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# Smart Waste Management using IoT

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**Abstract:** Waste management is one of the primary problem that the world faces irrespective of the case of a developed and developing country. The key issues of waste management of the garbage bin at the public places gets overflowed well in advance before the commencement of the next cleaning process. It in turn leads to various hazards and such as bad odor and ugliness to that place which may be the route cause for the spread of the various disease. To avoid all such hazardous scenario and maintain public cleanliness and health this work is mounted on smart garbage system. The main theme of the work is to develop smart intelligent garbage alert system for a proper garbage management using IR sensors, arduino uno, GPS and GSM with IOT system which produces the reports.

**Keywords:** Waste, sensors, arduino, GPS, GSM, IOT

## I. INTRODUCTION

To develop the smart waste management system in order to maintain the cleanliness of the city and smartly manage the collection of the garbage. It is developed in order to change the conventional method of collecting the garbage on a day by day process and smartly collect the waste from the garbage. The main objective of this project is to collect the garbage wastes from the bins installed at public places before it gets overflowed well in advance, before the commencement of next cleaning process. Another great objective of this project is that we can reduce the health related issues and maintain the surroundings clean. Mostly, nowadays we see peoples of the society dump their wastes in the dustbins installed at public places which gets overflowed before commencement of next cleaning process. Environment is highly polluted by unrelated wastes which leads to rise in health issues. No Smart Waste Management system is present in developing countries, in this way they lack behind the developed countries. In the system, IR sensor is used for measuring the level of waste in the dustbin. GPS(global positioning system) is used in the project to send the current location of the bin. Reports of every location of bin are stored in cloud as IOT process. This will give clear idea of every dustbins located in the city(which dustbin gets filled fast). The system of this smart waste management is implemented with the timestamp in which the realtime clock shown to the authorized person at what time the bins are full and the garbage is collected from the smart bins. If the garbage wastes get overflowed it sends a message to the authorized officials sharing the location coordinates of the overflowed dustbin to collect the garbage wastes. It also periodically provides an update about the collection of the wastes, location of the dustbins frequently collected and so on.

## II. LITERATURE SURVEY

Manual systems in which employee from municipal corporation clear the dumpsters periodically. An systematic approach towards cleaning the dumpsters was developed with GSM modulator which sends the automatic message to municipal corporation about the over flow of bin. Very less effective in cleaning city as employee of municipal corporation is unaware of location of bin. At the end a conclusion was made that the various issues like affordability, maintenance, and durability were addressed when the smart bins were designed. It also contributes towards hygienic and clean environment in the process of building a smart city. Insufficient information about the collecting time and area, no proper system for observing, tracing the trucks and garbage bins that have been gathered in real time, less productivity due to inefficient and poor utilization of vehicles, poor risk management strategies for risks such as truck accident, failure. Poor communication and response to civilian complaints. To tackle this issues many people have proposed their ideas and various research have been done so far. In [3] authors discussed about Radio Frequency Identification (RFID), Geographic Information Systems (GIS), Geographic Positioning System (GPS), transportation model, waste collection with bin monitoring application. In [5] some studies have done on real time bin monitoring but with some limitations. The researchers used Argos mote with geographical coverage of 430m and the system considers only one parameter for the bin status. Another approach uses wireless sensor network and can respond as soon as someone throw waste inside a bin. The aim of this work is to design a framework that can collect data on bin status in real time, which in turn helps to optimize waste collection and proposed a dynamic routing algorithm. to implement Cloud based system for collection and maintenance of waste using Wireless Sensor Nodes and Wireless Personal Area Networks (WPANs). Intelligent Garbage collection using IOT by Dr. Vinayak Bharadi from Mumbai University has already tried to implement this thesis. The Smart Dustbin by Dr.R.Pradeep and Dr.S.Anand an intelligent approach to fulfill Swatch Bharat Mission”

### III. SYSTEM ARCHITECTURE

A system architecture is the conceptual model that defines the structure, behaviour, and more views of the system. An architecture description is formal description and representation of the system, organized in such a way that supports reasoning about the structures and behaviour of the system.

