Smart Waste Management System Using IOT

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ABSTRACT

The study is centred on the notion of automation as it applies to waste management systems in the Cleanliness and Hygiene area. Garbage dumped on the streets and in public spaces is a typical occurrence in all developing nations, and it has a negative impact on the environment and creates a number of unsanitary circumstances. In order to address these issues, Smart netbin is a concept that combines hardware and software technologies, such as attaching a Wi-Fi system to a regular trash can in order to give free internet access to users for a set amount of time. The technology rewards the user for keeping the environment clean, and the two work together to ensure effective waste management in a neighbourhood. Smart netbin employs a number of technologies, the first of which is technology for measuring the amount of trash dumped, the second of which is technology for tracking the movement of the waste, and the third of which is technology for sending necessary signals and connecting the user to the Wi-Fi system. The suggested system will operate on a client-server architecture, ensuring a clean environment, excellent health, and a society free of pollution.

Keywords: *Loadcell, IOT, load sensing plate, Arduino, Wi-Fi, Internet*

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I. INTRODUCTION

The amount of waste produced daily by industries and households is increasing at an alarming rate, and the main reason for this is the increased use of packaged items, textiles, paper, food, plastics, metals, and glass, among other things. As a result, waste management has become an important part of our daily lives. Many efficient techniques are used for the proper management of waste in most developed countries, but in some developing countries, people's careless attitude toward maintaining clean surroundings, as well as many issues such as no stringent laws for using biodegradable materials, no proper environment policies, and no laws for sustainable development, are the seed for waste management's fatal results. Because of the increased garbage, the public bins meant to collect it are overflowing, and the neighbourhood is a tangle of rubbish, resulting in not only foul-smelling streets but also a detrimental impact on health and the environment.

Waste is a critical issue that must be tackled intelligently. We sort our trash at home to make processing and recycling easier. We noticed trash vehicles arriving at residences at unpredictable intervals,

resulting in domestic despoliation. As a result, many citizens empty their overflowing trash cans in public places. As a result, pollutant levels in the environment rise.

Waste is a major source of concern for our health and the environment, with several negative consequences. Bacteria, insects, and flies reproduce in trash, and these flies are the same ones that fly around eating and dropping offspring. As a result, they raise the danger of food poisoning, typhoid, gastroenteritis, salmonella, and the insects that cause malaria, dengue fever, and other diseases. In addition to flies and insects, rodents and stray canines thrive in the waste, spreading infections, Garbage also causes a variety of respiratory illnesses. Toxic contaminants such as CO2, methane, and nitrous oxide, in addition to creating health problems, have a negative impact on the ecosystem, producing air and water pollution. The disposal of hazardous material in water, such as electronics and plastics, has an impact on aquatic life and, indirectly, human beings. Garbage that is overflowing is a public nuisance and an eyesore. Everyone want to visit cities that are clean and fresh. A foul-smelling city with rubbish strewn about does not attract tourists, resulting in a loss of cash and prospects.

The 377 million people who live in urban India, which is now the world's third largest garbage generator, generate 62 million tonnes of waste every day as their affluence rises. However, it is not the volume of waste created that is the problem; it is the fact that more than 45 million tonnes of rubbish, or 3 million trucks, is mistreated and disposed of in an unsanitary way by local authorities every day.

It is a very important issue to deal with and find proper remedies for it. For example, the government should enact strict laws against people throwing trash, against industries for not using biodegradable materials, more use of recycle items, less use of non-degradable items, and reuse the items. By doing so, the waste can be reduced to some extent. The proposal put forward goes along with this usage of technology for proper rubbish dumping and reducing its dangerous impacts.

The internet has enslaved the whole globe presently. There isn't a single person alive who doesn't have access to the internet, a phone, a tablet, or a laptop. It is widely considered that you cannot advance in today's society without connectivity, yet we occasionally lose access to the internet owing to hefty plans or connectivity troubles, enticing people to free Wi-Fi. Providing free Wi-Fi for throwing trash into the bin would alleviate the garbage problem, and the internet facility combined with the availability of free service would drive people insane and act as an incentive for keeping the neighbourhood clean.

