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Automatic Waste Segregation and Monitoring System by Using Arduino UNO, GSM and Bluetooth Module

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Abstract: ***In large cities waste generated is very large so for handling this waste properly we have to develop smart and an easy alternative for both municipal corporation authority and population. For maintaining the beauty of locality and also for maintain proper hygienic condition of surrounding which affect the health of population this waste should be managed properly which can be achieved by developing an automation system to sort out wet and dry waste which help to separate degradable and non-degradable waste. In our project we have using different sensors like infrared, moisture, temperature, Bluetooth and global system for mobile (GSM) through which the authority will get real time information via SMS and displays the data on mobile app through Bluetooth when dustbin is completely filled or any abnormal condition occur in system such as fire detected.***

Keywords: Automatic waste management, SMS, GSM, IR Sensor, Arduino Uno controller, Bluetooth, Moisture sensor.

1. Introduction

Day by day population growth is increases tremendously simultaneously pollution rate increases very rapidly. There are so many source which produced domestic waste, agriculture waste, hospital waste and savage waste. Majority of waste production is domestic waste because day by day rate of urbanization is increase highly, so waste generation per ton of each city is large and management of such huge waste is critical job for concern authority of country. Hence it is important to focus on such critical problem solving method which proved to be success in future atmosphere and also this new automated technique has overcome old one management control which can be achieved by using Arduino UNO, Bluetooth and GSM based technology.

Waste management is very essential because it is very hazardous for human being as well as environment surround, so many new techniques have been developed out of which automated waste management techniques has been proving to promising, that's why many cities are adopting this techniques to manage the waste. Automatic waste management can be simply referred to as co-relation between human thing, computer, and electronic things and all the mechanical working object can be controlled and monitored by using Arduino Uno controller, Bluetooth module, GSM and Dc motor. These devices can communicate and interact with other over the signal data and they can be remotely monitored and controlled. In automatic waste management system different sensors are been used which covert the physical data into the digital signals and transmit to the area where all these signals are monitored. All the physical data that is to be transmit over digital signal is based on real time basis scenario and by using this real time data we can develop a system architecture.
Now the current method of waste management is that government authorized person will monitor the status of the waste bin and normally in general they have a fixed appendix of collecting the waste or garbage from the dustbin. This appendix of collecting waste mainly depend on population of that area, it can be once in a day or twice in a day or in some cases once in two days. Here we can clearly see that quantity of waste generated is not been taken in consideration in our traditional old method of waste collection. But during few days in year like on festive season the waste generated is huge in such cases the garbage dustbin gets immediately full which leads to overflow, which is not supposed to happen. Hence these kind of problem can be solved by implementing our project in which the government authority will get the Short Service Message (SMS) immediately and can also get live status on android phone with suitable Bluetooth terminal application. Therefore we can say that smart monitoring is the best possible alternative for waste management because it reduces the amount of waste overflowing in waste bins such as domestic waste, small scale industry waste, agriculture waste etc. Man power required is also reduced and waste collection delay also minimized due to such benefit smart waste management has a great scope in future leading to new invention in waste management system.

Most of the developed cites and developing cities has also faces such huge problem of waste which causes unhygienic condition, overflow of waste, bad smelled so it is avoided by such proposed system.

2. Literature Review

This is not an original idea, for the implementation of automated working garbage bin; the idea has existed for many years, After the IoT field finding its grapple in our lives. This is, however an original plan for designing an automatic garbage bin with moisture sensor, IR sensor, GSM module and Bluetooth module for transmission of data and at

receiving side we can used android phone, laptop, desktop interconnected to GSM system.

1) Internet of Things: Challenges and state of the art solutions in Internet-scale Sensor Information Management and Mobile analytics by Arkady Zaslavsky, Dimitrios Georgakopoulos. This paper gave us the details about mobile analysis and sensor information management that will help in data segregation of various dustbins.
2) Meghana K C, Dr. K.R. Natraj have equipped the smart bins with ultrasonic sensor which measure the level of dustbin being filled up. The container is divided into three levels of garbage being collected in it. Every time the garbage crosses a level the sensors receives the data of the filled level. This data is further sent to the garbage analyzer as instant message using GSM module.
3) Vishesh Kumar Kurrel has built a framework in which a camera will be set at each garbage collection point alongside load cell sensor at base of the trash can. The camera will take continuous snapshots of the garbage can. A threshold level is set which compare the output camera and load cell sensor. Accordingly, information is processed that is controller checks if the threshold level is exceeded or not. This is convenient to use but economically not reliable.
4) Smart Garbage Management System by Vikrant Bhor, Pankaj Morajkar, Maheshwar Gurav, Dishant Pandya. It provided us with additional details and designs needed for flow and management of garbage while collection.

3. Proposed System

For collection of waste majorly humans and vehicles is required. Here in our project we are using approach in which level of waste in the dustbin is automatically detected where for neat and systematic operation a unique ID number is provided to the dustbin which is area wise, as soon as the dustbin will overflow, a SMS would be automatically send to the person who collects the waste by the means of vehicle also the person who collects the waste get real time notification on smart phone when he near the Bluetooth range such 10-15 meter. There are many problems rises due to overflow of dustbins and a proper solution for this problem is development of automatic waste management system. Now here we are interfacing a dustbin with Arduino Uno controller based system having IR wireless system so that all the status of the level of waste collected can be get notified when bins is full and also have moisture sensor which can separate out dry and wet waste. In this system we fit temperature sensor with buzzer when temperature increase it indicated to concern authority. Here we put Bluetooth connection in waste collection vehicle so the person who collect the waste can analyses the nearby areas waste collection in bins In this manner whole city can be kept clean time to time by using such techniques in field of sanitation with help of electronic equipment's.
Considering the need of modern technology the automatic garbage bin can expensive but considering the amount of dustbin needed in India, expensive garbage bin would not be a praise experiment that is why we have decide to use based sensors to reduce its cost and also make it efficient in applications.

