Smart Dustbin

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Abstract: **As people are getting smarter, so are the things. While the thought comes up for Smart cities. There is a requirement for Smart waste management. It is a common sight to witness garbage spilled out in and around the dustbins. The area around an improperly maintained dust bins can house disease spreading insects like mosquitoes, flies, bees and driver ants. The environment around a dustbin is also conducive for increasing the pollution level in air. Air pollution due to a dustbin can produce bacteria and virus which can produce life threatening diseases in human beings. The idea of Smart Dustbin is for the Smart buildings, Colleges, Hospitals and Bus stands. The Smart Dustbin thus thought is an improvement of normal dustbin by elevating it to be smart using sensors and logics. For Smart dustbin operation we are using ultrasonic sensor for detecting distance and object and another sensor servomotor is used for opening and closing the dustbin top and we are also using PIR sensor which is used for calculating the level of dustbin and also we are using led which glows showing the level of dustbin upto which it is filled.**

Keywords: **Ultrasonic Sensor, GSM Module, Arduino Uno, Servo Motor, PIR Sensor**

1.   Introduction

As the world is in a stage of up gradation, there is one stinking problem we have to deal with. Garbage!In our daily life, we see the pictures of garbage bins being overfull and all the garbage spills out. Thisleads to the number of diseases as large number of insects and mosquitoes breed on it. A big challengein the urban cities is solid waste management not only in India but for most of the countries in the world. Hence, such a system has to be built which can eradicate this problem or at least reduce it to the minimum level. The project gives us one of the most efficient ways to keep our environment cleanand green. The smart city concept is still new in India, although it has received a lot of attention in few years when our present Prime Minister gave the idea of building 100 smart cities throughout India.Now, with the upcoming large number of smart cities, large numbers of responsibilities are also required to be fulfilled. The prime need of a smart lifestyle begins with cleanliness and cleanliness begins with dustbin. A society will get its waste dispatched properly only if the dustbins are placed well and collected well.

The main problem in the current waste management system in most of the Indian cities is the unhealthystatus of dustbins. In this paper we have tried to upgrade the trivial but vital component of the urban waste management system.

2. Methodology

2.1 Block Diagram

The basic operation of the system. The fullness status of the bin is determined by calculating the distance between the lid of the bin and the trash by using a sensor. A distance threshold will be set according to the bin dimensions. When the distance measuring sensor indicates that the bin is full, then a microcontroller board will control a GSM module to send SMS alert that contains bin ID and alert message to a predefined phone number. The location of the bin is predefined by a sanitary workerwho will identify the filled bin by its ID which received by the SMS alert. The system will return to default operation when the bin is emptied by the sanitary worker.
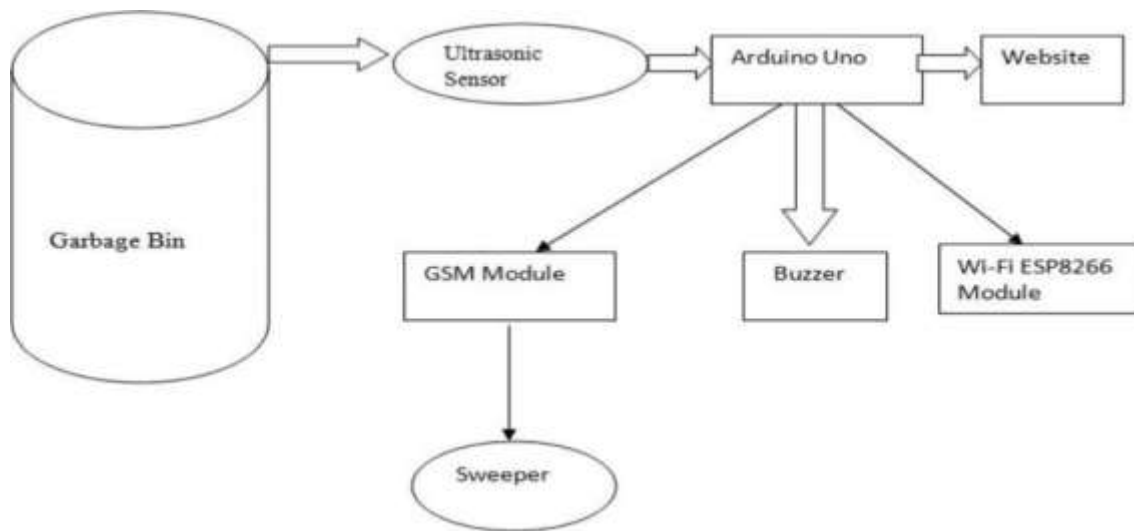
Figure 1 - Block Diagram of Project

