

Smart Garbage Monitoring System

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Abstract: Garbage waste monitoring, collection and management is one of the primary concerns of the present era not only in India but in other countries also, due to its detrimental effects on environment. The traditional way of manually monitoring and collecting the garbage is a time consuming process as it requires considerable human effort and time leading to higher cost. In this paper, an IoT based garbage monitoring system using Thingspeak, an open IoT platform is presented. The system consists of some electronic equipments like an Arduino microcontroller, an ultrasonic sensor, a load cell and a Wi-Fi module. The Arduino microcontroller receives data from the ultrasonic sensor and load cell. The depth of the garbage in the bin is measured using ultrasonic sensor and the weight of the bin with garbage is measured from the load cell. The Wi-Fi module transmits the above data to the internet. An open IoT platform Thingspeak is used to monitor the garbage system. With this system, the administrator can monitor and schedule garbage collection more efficiently. Further details are presented below-

Keywords: Internet of Things, Arduino microcontroller, Wi-Fi modem, Ultrasonic sensors, Waste monitoring system.

I. INTRODUCTION

Pollution has a big impact on the environment as well as our health also. The garbage lying around the sides of the street could quickly harbour fleas and rats that carry harmful diseases if collection and disposal are not done appropriately. The piling up of garbage could lead to epidemics which may cause deaths. In order to preserve the environment, the pollution rate must reduce as much as possible. Thus, a garbage monitoring system is needed to accomplish this task. Swachh Bharat Mission initiated by the government of India in 2019 has been recognized globally prominently to regain the environment's stability and sustainability. Our main concern should lie with the fact that our climatic conditions are changing drastically daily. Also, the Internet of things is a technology big mega-trend that will support data transfer from smart objects. Our approach will use this as a basis to design a smart system for garbage monitoring.

Today garbage handling is a big issue in developing countries. One must take up the charge for the overflowing dustbins which may lead to thriving insects and diseases in the surrounding, mismanagement of the garbage by setting it to fire, or be it the harmful elements that are taken in by various stray animals.

It is very important to check the level of garbage-filled in a dustbin. Today India's ranking is second globally in terms of population.

An IOT system is nothing but a network of connected physical objects which provides a common platform for all the devices that are interfaced say, sensors, to dump their respective data & a common language to communicate with each other. Sensors play a vital role here. Sensors are embedded in every physical device that we use today. These sensors receive and continuously emit the data about the working state of devices. Here ultrasonic sensors are to be used to detect the garbage level. This project presents a very technical approach to keep the surroundings clean. This system monitors the bins and then receives data regarding the garbage level, eventually sending out it to the network where its analysis is done and respective decisions are taken. The ultrasonic sensors are placed upon the inner side of the lid of bins. These work upon the same principle as radar technology. These detect the garbage level and if the level exceeds the standard level then send this data via webpage and then analytics work upon it. They decide whether the bin should be emptied or not.

II. PROBLEM STATEMENT

In the existing system, the situation that prevails is of overflowing garbage from trash bins, this, in turn, leads to the unhygienic and unhealthy environment causing various harmful diseases and unpleasant odor in the surroundings. In the current system, although the government sends a trash-collecting vehicle, the problem arises is that it could not travel to all the places on the same day.

As you can see in the fig. The garbage bin is full of garbage and Food, polythene and other dirty things are on Road. Now a days a disease is spreading rapidly named Black Fungus. (white & Yellow fungus also)

One of the basic reason of Spreading this Disease is Decayed Food. We can see in the Image Black and White fungus on the Food. If this food Stays on the ground as it is there would be more chances to be created other type of diseases also. The dustbin overflows and the animals on the road are causing big problems for animals like dog, bull and cow. The eat polythene and other junk food from it and it harms them so much even it can cause death of them. As we can see in the below images

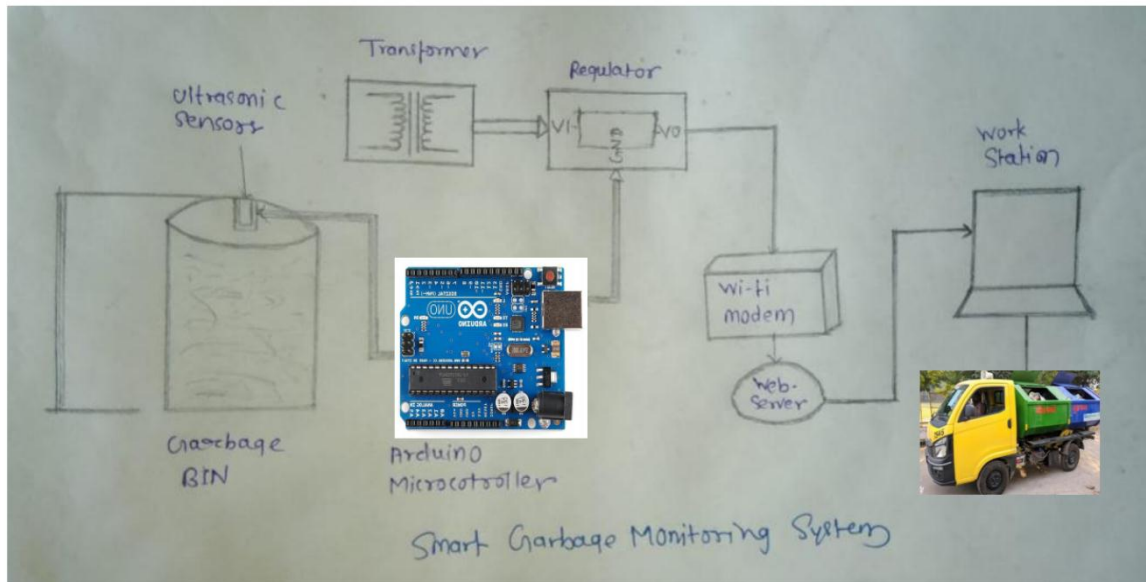


III. SYSTEM STRUCTURE

This Existing system has some limitations such as overflow of garbage, time-consuming, unnecessary consumption of fuel, thus being detrimental to people and creating a filthy environment. The gases released by garbage are noxious and have pungent smell leading to more diseases and an unhealthy environment. So, the proposed system talks about how to make use of the recent advancement in technology to make our place clean and tidy.