In our project following components are used:-

- ARDUINO UNOCONTROLLER
- GSM MODULE
- MOISTURE SENSOR
- IR SENSOR
- TEMPERATURE SENSOR
- DC MOTOR
- BUZZER
- BLUETOOTH MODULE

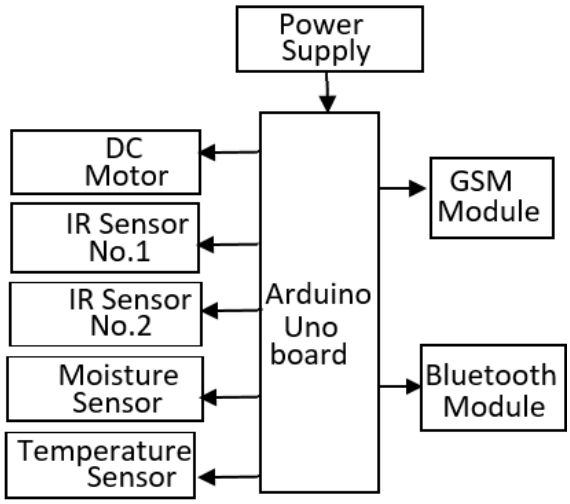

Figure 1: Block diagram of transmitting part

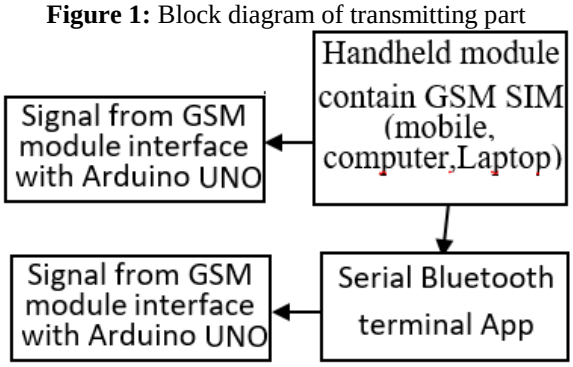

Figure 2: Block diagram of receiver part

In this automatic management system, automatic bins play the vital role to start the processing in a standardized way. This project is the co-relation of human things, mobile or computer and field device which is automatic bins in our project. In a single unit we are using two separate waste collection bins, at top part of the dustbin moisture sensors are been placed which work on principle of dielectric medium and separate out the solid and liquid waste with help of DC motor placed attached to separator, hence lots of time is saved while dumping the waste. To detect the level of waste an infrared sensor is been used which is interfaced to Arduino Uno controller unit which is then further connected to Bluetooth module which indicates the level of waste filled in bin on our smart phones or vehicle which collect the waste. Also the real time data is also been transmit by using GSM and IR sensor to the receiver side from where the whole system will monitored through GSM, Bluetooth terminal application, IR sensor power supply unit is used to provide supply to the whole system. For ensure of working

person bin which is made up of fiber material having separate arrangement of dc motor which is directly connected to the bins which rotate the bin clockwise and anticlockwise for unloading purpose. So at the time of collection the operator just have to turn on the switch for turning on the motor and the bin will become clean. In this manner overall system works.

4. Test Cases And Result

1) Dustbin when empty - 0% (when IR Sensor gives output)
2) Dustbin full – 95% (when 1st and 2nd level IR Sensor gives output)
3) Dry waste – 100% (output of moisture sensor is low IR Sensor gives output)
4) Wet waste- 100% (output of moisture sensor is high IR Sensor gives output)
5) Dry or wet separation (motor rotate clockwise and anticlockwise)

5. Overall System Working

Mainly three sector are control whole management system. Those are safeguard unit, transport unit and mechanical engineering unit. When the waste are being filled up in the automatic bins which will be connected in the Arduino Uno controller, sensor, Bluetooth and GSM, the data will be sent be send to municipal corporation office and then on the basis of waste amount, priority table is formed in which we will get the most filled up waste in the higher and least filled up waste as in the least time consuming task in the last so, we have the task list in descending order.so bins which is almost filled up will be treated first. Also if available, the system will assign more than one person if needed to clear out an area with comparatively more waste filling up in the bins. As per ID provided by operator person waste collection process start by person who are responsible for waste collection. After the collection of waste bins status update as empty or 0% level of waste and process is repeat again and again. If when moving toward waste collection bin any bin as per priority order is pass away then we also give priority for that bin which indirectly reduced the working time and reduces extra man power unit.

6. Conclusion

This project work is the implementation of automatic garbage management system using IR sensor, Arduino Uno controller, and GSM and Bluetooth module. This system ensure the cleaning of dustbins soon when the waste level reaches its 95% full level. By using Bluetooth connection we get nearby areas dustbin real time information this reduces the total number of trips of garbage collection vehicle and hence reduces the overall expenditure associated with the garbage collection. It ultimately helps to keep cleanliness in the society. The objective of this research paper is to solve the problem related of traditional way of handling and managing waste management system and also reduces the man power required for extra work such as cleaning of waste overflow, delay in waste collection

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