

Smart Dustbin System Using IOT

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Abstract- Due to overpopulation, waste management has become very difficult and costly as well. Prime reason is segregation and handling of waste. As the garbage bags gets full, before clearing the waste, making it difficult for government to handle such huge amount of waste. As result of which, several diseases are spreading. For handling such complex problem, we are proposing smart dustbin system using IOT. Garbage bins will have RFID unit which will tell its position to host server. Furthermore, it will calculates the weight of the garbage added, hence the database will be updates each time with current status of dustbin and based on capacity of dustbin carrying vehicle it will provide shortest route to evacuate the dustbins. Truck capacity will also be calculated each time, when they will service the bins. Furthermore, each citizen will have garbage card ,which will have information regarding classification of garbage, status of dustbins. Major advantage of this system is, minimum cost and maximum efficiency by collecting and handling the garbage.

Keywords- smart dustbins, RFID, IOT, waste collection, waste handling.

I.INTRODUCTION

In India, 377 million people live in 7,935 cities and produce 62 million tonnes of solid waste per annum. Only 43 million tonnes (MT) of the waste is collected, 11.9 MT is treated and 31 MT is dumped in landfill sites. Government spends billions of money each year, but result is not satisfactory. Around the globe in 2016, the worlds' cities generated 2 billion tonnes of solid waste, With rapid population growth and urbanization,. Over 90% of waste is often disposed in unregulated dumps or openly burned. These practices create serious health, safety, and environmental consequences. We have to take serious measures regarding waste management, else we would be taking ourselves towards

This smart dustbin firstly will provide efficient collection of waste, with economical management system, secondly it will dustbins from overflowing in different places. One of the feature of this system will provide citizens coins, so that they would be able to evaluate which garbage to dump to which dustbins with the help of RFID unit. This feature will help municipal corporation to maintain the cycle of waste collection.

Arduino Uno unit will give collect the data from various dustbins and will send it to main server of municipal corporation.

Data processing unit will help the main server to decide and implicate what to do in different situations. Basically it will learn from the data about current situation and act accordingly.

Application unit consists of GPS, truck capacity unit responsible for management of trucks through various bins, according to need. GPS will help in tracking bins.

II. System Design

System Architecture

The system architecture is the frame work of any system.

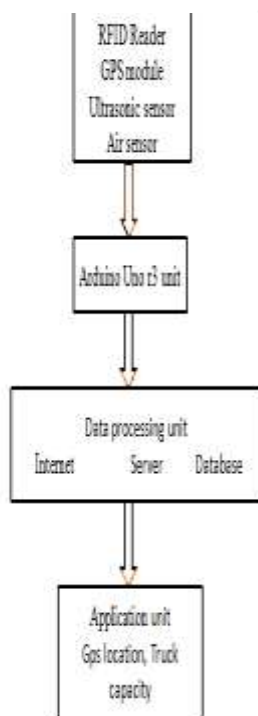


Figure 2.1 system architecture

As illustrated in Fig. 2.1 , waste management by waste collection and afterwards application through which it can be handled.

System Design

System will have RFID unit which consists of level sensor and toxicity sensor, which will send its data to operators concurrently. Firstly it will send the data to municipal corporation so that municipal corporation can decide the dustbin to be collected right now or wait for it to be full. Secondly citizen will have knowledge about the status of the dustbins. The air sensor CCS811 will keep track of quality of air and decide whether it is poisonous or not. For maintaining status of the dustbins we have HC SR04 sensor.

An Arduino Uno r3 is a microcontroller board, used to read the values from HC SR04 sensor, air sensor CCS811 and send the data to the server. It is means of transportation of data.

The data processing unit consists of the server, which has algorithm to decide which bins should be updated in the list for the collection on the basis of data received.

Then, the algorithm computes the total weight from the list, and accordingly the number of the trucks and type of the trucks will be selected.

