

Automated waste management system for smart cities

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Abstract :Waste management is an issue for the past few years and with the developing technology that has been a boon to the society,this issue can be handled in a more smarter way.Segregation and recycling of waste is one the solution which can be combined with technology so that waste disposal in cities is minimized. This paper discusses an automated waste management system for smart cities.It consists of two parts:first is an alerting mechanism when the level of waste has reached its maximum limit for timely collection of waste and second part is the segregation of waste once it is collected.

Index Terms - GSM,IR-Sensor,Inductive sensor,Capacitive sensor,float & sink

I.Introduction

A smart city is the one that uses technology to manage its resources and monitor its activities which includes smart management of water,waste management,energy management,traffic management and many similar things.A big challenge in the urban cities is that of waste management as there is a rapid growth in the rate of urbanization and thus there is a need of sustainable urban development plans[2]. Smart waste management is an important aspect of a smart city. Uncontrolled dumping of wastes on outskirts of towns and cities has created overflowing landfills, which are not only impossible to reclaim because of the haphazard manner of dumping, but also have serious environmental implications in terms of ground water pollution and contribution to global warming. Burning of waste leads to air pollution in terms of increased TSP and PM10 emissions[1]. Without an efficient solution for waste management,the pollution due to waste cannot be controlled.

India is facing a huge challenge in waste management. Approximately 65 million tonnes of municipal solid wastes per year. But from them only 43 million tonnes (MT) is collected, 33 MT is dumped in landfill sites and rest 12 MT is sent for treatment[4].So the solid waste generated has to be segregated and managed properly which will in turn give environmental and economic benefits.With changing policy requirements, new sustainability and recycling goals and improved technology, cities across the globe are joining the “smart cities” movement to become more efficient in managing solid waste.For example in India,the city of Nagpur has come up with various solutions for the management of solid waste.Los Angeles-based Ecube Labs Co., for example, is using solar-powered waste compacting bins, data analytics and a resource management platform to help cities optimize the efficiency of their waste collection value chains.Separating the various useful elements like metal,plastic and paper from the collected waste and recycling them will provide economic gain for waste which otherwise would have been dumped.

II.Block Diagram

Part A: Smart Dustbin

Block Diagram Part A

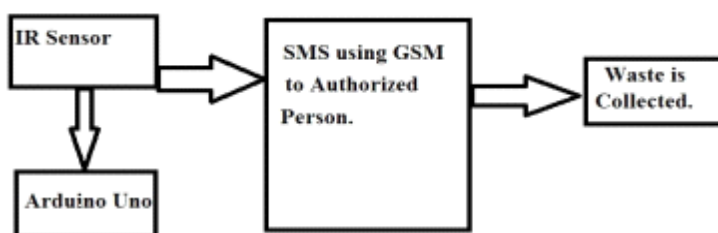


Fig 3.1 Block Diagram of Smart Dustbin

Infrared sensor is an electronic device which emits light for detection of various aspects of the surrounding. Here it is used for sensing whether the dustbin is full or empty. The output of the IR sensor will be high when there is an object nearby & low when there is no object near it. When the dustbin is full, a message informing the same will be sent to the respective municipal authorities by using GSM module. GSM uses GSM network operator SIM card and is thus used just like a cell phone with its own unique phone number. The RS232 port of this module is used for communication. Also this is a touch free dustbin so, the lid of the dustbin will open automatically when a person comes in its vicinity. There will be no need of touching the dirty lid with our hands. This is done using ultrasonic sensor that detects the reflected wave that is emitted by sensor if there is an obstacle in front. So when a person reaches in the vicinity, it will be detected by ultrasonic sensor and lid of dustbin will open. DC Motor is used to open and close the lid when a person reaches to throw garbage in it.

