..... (SMART DUSTBIN) .....

A

Major Project

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AKTU LUCKNOW

ABSTRACT:

An exponential increase in the Human population possess a huge challenge to the garbage management system and hence to sustaining a clean Environment. Because of inadequate waste management, many cities throughout the world are at risk. Our project seeks to discover a solution by using a GSM and GPS-enabled Smart Dustbin. It employs an 'Ultrasonic Sensor' to prevent the overflow of garbage from the dustbin and ensures timely disposal of the unhygienic contents of the Dustbin. Therefore, our initiative intends to prevent the dustbin from overflowing with rubbish and to end the presence of unhygienic conditions there. The system is made to gather data and transmit it over a wireless mesh network. The duty cycle approach is also used by the system to minimize power consumption and extend the operating duration. The Smart bin system was also put to test in an outdoor environment. We gathered information during the test and used data-sense-making techniques to learn about trash bin usage and daily seasonality information. With such information, waste bin providers and cleaning contractors can make better decisions to increase productivity. Thus, our project intends to have an effective and efficient waste/garbage disposal system.

1. Introduction

Swachh Bharat Abhiyan, also known as the Clean India Mission or Swachh Bharat Mission, is a national initiative of the Indian government that targets 4,041 statutory cities and towns, to maintain the country's infrastructure, highways, and streets. With that saying Waste Management is a critical process for a country. It has an impact on practically every aspect of the nation, including the economics, culture, health, way of life, and living standards of the populace. Waste management aims to lessen the negative consequences of waste in the aforementioned areas. With the rapid growth of the Indian population, waste generation is also increasing. According to statistics from the Ministry of the Environment, the average amount of garbage produced daily in the nation is 6,400 tonnes, yet only 2,800 of those tonnes get picked up by local authorities. The remaining 3,600 tonnes of solid garbage are dumped in low areas, near lakes, and along roadsides, endangering both human health and the environment. According to the current procedure, before garbage is collected by collectors, the government allows families and other entities to classify their waste. It is not a successful system because there is not any motivational factor for the households and entities to categorize the garbage. For this process to be a success there should be a legal and regulatory framework that relates to waste management encompassing guidance on recycling also. To dump garbage properly or to recycle them, first, the waste has to be categorized. It can be done in the following two ways.

- **Categorizing waste in a centre after collection:**

In this method first, the waste is collected and brought into a centre, then the waste is categorized manually as plastics, paper, glass, metal, etc. This method consumes a lot of labour, time, and money.

- **Categorizing waste at the moment they are collecting:**

This method is much different from the above. In this method, the waste is categorized before they collected. For this, we have given the public a single dustbin with two different sections. So, the waste can be collected as categories under this method. This approach is more expensive initially than the first one, but it is also more effective and efficient, saving time, money, and extra labour costs associated with the first method. We are implementing this method as it has been proven efficient as compared to the first method.

As a developing country, India still doesn't have a proper waste management process. The current process followed by the government is dumping garbage into different sites. This causes many problems like the spread of diseases, negative impact on the economy, and environmental pollution as there is no proper recycling process and regulations. Workers at the waste management centre sort and classify the rubbish that has been gathered. The local council spends too much time, money, and labour resources on this procedure. Because it is practically challenging to constantly classify and maintain tonnes of rubbish at a waste collection centre, this approach is not particularly productive. These related issues are addressed by the system that has been put into place. This research project's main goal is to offer a useful and practical system for classifying garbage before waste collection. Also, encourage people to properly dispose of trash in trash cans.

2. Results and Discussion

The system is implemented with Arduino Uno-based garbage bins. When the garbage reaches the threshold level, a notification is sent to the Authority, where they are tracked to the path to clean the same. For a few decades, the waste in the city are overflowing creating an unhygienic environment. The previous work involved manual intervention to clean up the full bins. The plastics and other intoxicants when dropped inside the dustbins most of the time land up being dropped outside or the filled garbage bin overflows the excess outside the bin causing tidiness all over. Thus, this kind of technology provides a great opportunity to maintain a clean environment and save millions of lives from danger due to illness. In this system, we utilize a highly efficient and effective Ultrasonic Sensor. The ultrasonic sensor uses sound waves to sense the distance. The sound waves are monitored at a specific frequency and sound waves are recorded and generated to and fro. Thus, the data from the database are continuously monitored and when the threshold level is reached, the messages are sent.

3. Hardware and Software Requirements

Hardware Requirements

1. Arduino Uno
2. Ultrasonic Sensor
3. Wi-Fi Module – ESP8266
4. Proximity Sensor
5. Servo Motor
6. Effective Model of Dustbin

Software Requirements

1. Arduino IDE
2. Web Server

Frontend Technologies

a. HTML5
b. CSS3
c. JavaScript

Backend Technologies

a. Java
b. C (For setup processes in Arduino Uno)
c. MySQL

4. Conclusion and Future Work

Due to the current technological developments in several aspects of life and with the growing population, and lifestyle changes, waste management is another area that requires adequate maintenance. Therefore, using sensors to monitor and clean trash cans is a more effective method than the one that is currently in place. Our concept of a "Smart Waste Management System" primarily focuses on monitoring waste management, offering smart technology for waste management systems, and lowering human time and effort, cost, and environmental impact. The smart trash receptacle can provide a resolution for the unhygienic and unsanitary environment that exists in cities. By doing this, several ailments brought on by the harmful fumes emitted by garbage can be avoided. Thus, our initiative holds this belief that overspills of garbage on the streets could be evaded. It contributes to keeping the nation's environment safe and sanitary. A database system for every dustbin can be kept by the municipality. It is also convenient and feasible to keep communication between the municipality, the dustbin, and the truck member. The smart trash receptacle is discovered to be quite economical. The system is developed to gather data and transmit it over a wireless mesh network. The duty cycle approach is also used by the system to minimize power consumption and extend the operating duration. The Smart Bin system was put to the test outside and gave promising results. In our system, the smart trash receptacles are linked to the internet so that users can get real-time data on them.

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