

Solid Waste Management using Internet of Things and Android Application

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Abstract

Internet of Things(IOT) can plays a major role in making the cities greener and smart . It provides a number of services to make the cities smart. One of the major services offered by Internet of Things (IOT) is smart Management System. Waste Management is one of the threats what we are facing today. This paper provides a solution for this issue based on Internet of Things (IOT) enabled system along with ultrasonic and infrared sensors which will provide intelligence to the waste bins. The collected data will put into a spactio-temporal context and processed by several optimization algorithms to update the status of the wastebin to the authorities and as well as to the waste collectors. Data is transmitted over the internet along with wastebin location. After getting the intimation that is wastebin is true, the wastebin can be cleaned. The vehicle can be tracked and the task completed notification can also send to the authorities using android application.

Keyword- Sensor, Internet of Things (IOT), Solid Waste Management, Waste Collection, Android Application

I. INTRODUCTION

Smart city is the integration of several information and communication technology along with IOT for managing the assets of a city [1]. This includes transportation, hospitals, libraries, schools, information Systems and waste management systems. This paper put forward a mechanism for the management of wastes. There is a dramatic increase in the world's population rate. Unattended wastes around attracts flies, rates, and other creatures in to the waste and results in the spreading of many diseases wet wastes decomposes and results bad odour and leads to unhygienic conditions and many health problems. Hence waste management is a major problem that we are facing today. Many studies proven that residents are affected by cancer due to the hazardous wastes. Proper waste disposal measures have to be implemented to ensure that the waste materials are not causing any unhygienic conditions in the environment and any health issues. In the previous methods the intimation which alerts the waste bin is full which is given to the authorities. Prevention and collection mechanisms are not included in those methods. Ultrasonic sensors are fixed at the top of the dustbin. The distance from the top of the dustbin to the waste is measured by ultrasonic sensors for determining the waste level. If the distance is less than a particular value, then automatically message is passed through Access Network Interface [2]. The Data which is send through the access network interface stored in the data base MySQL. The sensors used to measure the physical quantity such as distance and the collected data is transformed to digital format [3]. However in the existing system, the information about the collection of waste and the tracking of vehicles are not possible.

II. PROPOSED SYSTEM

Smart waste management system is based on the level of waste present inside the trash bins. The data collected from the sensors are transmitted to the municipality office through GSM module via internet. This data can be used for the intimation of the status of the dust bin. This method consists of an IOT based prototype with ultrasonic and IR sensors for measuring the volume of waste and also the facility for the transmission of collected data over the internet [4]. An ultrasonic sensor is fixed at the top of the dust bin. It will produce high frequency sound waves by the trigger pin. . When the sound waves are get obstructed by waste materials it will get reflected back to the ultrasonic sensor and this will be sensed by the echo pin. It can measure the distance between the top of the dust bin to the level of the waste. If the distance detected is less than a particular value then a message with the dustbin is send to the corporation indicating that the dust bin status is full. Then the authorities will get the intimation that the dustbin is full. Then the authorities will send a text SMS with latitude and longitude values indicating the dustbin location in a particular format.

