IoT Solutions for Smart Cities: Garbage Dustbin Management System and Reporting to Municipal Authorities over IoT

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Abstract

The important concept of smart cities is the waste management which is very much trending and helpful these days. In the earlier existing systems, it gives prior information of the filling of the garbage bin that alerts and sends warning message to the municipality so that they can clean the garbage bin on time and safeguard the country. In this proposed system, multiple dustbins from the different areas throughout the cities are connected using IOT technology. The dustbin uses low cost embedded devices and it will sense the level of dustbin, then it is sent to the municipality officer. Then the information is sent to the truck driver to collect the waste.As the concept of smart cities is very much trending these days and the smart cities cannot be complete without smart waste management system. There needs to be system that gives prior information of the filling of the bin that alerts the municipality so that they can clean the bin on time and safeguard the environment.This schedule varies as per the population of that place. But we tend to see that just in case there's some competition or some perform, a lot of garbage material is generated by people therein specific space. In such cases the garbage dustbin gets at once full so it overflows that creates several issues. Therefore in things, with facilitate of our project the govt. authority person will get SMS at once. So that they can get SMS before their periodic interval visit of finding out the dustbin.To avoid all such hazardous scenario and maintain public cleanliness and health our work is mounted on a smart garbage system. The main idea of proposed work is to develop a smart intelligent garbage alert system for a proper garbage management. A smart alert system is designed for garbage clearance by giving an alert signal to the municipal web server for instant cleaning of dustbin with proper verification based on level of garbage filling.

INTRODUCTION

Waste management is the action required to manage waste from its inception to its final disposal [1]. This includes collection, transportation, treatment and disposal of waste together with monitoring and regulation. Waste collection methods vary widely among different countries and regions. Domestic waste collection services are often provided by local government authorities.Nowadays population is increasing quickly, which ends in lack of public awareness and folks invest less cash in program associated with the waste management. This has been making an enormous health problems everywhere the planet [2]. Correct management of waste materials is very important to keep up healthy and hygienic environment to measure. As per the analysis of CPHEEO (Central Public Health and Environmental Engineering Organization) the total quantity of waste generated in Asian country is around one.3 pounds per person each single day. This figure is relatively less compared to four.6 pounds of waste generated per person on a daily basis within the United State (U.S.). But the U.S. population was around 307 million in Gregorian calendar month 2009, whereas India's population was one.2

billion [3]. These statistics shows that Asian country is generating nearly twenty seven million additional heaps of waste than the U.S. every year. Governments of Asian country are troubled for several years to search out how to manage the country's increasing quantity of garbage.

The Internet of Things (IoT) is an environment in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. For instance, there are home smart devices that are synchronized with each other and can be controlled remotely. The ever-evolving IoT is making it only efficient as the user is able to control devices as per their usage and save resources [4], [5]. Think of your fridge with smart capabilities to know which item in your fridge is running low and it automatically refills your item via automatic shopping. This usage is more related on day to day basics however it just scratches the surface of what IoT can really do. One of the main concepts of IoT is to make it as efficient as possible for users to control devices as per their usage and save resources. When it comes to the waste industry, waste and recycling collectors are always looking at ways to minimise cost and increase productivity when possible. This would meant better utilisation of manpower, reducing fleet cost and increasing productivity per head while at the same time automate what used to be a tedious process _fixed-route' collection method. The smart dust bins are connected to the internet to get the information of the smart dustbins. In the recent years there was heavy pollution caused to the environment [6].

Due to the bad odour it spreads the disease to the children. When the garbage is spread in the city the animals eat that wastes and they are affected by the avoidable diseases. Due to lack of resources, ineffective groundwork, some waste is not collected which poses serious health hazard to the surrounding environment. Proper cleaning intervals may provide a solution to this problem. But keeping a track of the status of the bin manually is a very difficult job.

## SYSTEM ANALYSIS
Existing System

As we have seen number of times the trash cans are getting over flown and concern person don't get the information within a time and due to which unsanitary condition formed in the surroundings, at the same time bad odor spread out due to waste, bad look of the city which paves the way for air pollution and to some harmful diseases around the locality which is easily spreadable.In the existing system garbage is collected by corporation by weekly once or by 2 days once. Though the garbage shrinks and overflows the garbage bin and spread over the roads and pollutes the environment. The smell will be heavy and produces air pollution and spreads disease. The street dogs and animals eat the waste food and spreads over the area and creates dirty environment.