This system monitors the garbage bins and notifies about the level of garbage collected in the bins via a webpage. This system makes use of ultrasonic sensors that are positioned over the bins to detect the garbage level. Also, it has an Arduino board, LCD Screen, Wi-Fi modem for sending data, and a buzzer. The system is powered by a transformer.

The Proposed system helps to maintain the cleanliness of the city by indicating the level of the garbage level on an LCD screen and through a webpage to the user monitoring it.



IV.METHODOLOGY

A.) Mathematical Modeling :-

The block diagram of the design methodology is depicted in Figure. The garbage bin is equipped With ultrasonic sensor and load cell. These sensors are connected to the microcontroller.

The Sensor was placed and adjusted at the inner side of the lid such that it can easily detect the level filled such as in RADAR. A threshold level is set as some cm. A threshold level is a standardized level which when reached by the garbage, the sensors detect it and triggers the GSM modem which then alerts the authority to analyze the condition of the bin. The authority then orders to empty the dustbins manually. Unless the bin is emptied the modem keeps on alerting the authority unless it's emptied. In the end, it concluded various advantages of using this such as I's affordability as Uno board is used which commensurate with the fact that it can be implemented nvery easily in most of the areas. Energy conservation, maintenance, and durability of the system should also addressed while designing these bins. It directly contributed to the better hygienic conditions of the surroundings and thus a healthy environment to work in. In this ultrasonic sensors are used for the level detection of the garbage-filled in the bins. These sensors after detecting the level will send the data then to the Control Room using the GSM module. Here, MATLAB also played a part. GUI was developed and it was based on the MATLAB. Two units are present in the system, the Slave unit, and the Master unit. The Slave unit is present in the bin whereas the master bin is in the control room. The sensors used will receive the data and it will transmit the data through the slave unit on the lid to the master unit in the control room. Then based on data received the authorities further take the actions.The method of garbage management in which a microcontroller is used. The bin was interfaced with a microcontroller which IR wireless systems with a Central Monitoring System which show the current status of garbage in that bin. The status can be seen on the mobile-based browser with the HTML webpage by using Wi-Fi. This system is not cumbersome, it has a low cost, as they only used weight-based sensors on the receiver's side, and on the sender's side, they use the Wi-Fi module. And further actions are taken based on analysis done after receiving the informative data. In , the LASER is used as the main tool. A laser diode is a p-n junction diode that produces a narrow beam of light which is very intense, coherent as its nature and focused. Here, a photo-detector is used which converts the light signals into the electrical signals, further can be amplified and processed. Dustbins, Photo Detector diode, LASER Diode, Road Side Units (RSU), and Garbage collecting Vehicle (GCV) are components of the technology here. Further routing and analysis are done with the help of the Transmission Control Panel (TCP) like in any other research paper; it is a normal controlling and analysis room. The dynamic routing of GCV compared with the static solution is much more efficient and will be much more effective when more than one dustbin fills up at the same time. The initial planned route is saved so that when the real-time data is received, the only portion of the planned path may be changed. Various bins were placed around the city, provided with a low priced embedded device, helped in tracking the garbage level in the binsbins.

B) Equipment Used :-

It mainly consists of Ultrasonic Sensors, a Arduino Microcontroller, Wifi Modem, web Server, Transformat, Regulator, LCD, an AC source.

V. RESULT AND DISCUSSION

In the paper, an garbage monitoring system based on IOT using Thingspeak, is presented. A prototype have been developed using a sensor to check the level of the garbage in the bin and a load cell to detect the weight of the bin. It has been tested and also found to work satisfactorily. Thingspeak (a public channel which can be viewed by each and everyone) is used to monitor the dust or garbage bin online. A social network webpage we call it Twitter, is used to give live updates of the garbage bin status periodically every day. Garbage bin which is overflow or overload will result in an update of status in twitter and actions can be taken by the authorized personnel. Sharing the information to the public can increase the awareness of public towards waste management and waste pollution. With this system, the administrator can monitor and schedule garbage collection more efficiently. This system will surely help to make the cities cleaner, improve environment hygiene and contribute to intelligent waste management.

V. ADVANTAGES

- :-_Real time information can be attained
- :-_Cost very effective
- :-_Helps to maintain a clean and also disease-free environment
- :-_Resource optimizations.

VI. CONCLUSION

Large-scale implementation of the project can reduce the service cost associated with the Waste Management System significantly. It is recommended to include hidden camera to monitor the improper usage of the garbage bins. In future, the project can be enhanced by implementing data security and device security on the edge level. The stored sensor data can also be analyzed for decision making. An efficient garbage monitoring system that uses recent technology has been designed, to contribute to keeping the city clean by eradicating the problems related to garbage overflow, infested environment, wastage of fuel. By implementing this system, the level of garbage can be checked using a Wi-Fi modem via a Webpage, thus an immediate action should be taken to empty the Dustbin. This proposed system is useful in both large and small scale, as it prevents manual work, also quick and prompt decisions can be made by the information provided on the webpage. In future, some more sensors of different types can be used in the system to make it more structured, labor-saving, and effective and get precise outputs.

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