

Smart Waste Management using IoT

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Abstract

We as concerned citizens of our country are trying to make our country look more beautiful by solving the problem of overflow of garbage throughout the city. We are trying to implement a system that contains a network of smart dustbins. These dustbins will contain sensors and different modules like GSM module and GPS module to make it easier for the collector to track the real time location and level of the dustbin accurately. It will sense the level of dustbin and prevent the garbage overflow. It will make the waste disposal of garbage easier for the concerned party. We are trying to make it with the help of IOT and trying to make it cheaper so that it can be used easily and vastly.

Keywords: Android application, Bluetooth module, and Ultrasonic sensor, dustbin, Arduino, GPS module.

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1. Introduction

In this project we present a sensor framework for Smart waste management using IOT and smartphone application. We can define IOT as the objects around us that can be controlled through the internet. The objects that surrounds us can be controlled and connected to internet. These can be wired or wireless as per the user requirements. The main focus of our paper is to create smart waste management across whole city and monitoring single system efficiently. Due to high growth in the population rapidly it results to disposal and infectious virus. "CLEANLINESS IS THE NEXT TO GODLINESS". Thus, we need to create a healthy environment to happy people. Person can also upload the pic of the garbage from the street or anywhere with location tag in order to get clean as soon as possible. The idea of smart waste management is emerging without cleanliness is useless so we need smart waste system for entire city it is connected to GSM module, which helps to get the real time information about the dustbins and the waste across the area.

We are trying to resolve few problems such as:

- Public dustbins would be more accessible.
 - System is efficient of time cost.
 - Type of waste inside the dustbin.
- "Cleanliness is a state of purity, clarity, and precision".

2. Literature Survey

1. Smart Dual Dustbin Model for Waste Management in Smart Cities

Author: G Sai Rohit, M Bharat Chandra, Shaurabh Saha, Debanjan Das

The authors tried to combine the two types of models, the prototype detects the object near the dustbin and controls the lid and another feature is to sense the level of garbage inside the dustbin. Their work centred around to create a dustbin that can be used throughout the city in public places. The level of dustbin will be checked and a message will be sent to the collector whenever the dustbin is full. This system uses a set of sensors to check the level of the dustbin and to control the opening and closing of the lid of dustbin. They made the lid of the dustbin to work on basis of the object detected in front of it. IT is a dual-purpose dustbin and fully automatic one.

2. Design a smart waste bin for smart waste management

Author: Aksan Surya Wijaya, Zahir Zainuddin, Muhammad Niswar

Author intend to propose a technological process for waste management system. They are using network environment for smart waste-bin. They are using network environment, so that they can acquire real time accurate data from the applied system so that they can efficient in waste management system. The collected real time accurate data from the given system can be used as an input to a management system. They are using load cell calibration approach, which simplifies the calibration process so that it can be use in any waste-bin without changed or modification. The sensors are attached to

waste- bin. So, that it informs the management when it reaches the threshold value.

3. Waste Management as an IoT-Enabled Service in Smart Cities.

Author: Alexey Medvedev, Petr Fedchenkov, ArkadyZaslavsky, Theodoros, Anagnostopoulos, Sergey Khoruzhnikov

The authors here mainly focus in a quantitative analysis between the dustbins distributed over the population. They analyse the distribution of dustbins in a particular city 'Dhaka' using the average nearest neighbour functions of GIS. They mainly try to find the spatial circulation of dustbin over the city. After analyses they found spatial circulation of the dustbins is in clustered pattern. After that they calculate the total number of dustbin present in city and additional how many dustbins required more in city. They also consider case if the population increase than current number of dustbins should increase so they calculated it using spatial analyst functions of GIS. They also find that burn of garbage present in these dustbins causing pollution to the environment. They came to various results and conclusion that will help to understand the present situation of the waste management of Dhaka city and how to control the waste management system and protect pollution to environment.

4. IOT Based Intelligent Bin for SmartCities

Authors: Meghana K C, Dr. K RNataraj

The authors here using ultrasonic sensors in smart dustbins. These ultrasonic sensors mainly find out the level of the dustbin filled with garbage. The sensor is set at three level as they divide the dustbin into three levels. Every time the garbage crosses these levels the sensors sense and collect the data of the filled level. This collected data is than sent to the garbage manager using GSM module.