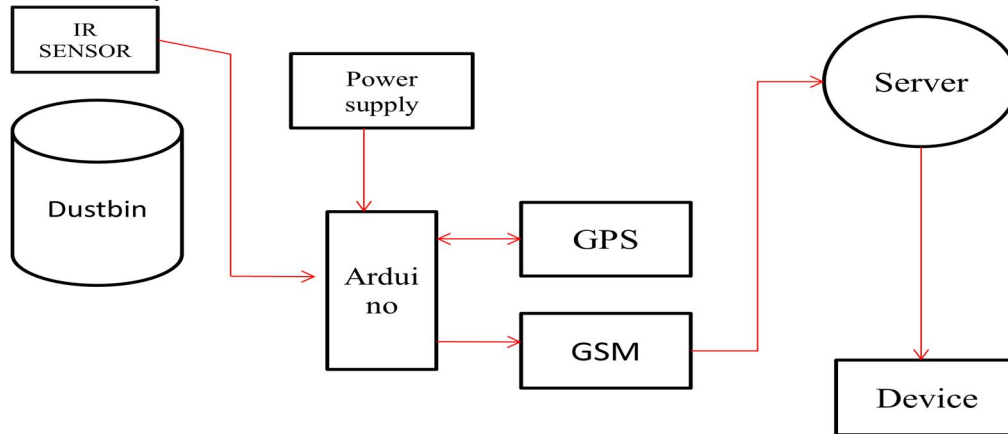


Figure 1 System Architecture

The features and characteristics of the components used are given below

#### A. IR Sensor

An infrared receiver is a hardware. Sends information from infrared to another device by receiving and decoding signals. Receiver outputs a code to uniquely identify the infrared signals that it receives.

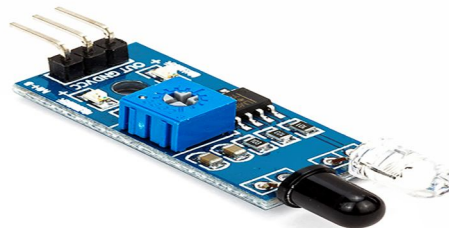


Figure 2 IR Sensor

#### B. Arduino

Arduino is an open source electronic platform. It is based on easy to use hardware and software. Arduino boards are able to read the inputs-lights on sensor.



Figure 3 Arduino Uno

### C. GPS

GPS navigation device. GPS is capable of receiving information from GPS satellite. Calculates the device geographical position. Displays the position on a map and it may offer direction.

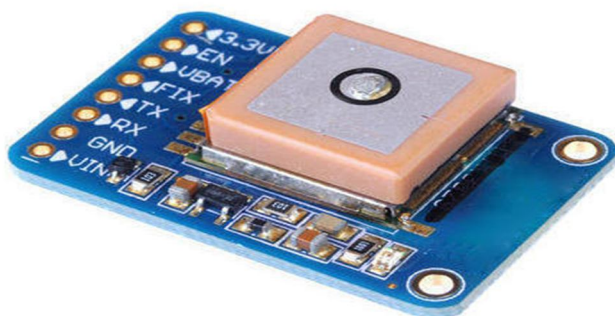


Figure 4 GPS

### D. GSM

The GSM module or GPRS module is a chip or a circuit. It is used to establish communication. It can be between a mobile device or a computing machine and a GSM or GPRS system.



Figure 5 GSM

## IV. WORKING

The working of this smart waste management comes as follows as once the dustbin is full the IR sensor is used for measuring the level of waste in the dustbin. GPS(global positioning system) is used in the project to send the current location of the bin. Reports of every location of bin are stored in cloud as IOT process. This will give clear idea of every dustbins located in the city(which dustbin gets filled fast).The proposed system of this smart waste management is implemented with the timestamp in which the realtime clock shown to the authorized person at what time the bins are full and the garbage is collected from the smart bins. If the garbage wastes get overflowed it sends a message to the authorized officials sharing the location coordinates of the overflow dustbin to collect the garbage wastes. It also periodically provides an update about the collection of the wastes, location of the dustbins frequently collected and so on. The working on this management is depicted as a flow chart.

