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CLEAN INDIA-A NOVEL APPROACH FOR WASTE MANAGEMENT SYSTEM USING IoT

S.Gowri[1], M.Divyalakshmi[2], S.Abinaya[3], C.Aarthi[4]

[1,2,3]UG Student, Department of ECE,
Sengunthar Engineering College, Tamilnadu,(India)
[4]Associate Professor, Department of ECE,
Sengunthar Engineering College, Tamilnadu,(India)

ABSTRACT

Solid waste management is one of major aspect which has to be considered in terms of making urban area environment healthier. The common dustbins placed by the municipal corporation are leading no of health, environmental and social issues. Various causes are there like improper dustbin placement in city, improper system of collecting waste by City Corporation, and more specifically people are not aware enough to use dustbins in proper way. This various major causes are leading serious problems like, an unhygeienic condition, air pollution, and unhealthy environment creating health disease. Up till now,research has been carried out by developing a software. Applications for indicating dustbin status,another by shortest path method for garbage collecting vehicles by integrating RFID,GSM,GIS system;but no any active efforts has been taken paying attention towards managing such waste in atomized way.Considering all these major factors,a small solid waste management system is designed that will check status and give alert of dustbin fullness and more sufficiently system has a feature to literate people to use dustbin properly and to automatically sends and clean garbage present outside the dustbin.Thus presented solution achieves smart solid waste management satisfying goal of making Indian cities clean,healthy and hygienic.

Keywords: Alarming system, Elevator assembly, GSM, IR Sensor, Mechanical shaft, Monitoring and management, Smart solid waste collection.

I.INTRODUCTION

In recent decades, urbanization has increased tremendously. At the same phase there is increase in waste production. Waste management has been a crucial issue to be considered .The Present stage is consisting of waste bin which is without having the lid on top. The people will have a negative impression and they are not willing to put waste inside the bin. In order to overcome this problem, we are implementing a new system which having high role in the social cleaning. Our system consists of automated waste bin with entire power which is from the renewable solar energy. It requires voltage regulation for charging the battery. The smart waste bin will detect the presence of people and automatically opens the lid, after it closes the lid.

This system also monitors the garbage bins and informs about the level of garbage collected in the bins via web page. This enables the tracking of operational statistics and collection for each container through GPS(Global Positioning System) and more significantly system has a feature to literate people to use dustbin properly and to automatically sense and clean garbage present outside the dustbin. Smart bins are built on microcontroller based platform Arduino Uno Board(ATmega320) which is interfaced with GSM modem, a Piston and Ultrasonic Sensor JSN-SR04T(Water proof).If any hazardous gas present in the bin, then it will be detected and informed to the municipal.

An **Ultrasonic Sensor** is used for detecting whether the trash can is filled with garbage or not. Here Ultrasonic Sensor is installed and will measure the distance of garbage from the top of Trash can and we can set a threshold value according to the size of trash can. If the distance will be less than this threshold value, the Trash can is full of garbage and sends the indication message to cleaners.

When the garbages in the bins attains their threshold level, a piston fitted at the top of smart bin which is capable of optimizing storage space by automatically compacting wastages by applying pressure. It gives us one of the most efficient ways to keep our environment clean and green. It is observed that often the garbage gets collected due to irregular removal of garbage present in bins. In the proposed Project, a new model for the municipal dustbins which intimates the center of municipality for immediate cleaning of dustbin and it adds new features of waterproof sensors and compacting garbage techniques in this proposal.

II. MOTIVATION AND BACKGROUND

This Paper is aimed to safeguard the environment and encourage recycling. This system defines as a unique and globally successful solution. By implementing this proposed system the cost reduction, resource optimization, effective usage of smart dustbins can be done. This system indirectly reducing traffic in the city. It also reduces the fuel consumption of vehicles by using the optimized route. Our System will inform the status of each and every dust bin in real time so that the concerned authority can collect only when the dustbin is full. The future work includes fixing the smell detectors to detect even the smell of the garbage.