Here they are placing three ultrasonic sensors, so that they divide the dustbin in three different levels. Here it may be disadvantage of using three sensors in a single dustbin because it will increase the cost of the project. One another disadvantage is sensors can be damage because of rough handling and using of dustbins. An IoT-based smart garbage system (SGS) is proposed to reduce the amount of waste and environment pollution.

5. A Novel Approach to Garbage Management Using Internet of Things for SmartCities.

Authors: Kasliwal ManasiH., Suryawanshi Smitkumar B

The authors here using an SGS, battery-based smart garbage bins (SGBs). In SCBs it uses wireless mesh networks to communicate between each other. In SGBs it also uses a router and server to gather information and analyse the collected data for their work. The SGS also includes different IoT skills like ease handling for user and also increases the battery lifetime. The SGS is already in use in many projects like a pilot project in

Gangnam district, Seoul, Republic of Korea. Its functioning here for one year. The analyse report says that there is decrease in 33% of waste than the norm alone.

3. Expected Implementation

In today word scenario the technology and innovation, is much advance and the idea of project is not original. This idea has been given before. But we need an original and effective plan for designing a Smart dustbin using IOT and ultrasonic sensors. These types of system already present but these systems are very complex circuitry and high costs and features are also limited. If we consider country like India, and if we have a dustbin which have such high cost than it will not work. Thus, here we are making such kind of system that is cheaper and having effective features that is easy to implement and control. Here for detection of garbage level in dustbin various types of sensors can be used like weight sensors, IR sensors, etc. But here ultrasonic sensors we are using which gives us exact information about the level of dustbin which is filled with garbage. So, it is advantageous over all types of sensors because other sensors only give weight etc.

A. Theory Behind Smart Dustbin

Step 1: Initialize arduino nano microcontroller, ultrasonic sensor and gsmmodule.

Step 2: Measure the level of garbage in the dust bin using ultrasonic sensor.

Step 3: When the level of garbage is lesser than 30%, then green light is displayed in blynk application.

Step 4: When the level of garbage is lesser than 70%, then orange light is displayed in blynk application.

Step 5: When the level of garbage is greater than 70%, then red light is displayed in blynk application and a notification is sent to the concerned party.

Step 6: Step 2-5 is repeated after collecting garbage from the bin.

B. Area of Working

Here we are working in the field of IOT. The proposed system is to be controlled by Arduino. This field deals with the term object detection in the robotics field. We tried to bring a new system by proposing this.

4. Design, Implementation and Algorithms

We are trying to implement a system that would provide the real time level of the dustbin to the collector and will send a message once the dustbin is full. There would be another notification once the dustbin is not cleaned during the time provided after the first message was sent. This will prevent the dustbins from overflowing and will check the cleanliness of the area. The smart dustbin will contain 2 ultra-sonic sensors out of which one will check the level of the garbage inside the bin and another will control the lid of the dustbin (opening and closing of the lid once object is detected in front of the dustbin). It will also contain a GSM module for the messages to be sent to the

collector and a GPS module to track the real time location of the dustbin to make it easier for the collector to collect the garbage resulting in less time in garbage collection.

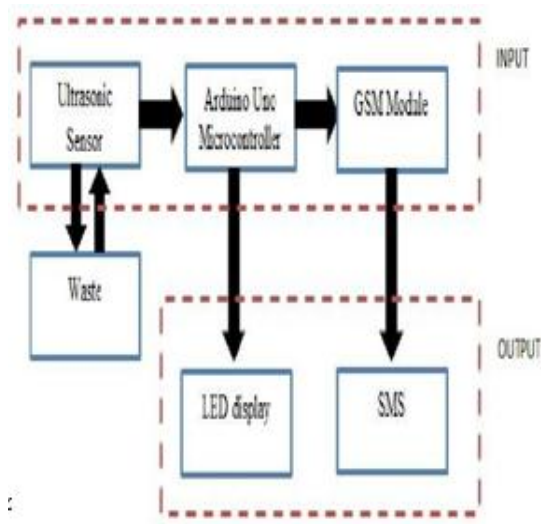
A. Objectives

- Level of dustbin in an instant of time.
- Usage of extra dustbin when needed.
- Cheaper and proper utilization of resource.
- Reduction in stinking garbage smell.
- Cleaner locality.
- Optimal usage of dustbin.
- Reduction in garbage overflow.