The system will have information of capacity of trucks. Information coming from various dustbins , the system will assign trucks.

Application unit will send the coins to citizens if they dump the data to the right dustbin, and secondly it will define clusters as a node for each truck according

to their capacity, and each will be provided a route to collect the waste from the cluster nodes.

III. Hardware Analysis

Managing all the hardware so that they could work with coordination is very important. In fig. 3.1 RFID unit contain the sensors and data, arduino unit will send the data, and processing unit will decide the to act according to the information coming from both units.

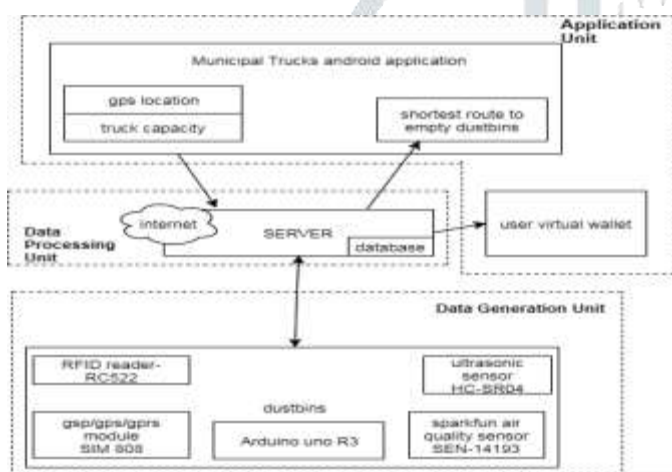


Figure 3.1 Hardware Functioning

IV. Module Identification

The system is divided into four parts such as following

RFID unit

Data processing unit

Arduino UNO unit

GPS enabled application unit

4.1 RFID unit

Comprises of the dustbins equipped with three sensors which include RFID reader to read the

user's RFID card(RC522), ultrasonic sensor (HC-SR04) as a level indicator and Air Quality Breakout Sensor (CCS881).SIM808 for sending messages and establishing a communication between server and the dustbins, for the purpose of data transfer.

4.2 Arduino Uno unit

An Arduino Uno r3 is a microcontroller board, used to read the values from all the sensors and send the data to the server. These data will be send to the main server in the data processing unit.

4.3 Data processing unit

The data processing unit consists of the server, which has algorithm to decide which bins should be updated in the list for the collection on the basis of data received.

Then, the algorithm computes the total weight from the list, and accordingly the number of the trucks and type of the trucks will be selected.

These clusters are selected as a node it uses using Top-k query based algorithm for collection according to the data parameters of the trucks.

It decides these clusters as a node for each truck according to their capacity, and each will be provided a route to collect the waste from the cluster nodes.

4.4 GPS enabled application unit

Application unit has two task, firstly the application will be provided to the citizen consisting of a virtual wallet in which users will be rewarded and also it will provide information about the nearest dustbins in the cluster according to the GPS location of the citizen. Second, application for municipal trucks to retrieve GPS location along with the total capacity of the truck and application will provide a route and the nodes where the waste has to be collected for that particular truck.

V. CONCLUSION

In, this system we have seen that, how waste management can be done so efficiently and properly with the help of IOT. Many biggest problems related to collection of waste and overflowing of waste can be solved using this system. For example, we can track the location of dustbin so as the municipal corporation. They can know the status of dustbins, and can send truck according to the need of the situation. Citizens dumping garbage in these smart bins will be rewarded with coins which they could use anywhere. This system will eradicate overflowing of garbage. Specially in developing countries like India, it could save millions of money of the government through its effective and economical means.

VI. FUTURE SCOPE

In future waste management could turn problem can turn even more serious, as annual waste generation is expected to increase by 70% from 2016 levels to 3.40 billion tonnes in 2050, around the world.

In India we will need a separate city as big as Mumbai for garbage handling. Therefore smart bins using IOT can play a huge role by managing one of the serious threats to well being of humankind around the world.

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