III.ARCHITECTURE OVERVIEW

The core of our proposed Smart waste bin scheme basically consists of an ultrasonic sensor that functions as the distance calculator. The ultrasonic sensor will be attached to waste bin which is placed in public areas. The ultrasonic sensor continuously measure the distance in front of the bin and if the distance fall below a particular value the presence of humans can be identified. At this time the H Bridge can be activated and lid can be opened, a buzzer can be activated for indicating the operation. This system is entirely working in renewable solar energy. Since the solar energy is highly fluctuating voltage regulator circuit is used for making constant supply of voltage to charge the battery. LM317 voltage regulator is used in the circuit.

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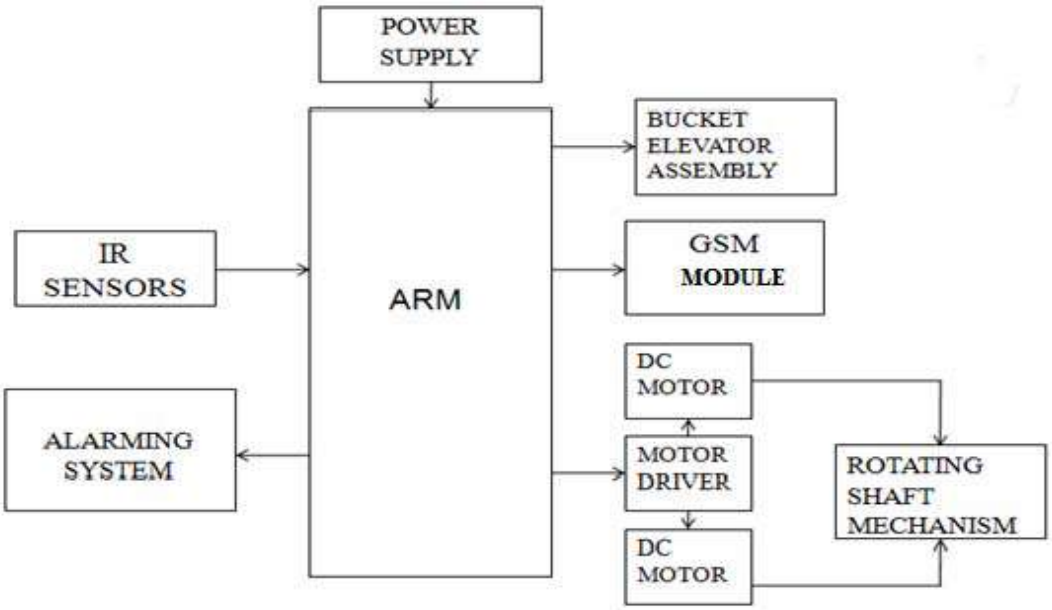

Fig1. BLOCK DIAGRAM OF WASTE MANAGEMENT SYSTEM

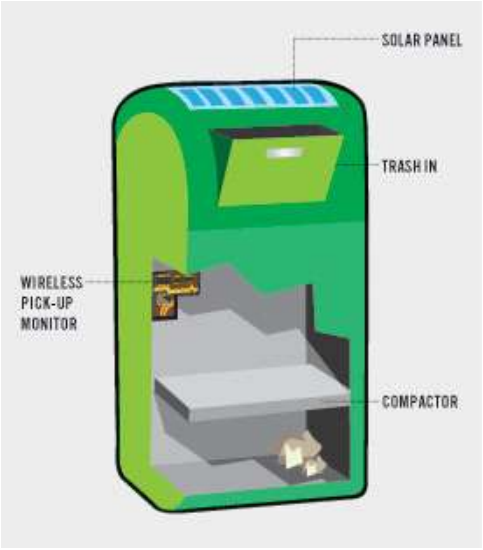

Fig 2.DIAGRAMATIC REPRESENTATION OF WASTE MANAGEMENT SYSTEM

Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measure function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle of work:

(1) Using IO trigger for at least 10μs high level signal.

(2) The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.

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(3) If the signal is back through high level, time of high output IO duration is the time from sending ultrasonic to returning.

Test distance = (high level time × velocity of sound (340M/S) / 2.