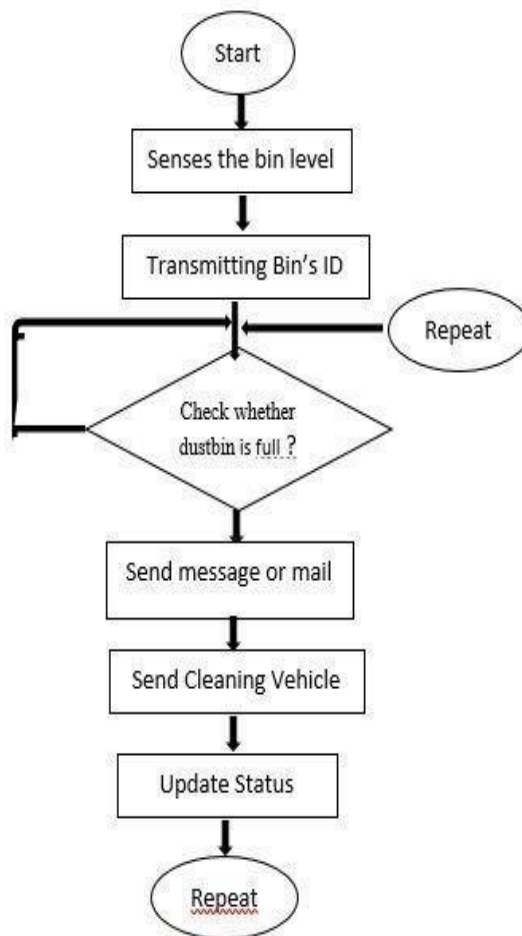
B. Implementation

The topic we choose is not unique but the way we implement it is unique in itself. The system measures the level of dustbin at an instant and in interval of time set by operator. There are two ultrasonic sensors used, one out of which will be used to sense the level of the garbage inside the dustbin and the other will be to control the lid of the dustbin (opening and closing of the lid once object is detected in front of the dustbin). The lid will be controlled by the pulse generated when an object is detected near the dustbin. A servo motor is to be used to control the opening and closing of the lid of dustbin. This will result in not being in physical contact with the dustbin to use it making it more hygienic than before. There will be smartphone application that will show the level of the garbage inside the dustbin on your smartphone. The GSM module used in the dustbin will send a message to the collector as a notification once the dustbin is filled completely. As a result, there would be rapid collection of the garbage from the dustbin once it fills completely and prevents from garbage to overflow from the dustbin. We are trying to mount a GPS module to make it easier for the collector to locate the dustbin across the city. We are using the concept of IOT in this project to make it working more effectively. The total outcome of this project is to make cities cleaner than before and area to be more hygienic place to live in.

C. Lock Diagram



D. Flow Chart



5. Application Overview

The output of this system will be the level of the garbage inside the dustbin which will be shared to the concerned party along with the live location of the garbage. We are trying to make the lid of the dustbin to operate automatically. I will open and shut as per the object (human) detected in front of it.

A. Expected New Applications

- School/Colleges/Universities
- Hospitals
- Companies

6. Conclusion

We tried to implement a waste management system with the help of IOT. The dustbin made in this project makes the waste collection easier for the collector and prevents the overflow of the garbage from the dustbin as it continuously checks the level of the garbage inside the bin. The GSM module used will notify the collector whenever the level of garbage reaches the limit. The GPS module will provide the exact location of the dustbin throughout the city making it easier for the collector to collect the garbage. The result of this would be less garbage throughout the city and the proper collection of

the garbage.

- We tried to implement a waste management system that is rapid and accurate. The dustbin provides the level of garbage inside the dustbin at every instant in the fixed time interval.
- The data of the dustbin makes it easier for the collector to make decisions and make their work more efficient.
- We are trying to optimize the usage of the resource and simultaneously trying to reduce the cost of the management of wastage.
- There are few applications for the smartphones but they are not so tightly built to work so efficiently.
- This will be a routine check-up and proper guideline for the personnel responsible for the management of the wastage.

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