Part B: Segregation of Waste

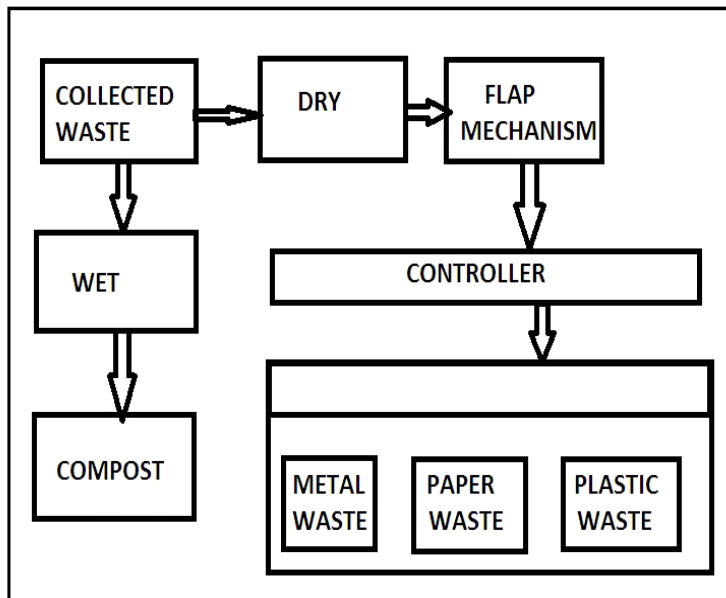


Fig 2.1 Block diagram for segregation of waste

The waste is considered separately as wet waste and dry waste. The wet waste is further processed into compost and can be used as a fertilizer. The dry waste is separated by flap mechanism. Pic is used as a controller for this segregation unit. The waste will be separated as metallic and non-metallic waste which can be utilized by recycling further. The plastic and paper waste will be further separated by float and sink method. As density of plastic is less, it will float whereas the paper will sink.

III. Results and Discussion

The Automatic waste management system is a step forward to create the manual assortment and segregation of wastes automatic in nature. The developed system would pioneer work for solid waste management and segregation processes.

In the system presented, combination of sensors, controller and internet connectivity will lead to a uniquely smart disposal trash bin. Waste management through automation is one of the pillars of the Smart City and modern approach towards environmental responsibility.

PART A: The system presented, combination of sensors, controller and internet connectivity will lead to a uniquely smart disposal trash bin. Waste management through automation is one of the pillars of the Smart City and modern approach towards environmental responsibility. This system mainly indicates if the dustbin is full or not. We use IR sensor and a GSM module. IR sensor detects if the bin is full. GSM module sends a message to the respective officials when IR sensor detects that the waste in the dustbin has exceeded a certain threshold. The message will indicate that the bin is full. The lid of the dustbin is attached to servo motor which automatically opens when it detects motion. Thus human intervention is reduced and the system is completely automated. The figure as shown below represents the system of waste management.

The waste management services ensure a healthy environment allowing optimization of the technological advancement and prevent overloading the carrier for waste disposal. Smart waste management also contributes to the overall waste recycling efficiency.

Part B : SEGREGATION OF WASTE

When it is mixed it is waste when separated it's a resource.

Effective segregation of wastes indicates that less waste is dumped to landfill making it cheaper and better for people and the environment. Segregation is essential for sustainable development and healthy society . In particular, hazardous wastes can cause long term health problems, so it is very important that they are disposed of correctly and safely and not mixed in with the normal waste coming out of your home or office.

Expected output of Part B:

The wet waste and dry waste will be present in the different bins. An initiative is taken by government of India for provision of two separate under the Swachh Bharat Abhiyaan. The wet waste will be present in green bin and the dry waste will be present in the blue bin. The wet waste will further be converted to compost and can be used as a fertilizer. The dry waste will be separated as metallic waste, plastic waste and Paper. The Metallic waste will be detected by Inductive sensor, Plastic and paper waste will be detected by Capacitive sensor which can further be separated by float and sink method.

Sr no	Waste	Type of Waste	Detected by using
1.	Plastic bottle	Dry	Capacitive sensor,float and sink method
2.	Keys	Metallic	Inductive Sensor
3.	Cardboard	Dry	Capacitive,float and sink method
4.	Soft drink Can	Metallic	Inductive Sensor

Table 3.1 Result of segregation of waste

IV. Conclusion

This idea for the management of waste is quite economical. Also a lot of time is saved in this method than the presently using methodology which involves municipal workers collecting waste without knowing the status of the bins .It also helps to keep the society clean and reduced human intervention also ensures a healthy lifestyle of the worker. This system provides the route optimization opportunity for utilities to reduce traffic and fuel use. This system may be a leap forward to detect waste automatically and further utilize their potential by recycling them or reusing them.

This planned system wouldn't solely operate for grouping and change knowledge mechanically and timely, however conjointly it might analyze and use knowledge showing intelligence. The planned system would solve loads of downside concerning solid waste assortment, monitoring, minimizing value and accelerate the management. The Trash management system may be a leap forward to create the manual assortment and detection of wastes automatic in nature. It might pioneer work for solid waste assortment, observance and management processes. This project for the management of wastes is economical and time saving method than the presently using methodology within which involved municipal worker must seek for the stuffed waste bins manually across totally different spots in an area/street for checking often whether or not the waste bin is stuffed or not.

V. References

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