- 5V Supply
- Trigger Pulse Input
- Echo Pulse Output
- Ground

GSM (Global System for Mobile communication): This uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies. The GSM uses TDMA to split a frequency into time slots. GSM/GPRS module is used to establish communication between a computer/mobile and a GSM-GPRS system.GSM modem is used to send or receive the messages. This GPRS system is fixed in the dustbin to indicate the level of trash in the bin.

A Piston is connected to the top of the bin. When the indication level indicates that the bin reached its threshold level, the piston compact the trash into $3/4^{th}$ of its original size. This piston is used to replace the overflow condition and to make additional space in the smart bin.

IV.TOP VIEW OF WASTE MANAGEMENT SYSTEM:

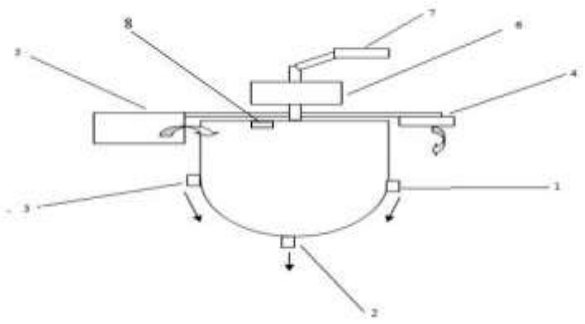

Fig 3. TOP VIEW OF WASTE MANAGEMENT SYSTEM

Number	Components
1	IR sensor and its direction of radiation
2	IR sensor and its direction of radiation
3	IR sensor and its direction of radiation
4	Rotating mechanical shaft with arrow indication of its direction of movement
5	Elevator assembly with arrow indication of its direction of movement
6	Logical representation of control unit
7	Alarming system
8	IR sensor present inside the dustbin

1.SOLAR PANEL

Quality solar panels with high efficiency and smaller footprint compared to our regular mono crystalline models. An easy way to keep the 12V batteries topped up and ready to go on caravan, farm equipment, the spare car, or on the shed out the back. The dust and weather resistant panel features a robust frame, and is supplied with 3m long leads terminated with battery clips. Each version is fitted with a blocking diode, so they are suitable for direct connection to your battery as a trickle charger (take note of the minimum battery capacity), or as a low current charger to replace a load or current drain on the battery. A charge controller such as AA0348 is recommended on the 10W and 20W versions when there is not enough current drain to prevent over-charging of the battery.

2. SENSOR

Detects body heat (infrared energy). Passive infrared sensors are the most widely used motion in home security systems. When your system is armed, your motion sensors are activated. Once the sensor warms up, it can detect heat and movement in the surrounding areas, creating a protective "grid."

V.TEST CASE AND RESULT ANALYSIS

The proposed system consist sensors at various positions of the dustbin. The sensing of its respective parameter gets carried out properly by these sensor as per the program and desired objectives. As well as alarm gets activated after detection of garbage at the outside of the dustbin.

The result of analysis of system proposed in this paper can be given in two forms :

1. Accuracy of system in terms of cleaning garbage present outside the system

- The rotating mechanical shaft which is having cleaning brush at its bottom will play role of cleaning the waste present outside the dustbin
- This will define the accuracy of system's innovative function.
- Iteration has been carried out for five times and result is analyzed based on the execution of system

2.Real time alert message sending based on sensor data

The sensor is placed inside the dustbin so as to monitor the bin fullness. When this sensor senses garbage level up to threshold then system will automatically send the message to the respective authority as shown in fig.

Fig 4: Message alert through GSM **Fig 5: Garbage bin overflow indicator with load cell**

VI.CONCLUSION

The smart city is a newly emerging trend and actively running all over country.The proposed system is best suitable concept to implement and provides optimum solution for the major issue of managing solid waste properly in terms of collecting it and cleaning waste thrown outside the dustbin. Paper focuses on the actual causes for the for this issues and work at it.Integrated assembley of sensors, GSM provides the bin fullness status to respective authority in municipal corporation. The rotating mechanical shaft,sensor placed at bottom side of dustbin and elevator assembly together collects the waste thrown outside and put it back in dustbin properly. One more significant aspect gets achieved by system is literate and make people aware to use common dustbins in proper manner by alarm system. Hence, this paper presents highly advanced and fully automatic system to collect and manage waste efficiently.

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