

Smart Waste Management System

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Abstract - Garbage! In our daily life, we see the pictures of garbage bins being overfull and all the garbage smells out. This leads to the number of diseases as large number of insects and mosquitoes breed on it. A big face up to the smart cities is solid waste management, not only in India almost all the countries in the world

Keywords - Arduino microcontroller through RS232, LCD, Arduino Software (IDE)

I. INTRODUCTION

This project gives the most efficient ways to keep our environment clean and green. The upcoming large number of smart cities, large numbers of responsibilities is also required to be fulfilled. The most important need of a smart way of life begins with cleanliness and cleanliness begins with smart dustbin. A people will get its waste dispatch properly only if the dustbins are placed well and collected well. The main problem in the current waste management system in most of the cities is the damaging status of dustbins. So, by using the new technology we send the information to the concern persons and display boards are arranged in the concern offices. The progress of waste across the entire city can be tracked and thus can be monitored by a single system efficiently and concretely. This system can prove to be a revolution for the whole waste management system of future smart cities.

II. MATERIALS AND METHODS

Hardware Requirements

The hardware requirements for the system are as follows.

Ultrasonic Sensors: Detecting the level of Garbage. The Ultrasonic Sensor sends out a high-frequency sound pulse and then times how long it takes for the echo of the sound to reflect back. The sensor has 2 openings on its front. One opening transmits ultrasonic waves, the other receives them. The speed of sound is approximately 341 meters (1100 feet) per second in air. The ultrasonic sensor uses this information along with the time difference between sending and receiving the sound pulse to determine the distance to an object.

It uses the following mathematical equation:

$$\text{Distance} = (\text{Time} \times \text{Speed of Sound})/2$$

Time = the time between when an ultrasonic wave is transmitted and when it is received.

To measure the distance to an object, the time from transmission of a pulse to reception is measured and converted into arrange by knowing the speed of sound. This signal together with noise is then passed through various forms of signal processing, which for simple sensors may be just energy measurement. It is then presented to some form of decision device that calls the output either the required signal or noise. This decision device may be an operator with headphones or a display, or in some systems this function may be carried out by software. Further processes may be carried out to classify the target and localize it, as well as measuring its velocity. Some ultrasonic sensors have multiple beams to provide all round cover while others only cover an arrow arc, although the beam may be rotated, relatively slowly, by mechanical scanning.

GSM Modem: GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily using GSM as shown below.

The modem can either be connected to Arduino microcontroller through RS232. It can be used to send and receive SMS or make/receive voice calls. It can also be used in GPRS mode to connect to internet and do many applications for data logging and control. This GSM modem is a highly flexible plug and play quad band SIM900A GSM modem for direct and easy integration to RS232 applications. Supports features like Voice, SMS, Data/Fax, GPRS and integrated TCP/IP stack.

Liquid Crystal Display: To display the dustbin location.

A liquid crystal display (LCD) is a display module with liquid crystals and backlight by LEDs. A 16x2 LCD display consists of two rows of display with each row consisting of 16 characters. LCD Module has 16 pins and operates

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with 5V. Power pins i.e. pins 1, 2, 3, 15 and 16 are used to supply for the module as well as the backlight LEDs. The voltage to the Contract Adjust Pin (Pin 3 or VEE) is usually given from a Potentiometer and will or battery to get started. The major advantage is control multiple appliances with a single board.

Software Requirements:

Arduino IDE: The Arduino is open source Integrated Development Environment or Arduino Software (IDE). It contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus.

Writing Sketches: Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom right hand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor. Arduino Language is user friendly and for programming is merely a set of C/C++ functions that can be called from your code.

III. DESIGN AND IMPLEMENTATION:

The project can be divided into two modules, one is detection of garbage level and then the second module is send the information to the corresponding officials through GSM.

Description of project: Garbage level detection is the done by ultrasonic sensors (HC-SR04).The ultrasonic sensors is placed on top of the dustbin facing the bottom. The sensors continuously emits the sonic waves, when the sonic waves hit the object and reflect back, the echo in the sensors senses the waves and calculates the distance of the object. Arduino Mega 2560 is used for controlling whole the process detecting garbage in different places and depending on the program first display in LCD to reminding the garbage level in the bin even though the garbage is not take out from the bin then the particular bin information is sent to higher officials through GSM.

IV. CONCLUSION

Garbage monitoring systems are the needs of Smart buildings. Smart waste monitoring and management is the keen idea of smart city planners. Garbage monitoring systems is a new idea of implementation which makes a normal dustbin smart using sensors for garbage level detection and sending message to the user updating the status of the bin. As soon as the dustbin is full it gives the information in LCD and sent the message to corresponding officials.

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