3. Hardware Description
3.1 Ultrasonic Sensor

Ultrasonic sensors measure distance by using ultrasonic waves. The sensor head emits an ultrasonic wave and receives the wave reflected back from the target. Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception. An optical sensor has a transmitter and receiver, whereas an ultrasonic sensor uses a single ultrasonic element for both emission and reception.
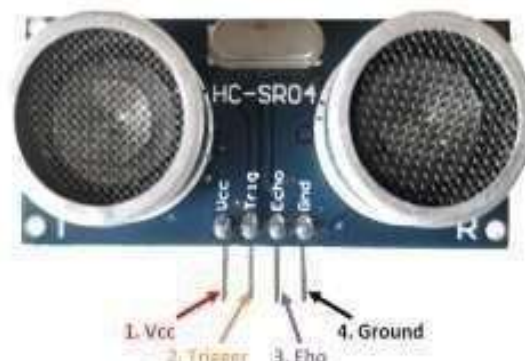

Figure 2 - Ultrasonic Sensor

3.2 GSM SIM 900

GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services. GSM differs from first generation wireless systems in that it uses digital technology and Time Division Multiple Access (TDMA) transmission methods. GSM is a circuit-switched system that divides each 200 KHz channel into eight 25 KHz time-slots. GSM operates in the 900 MHz and 1.8 GHz bands in Europe and the 1.9 GHz and 850 MHz bands in the US. The 850 MHz band is also used for GSM and 3 GSM in Australia, Canada and many South American countries. GSM supports data transfer speeds of up to 9.6 kbit/s, allowing the transmission of basic data services such as SMS (Short Message Service). Another major benefit is its international roaming capability, allowing users to access the same services when traveling abroad as at home. This gives consumers seamless and same number connectivity in more than 210 countries.

3.3 Arduino Uno

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Figure 3 - Arduino Uno

3.4   Servo Motor

Servo implies an error sensing feedback control which is utilized to correct the performance of asystem. It also requires a generally sophisticated controller, often a dedicated module designed particularly for use with servomotors. Servo motors are DC motors that allows for precise controlof angular position. They are actually DC motors whose speed is slowly lowered by the gears. The servo motors usually have a revolution cutoff from 90° to 180°. A few servo motors also have revolution cutoff of 360° or more. But servo motors do not rotate constantly. Their rotationis limited in between the fixed angles.

Figure 4 - Servo Motor

3.5   PIR Sensor

PIR sensor or Passive infrared sensor senses the heat radiation of a human or any other creature. It detects the motion of the person within its range. These are basically made of a pyroelectric sensor which can detect levels of infrared radiation. In our project, PIR sensor is installed on the front of the dustbin so that it can sense any human standing in front of it and gives high to the micro controller then in turn servo motor is turned on and lid of the dustbin is opened. Time delay and distance can also be adjusted in PIR with the help of on-board potentiometers.

Figure 5 - PIR Sensor

2.   Working

- After wiring and attaching all the devices and setting up to the Smart Dustbin, now observeall the important setup whether they are well connected or something missed.
- After connection set up now next step is to submit/upload code in Arduino and supply power to the circuit.
- When system is powered ON, Arduino keeps monitoring for any things that come near the sensor at give range.
- When Ultrasonic sensor detect any object for example like hand or others, here Arduino calculates its distance and if it less than a certain predefined value than servo motor get activatefirst and with the support of the extended arm of the lid.

- Lid will open for a given time than it will automatically close.
- As soon as the thrash in the bin reaches a threshold value GSM will send a message to the concerned for immediate action.

Figure 6 - Working Model of Smart Dustbin

2.1   Result
The dustbin is able to open the lid with the help of servo motor whenever it detects motion. Theultrasonic sensor is giving the details about the waste present in the dustbin. The status of the waste is transferred to the municipal authority whenever it is exceeding the threshold value.

5.   Conclusion
Here we are going to make an evolution change toward cleanliness. The combination of intelligent waste monitoring and trash compaction technologies, smart dustbins are better and shoulders above traditional garbage dustbin. It is equipped with smart devices like sensor Arduino etc. Lid of the dustbinwill automatically open when an object comes near to the dustbin and after certain time period it will close the lid. For society, it will help towards health and hygiene so that normal people to rich people can take benefit from it.

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