2.LITERATURE SURVEY

This is not a novel concept; IoT-based trash cans have been deployed and used in the past. Some writers described systems in which sensors in the bin checked whether the bin was full or not. If it was full, an automatic message was delivered to the system's server end through the Arduino SIM module, which used the Arduino board's application. When the server got the message, it transmitted it to the worker in charge, who, if available, would announce his or her presence by accepting the assignment and arriving at the specified location. The task would be shifted to another worker if the worker was unavailable.

The information of all smart dustbins may be viewed by the concerned individual at any time and from anywhere, allowing him or her to make an informed decision. The cost reduction, resource optimization, and effective use of smart dustbins were all accomplished by adopting this proposed method. The city's traffic was decreased indirectly as a result of this method. In big cities, the waste collection van came twice or three times a day, depending on the population of the region. The system provided real-time information on the state of each and every dust bin, allowing the responsible authority to dispatch the rubbish collection truck only when the dustbin is full.

Some proposed smart garbage management system using IR sensor, microcontroller and Wi-Fi module. This system assured the cleaning of dustbins soon when the garbagelevel reached its maximum. If the dustbin was not cleaned in specific time, then the records were sent to the higher authority who took appropriate action against the concerned contractor. This system also helped to monitor the fake reports and hence helped to reduce the corruption in the overall management system. It ultimately helped to keep cleanliness in the society

The Dustbin with a Wi-Fi Router was gradually launched. A Passive Infrared Sensor was installed in the Dustbin. The temporary connection code was programmed into the Wi-Fi router. The PIR sensor detected garbage in the trashcan and delivered signals to the microcontroller when the user threw it in. The signals were detected by the microcontroller, which transmitted them to the router device. The router checked the signals and created random codes before sending them back to the microcontroller. The signals were read by the microcontroller and transmitted to the LCD Display.The LCD Display displayed it. The user entered the random code generated by the router onthe PHP interface which was hosted on the server. The server then responded to the request and displayed the Master Wi-Fi password to the user. The user then used the Master Wi-Fi password to connect to the internet. The user got the internet access for 10 minutes and automatically got disconnected.

3.FLAWS IN THE EXISTING SYSTEM

The following are the key issues with the current solid waste collection and management system

More complications in the processing.
Many controlling units linked with each other.
Higher implementation cost.

4.PROPOSED SYSTEM

A typical trashcan is lifted using a microcontroller-based platform Arduino Uno board, which is connected to a load sensor and a Wi-Fi module. It is made up of two primary modules: mechanically designed components and electrically designed components. The shredder and the load sensor plate are mechanical components, but the Arduino Loadcell, LCD Display screen, IR Sensor, Amplifier, Relay module, and Wi-Fi Router are all electrical components. When the user throws garbage into the dustbin, the trash is first crushed within the shredder, and the shredded trash is then gathered onto the dustbin's load detecting plate. This is how the load sensor was mounted to the load sensing plate. The weight of the trash dumped in the bin will be measured by a sensor. When the weight limit is reached, the router's password is flashed on the LCD panel, even if the router is still turned off, following the password After the plate has been exhibited, the user must draw it outside so that the rubbish that has accumulated on it falls into the trashcan. The IR sensor captures the motion of falling debris, and once the IR sensor detects the falling motion,

Advantages of proposed system over the existing

Low implementation cost
Simple module
Easy functionality

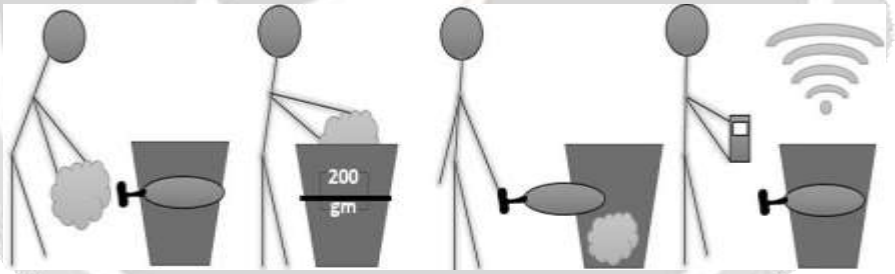

Fig.1: Proposed System.

