions. In future a team can be appointed in order to handle and maintain the system and to take care of its maintenances. A small grinder can be used along with a wet waste bin to make the organic waste into pieces so that it will be decomposed rapidly .The scope for the future work is this system can be implemented with time stamp in which real-time clock shown to the concern person at what time dust bin is full and at what time the waste is collected from the smart dustbins. Additionally plastic separation can be done in order to separate and recycle them.

8. REFERENCES

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