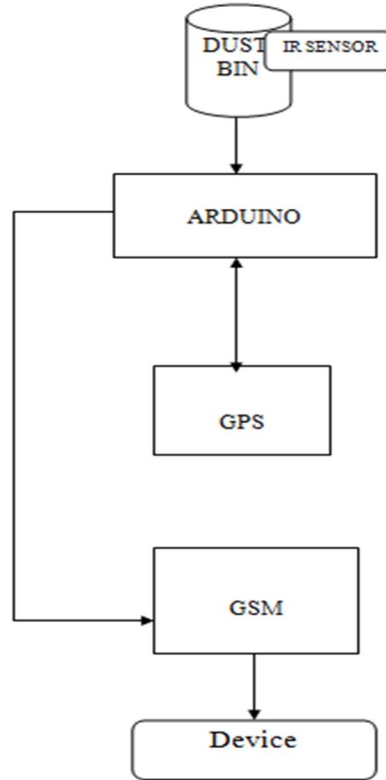


Figure 6 Working Flowchart

This is the text message format that would be notified as output to the authorized person once the GSM modules sends the information from the particular bin's location.

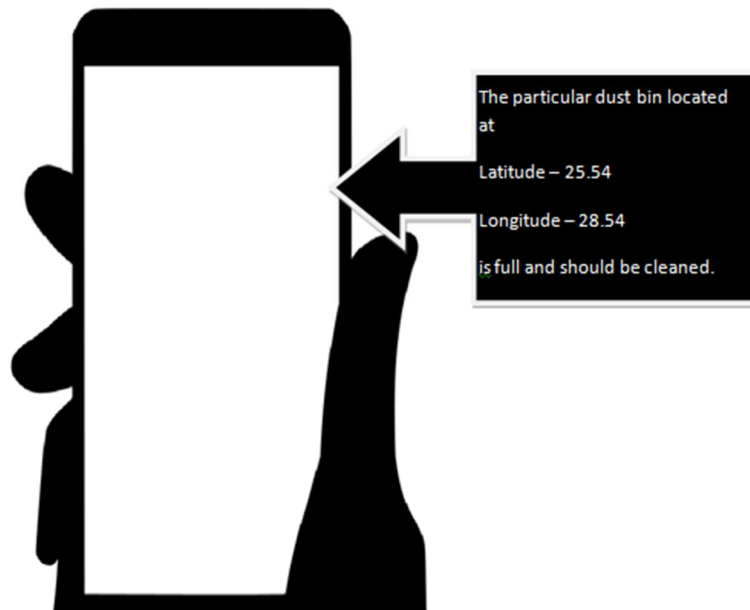


Figure 7 Output Model

The IOT is used to generate the reports of the following dustbins, and gives the information about an dustbin in detail and is easy to manage for the officials on day to day basis. The basic report model looks like,

Date	S.no	Dustbin Full Count
2019-01-13T08:05:37Z	1	1
2019-01-13T08:06:49Z	2	2
2019-01-13T08:07:31Z	3	3
2019-01-13T08:09:34Z	4	1
2019-01-13T08:10:16Z	5	2
2019-01-13T08:11:26Z	6	1
2019-01-13T08:12:10Z	7	2
2019-01-13T08:18:45Z	8	2
2019-01-22T06:32:56Z	9	1
2019-01-22T06:35:15Z	10	2
2019-01-22T06:41:05Z	11	1
2019-01-22T06:42:05Z	12	2
2019-01-22T06:43:28Z	13	3
2019-01-23T09:31:48Z	14	1
2019-02-09T05:09:40Z	15	1
2019-02-09T10:40:37Z	16	1
2019-02-11T06:14:10Z	17	1
2019-02-23T07:33:43Z	18	1
2019-02-24T16:09:11Z	19	36577

Figure 8 IOT Report

### V. CONCLUSION

Advancements in latest technology in different sector of life and with the increasing population and changes in life style,waste management system is another sector to need to be maintained properly. So monitoring of the trash bins with the uses of sensors,it's a possible way to monitor and deen the dust bin and more efficient system then the current existing. Smart waste management system mainly focus on monitoring the waste management and this system is based on an internet of things sensing prototype which measures the waste level of trashcans and send this data over the internet to servers for the storage and processing .Based on this data ,an optimization process allows the creating the most efficient collection routes, and this are forwarded to the workers. It is to focus on the efficiency and economic feasibility of the system,in order to motivate the potential interested parties to deploy intelligent solutions for common city services. To maintain the cleanliness in the city. It can be used to form an environment which is better for living, reducing the risk of health issues.This system can be used as benchmark. To take one step for increasing the cleanliness.It will Bring Transparency and accountability in the garbage collection process. Also the scope of this system will not be restricted to smart cities, it can also be developed in less developed cities or towns . Thus leading to clean and health environment.

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