5.SYSTEM ARCHITECTURE

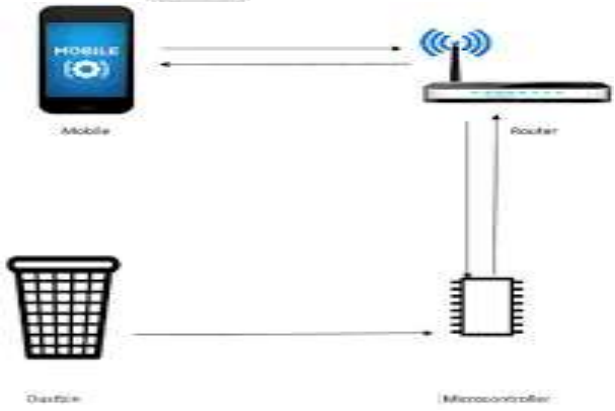

Fig.2: System Architecture

The system is composed of following components:

1. ***The dustbin:***

A standard trashcan made of plastic or metal that can handle all of the components put in it, with the mechanical shredder on top and the load detecting plate at a poor level, and all of the IOT components on the bottom. As a result, it should be of typical size (height 600-700 mm dia_).

2. ***Sensors:***

The load sensor and the infrared sensor will make up the majority of the sensing device. The load sensor is attached to the bottom side of the load sensing plate and measures the weight of rubbish being put into the bin. The IR sensor detects the downward motion of trash after the load sensing plate is taken out and the trash falls into the bin.

3. ***Load cell:***

Weight acts on the load cell's metal spring element during a measurement, causing elastic deformation. A strain gauge (SG) fitted on the spring element converts the strain (positive or negative) into an electrical signal.
Name of the product: 10Kg / 22lb Load Cell Load
1+/-0.15mV/V Rated Output

Fig3 Load cell

4. ***IR sensor:***

An infrared sensor is an electrical device that detects specific features in its environment. It accomplishes this by producing or sensing infrared radiation. Infrared sensors can also detect motion as well as measure the heat radiated by an item.
Voltage Range of Operation
3.65 volts direct current Detection Angle 35° Distance Measuring Range 2 30cm Average Current Consumption

Fig.4: IR Sensor

5. Wi-Fi module:

It consists of the router which will provide the internet facilities to the user for dumping the trash into the bin

6. Microcontroller:

The embedded system at the bins will use Arduino as its processing unit. This will be used to operate sensors and transmit data.
The following are the additional components:

7. HX711 amplifier:

Differential input voltage: ±40mV (Full-scale differential inputvoltage is ± 40mV)
Operating Voltage: 2.7V to 5VDC Operating current: <10 mA

8. LCD display:

The operating voltage ranges from 4.7 to 5.3 volts.
Without the illumination, the current consumption is 1mA.

Fig5.LCD Display

9. Power supply

The microprocessor, shredder, and router, which are the most significant components of the system, will be powered by the power supply.

10. Load sensing plate

The load sensor plate is a custom-made plate based on the specifications of the trashcan. It is constructed of plastic, wood, or metal and is used to collect rubbish thrown into the bin. A load sensor is attached to the bottom of the bin, which measures the weight of the trash thrown in. It has holes in it so that sand, soil, and mud may flow down through them and their weight is not taken into account. The holes also help to lower the total weight of the plate.

6.ADVANTAGES:

The proposed concept has several benefits and is convincing enough to be applied in every street of a growing country. The benefits come from how simple and useful it is to use. This will not only enhance the streets in which we live, but will also give a surface for a more efficient working system.

- Efficient and effective Functioning.
- Cleaner Environs
- Better health issues.
- Pollution free and stinking free environs
- Smart cities
- Technology development
- Tourist attraction.

This approach would be simple to deal with once it was built. Garbage will be deposited into bins, decreasing the health risks created by the junk that is prevalent all throughout.

7.FUTURE WORKS:

The moisture sensor may be used in conjunction with the other sensors, and chambers for separating dry and wet trash can be formed, therefore resolving waste segregation difficulties.

8. CONCLUSION:

Improper disposal and maintenance of household waste causes public health and environmental pollution, so this paper aims to provide a practical solution for waste management by combining it with the Internet of Things (IoT), i.e. providing free internet access for a set period of time once the trash is deposited in the bin. The suggested approach would undoubtedly aid in the resolution of all severe waste-related concerns and the preservation of the environment.

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