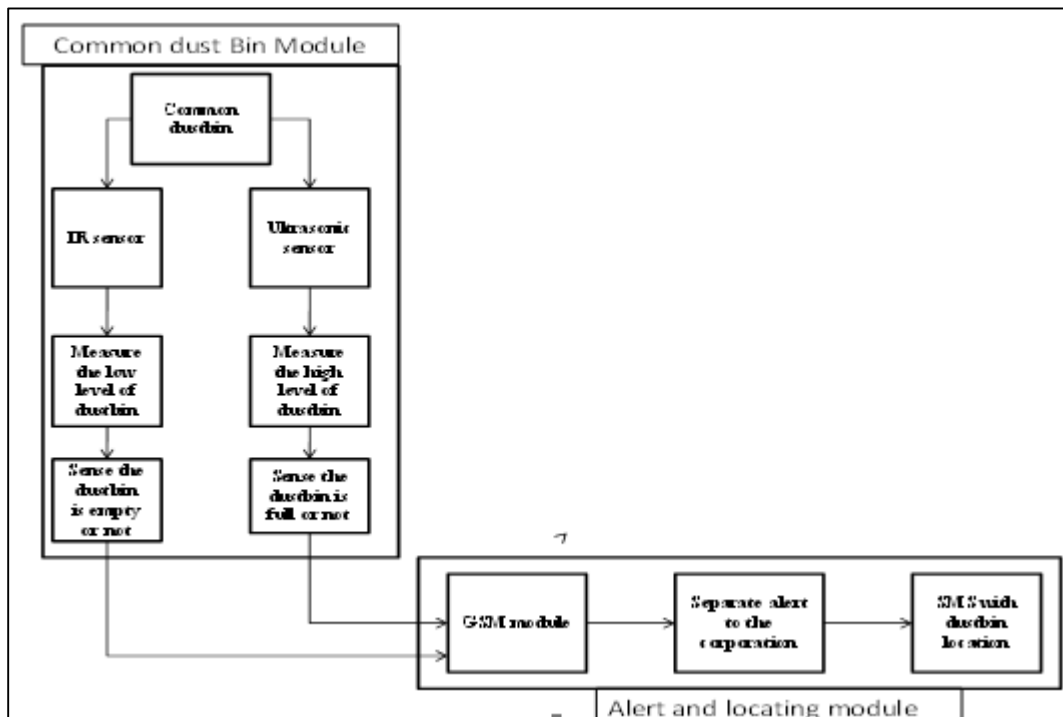


Fig. 1: Block Diagram for finding the status of dustbin and message passing

Driver will receive the text message and the latitude and longitude location of the dust bin is automatically read by the android application created. The application will itself read the current location of the driver. While clicking the path generator button in the application, the shortest path will be automatically generated. Then he can trace the path and reach the location. The location also will move according to the movement of vehicle. For this purpose Google map is accessed by the android application. The application will work only if there is internet access in the mobile phone. The location in the mobile should be switched on; then only the application will work properly. After the collection of waste form the dustbin the intimation indicating that the dustbin is cleared should be given to the corporation. For this purpose an IR sensor is fixed at the bottom of the wastebin. IR sensor will produce some infrared rays by using an LED which will act as a transmitter. When this rays are get obstructed by the waste materials it will get reflected back and detected by the photo detector which will act as a receiver. By measuring the variation in the resistance value we can analyze the presence of waste material and the distance at which the waste material is located. If the resistance value is greater than a particular value then a text message will be send to the corporation office that the dustbin is cleared. The text messages can be send by using GSM module (Global System for Mobile Communication). A 2G SIM is used for this sending the messages to the corporation.

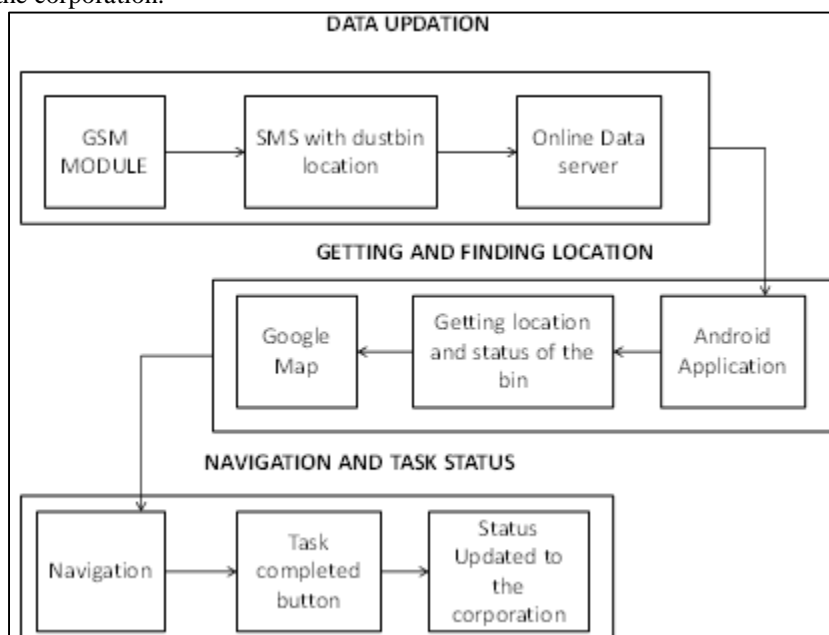


Fig. 2: Block diagram for the operation of Android application

III. COMPONENTS

A. Ultrasonic Sensor

It is a device that can measure the distance to an object by using sound waves. It is fixed at the top of the dustbin which is used to intimate the dustbin is full by measuring the distance between the top of the dustbin to the level of wastes.

B. Infrared Sensor

It is an electronic device that emits in order to sense some aspects of the surroundings. It is fixed at the bottom of the dustbin which is used to determine whether the dustbin is empty or not.

C. GSM Module

It is a module which accepts a SIM card, and operates over a subscription to a mobile operator, just like mobile phones. Output from the IR sensors and Ultrasonic sensors are given to the GSM module. The information is passed to the corporation and to the workers through GSM Module. The intimation is obtained in the form of SMS with the location of dustbin.

D. AT Mega 328p Controller

It is a single chip microcontroller created by Atmel based on AVR technology.

In the proposed system, not only the information about the status of the waste bin is provided it will also helps to track the vehicle and also the shortest path to the location of the dust bin. This method also ensures the clearing of waste from the fully filled dustbins. It also prevents the overflowing of dustbins and the unhealthy environments around the dustbin.

IV. CONCLUSION

The proposed system is a solution for the overflowing of dustbins and the unhygienic conditions created by the overflowing of waste. The system is based on IOT sensing proto type. The system will measure the waste level and send the data to the authorities. It will also help the workers to locate the wastebin location with the help of an android application.

V. FUTURE SCOPE

In future we can do many extensions in this system for an improved waste management system. We can separate the different types of wastes and work on them. We can generate electricity from the biodegradable waste material by the process of incineration. We can separate different types of plastic materials also. We also scan the materials inside the bin by using a capacitive sensor and predict the amount of different types of materials present inside the wastebin.

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