Fig.1: Conditions in the city

B. Proposed System

Internet and its applications became an integral a part of today's human lifestyle. It's become a necessary tool in each side. Because of the tremendous demand and necessity, researchers went on the far side connecting simply computers into the online. These researches led to the birth of a sensational gizmo, internet of Things (IOT). Communication over the web has grown up from user - user interaction to device – device interactions currently. The IOT ideas were projected years back however still it's within the initial stage of economic preparation. Home automation business and transportation industries are seeing rapid growth with IOT.
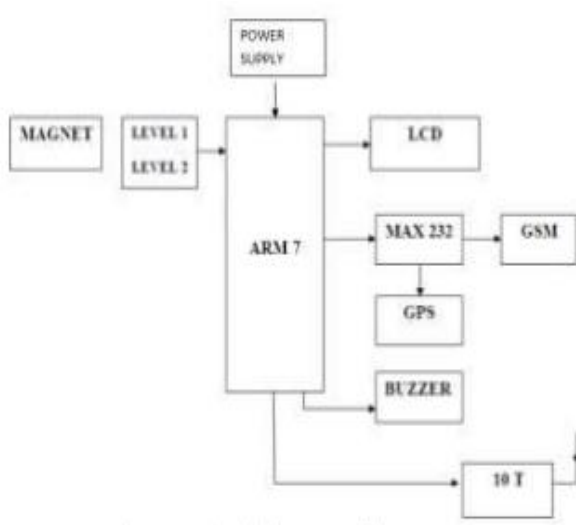
Fig.2: Proposed block diagram

WORKING PRINCIPLE

We propose a smart garbage bin using cloud IOT based raspberry pi to identify when the garbage bin is fill by using Ultrasonic sensor we can get the volume occupied and left in the smart garbage bin If the volume is full then the program triggers an alert message through raspberry pi and sends an alert and location of the bin to collect the garbage's. The garbage collector collects the waste and empties the bin. Though we can manage the waste through this advanced IOT based Smart Garbage Bin. this system maintains a dry waste a wet waste separately for that we are using a moisture sensor if that sensor detected then the cap will open for a weighted waste otherwise cap will open for dry waste. for saving a power for sensor we are using one PIR Sensor, this sensor will controls power of the sensors(ultrasonic and moister and buzzer) .If PIR detect then we will connect supply of above mention sensors through relay which will ON and if PIR not detect then remaining sensors are in off condition thereby we can reduce the power consumption of the circuit.

If the garbage is not cleaned within the time it gives another alert message to the responsible person and the garbage is checked for every two hours. So the environment will be cleaned and it will avoid the spreading of the diseases. It will also indicate the presence of any toxic gases in the bin by alarm sound. The proposed system is implemented, after cleaning the trash can, the ultrasonic sensor checks the trash whether it is empty or full, if the trash is empty, then it sends the information to the arduino, the it initiates the cleaning process by switching on the centrifugal pump by which the water with a force is applied to clean the trash. It will be very useful and can be installed in the Trash Cans at public places as well as at home. The trash can will be automatically open and close when a person is near by the trash can.

Advantages

• Ecological and save country.
• Don't want to problem the elders by conveying the task of searching particle buyers.
• Lazy to leave and retail your rubbish.

RESULTS

- Garbage bin when empty - 0% (when 1st level IR Sensor gives output)
- Garbage bin half – 50% (when 1st level and 2nd level IR Sensor gives output)
- Garbage bin full – 90% (when all three level sensors gives output)
- Garbage bin when Empty – clean the trash can with the force of water.

Fig.3: Typical hardware setup

Fig.4: Smart Bin-Garbage and Waste Collection Management solution

CONCLUSION

We provided the summary on municipal waste collection management methods and showed the examples of solutions introduced by recent research in this area. Given overview showed that it is not yet enough discussed the possibility of using genetic algorithms as a optimization method for waste collection. Our solution is based on the idea of IoT infrastructure, which should provide enough information to handle this Smart City issue more efficiently. This project work is that the implementation of sensible garbage management system exploitation level sensing element, microcontroller and Wi-Fi module. This technique assures the cleansing of dustbins shortly once the rubbish level reaches its most. If the dustbin isn't cleansed in specific time, then the record is shipped to the upper authority who will take applicable action against the involved contractor. This technique additionally helps to observe the fake reports and therefore will cut back the corruption within the overall management system. This reduces the entire variety of journeys of garbage pickup vehicle and therefore reduces the general expenditure related to the rubbish collection

FUTURE ENHANCEMENTS

With the help of proper technology (GPS & software applications) the lorry can be guided in selecting the shortest path for garbage collection. This project can add an edge to the cities aiming to get smart and eco-friendly.

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