

GARBAGE MONITORING SYSTEM

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ABSTRACT:

Smart Garbage Monitoring system is a mechanism of managing the garbage using IoT tools. A real-time garbage bin is monitored by this system and send its live condition and location to garbage management authority. This system consist of IoT tools, sensors, screen, GSM device and a GPS device. The objective of this paper is to introduce use and application of smart garbage monitoring by replacing dustbin with smart bins. Smart Garbage Monitoring system is a best way to reduce the mismanagement of garbage in the cities.

INTRODUCTION: In the last few year the rapid growth of population and urbanization of most of the cities is held, so as in result the garbage or home waste and waste from different field is also increased. Now a days the project of smart city is also at its height. To keep that smart city clean there is requirement for Smart waste management. The Garbage monitoring system is for smart buildings, buss stand, Hospitals, Schools, Colleges and the different location of smart cities. Garbage monitoring system is improvement of normal dustbins by a smart dustbin which will be consist of different sensors and ultrasonic sensor for garbage level detection, display and sending message with a GSM modem.

Those smart dustbin will carry indicator light as:-

1. Empty dustbin
2. Low level
3. Medium level
4. Dustbin full

And the level of dustbin will get by the ultrasonic sensor which will be mounted at the top of bin and it will calculate the level of the garbage inside that bin. When the dustbin will be full of garbage it will light the 4th LED showing as the dustbin is full and display the message on screen. The program is burned in the microcontroller with the help of Arduino software (IDE). And will send a message as "Dustbin is full" with its live location to its concern depart person using the updated status of dustbin by GSM and CDMA module. And then department truck will follow the address of that particular dustbin or department will notify a truck nearby those dustbin. As in result the time and fuel will also be saved. This system can bring a revolution for the coming smart cities.

OBJECTIVES:

- To minimize the garbage problem in cities.
- To efficiently use the resource and less human intervention.
- To keep city clean.

SCOPE AND APPLICATIONS:-

Some of its applications and scopes are as follows :

The system is useful in monitoring the garbage collection process

This system can be installed at public places to maintain sanitation

This system is equipped with real-time indicator which give live indication of particular bin.

It minimizes fuel consumption and optimizes time.

This system enables the workers to fix their daily schedule.

PROPOSED SYSTEM:

In 'smart garbage management system' system, the level of garbage in the dustbins is detected with the help of Sensor systems, and communicated to the authorized control room through GSM system. Microcontroller is used to interface the sensor system with GSM system. In this system, the Ultrasonic sensor is used for garbage level detection by using ultrasonic sound waves. GSM module is used for communication purpose, to send message to the higher officials when the dustbin is not cleaned. LCD is used to display the location of the dustbin is full at the control room. Arduino board is used to interface the sensor, LCD and GSM module. The ultrasonic sensor is act as level detector. The output of level detector is connected to the microcontroller. Depending on the microcontroller program in first level the dustbin filled information is displayed on LCD and in second level if the dustbin is filled not at cleaned then message send to the higher officials. The AT commands are used to facilitate the messaging service through the GSM Module. This program is burned in the microcontroller with the help of Arduino software (IDE). These messages consist of information of garbage levels of respective dustbins. Depending on the information

sent to control room, the authority informs the concern person of the respective area

about garbage level. Then the concerned person makes sure that the garbage of that particular area is collected by sending the cleaning vehicles.

HARDWARE REQUIREMENTS:

The hardware requirements for the system are as follows.

Ultrasonic Sensors: Detecting the level of Garbage.



Fig.1 Ultrasonic sensor

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

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

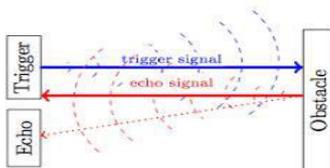


Fig. 2 Ultrasonic sensor transmitting and receiving waves

To measure the distance to an object, the time from transmission of a pulse to reception is measured and converted into distance 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 arc, although the beam may be rotated, relatively slowly, by mechanical scanning.

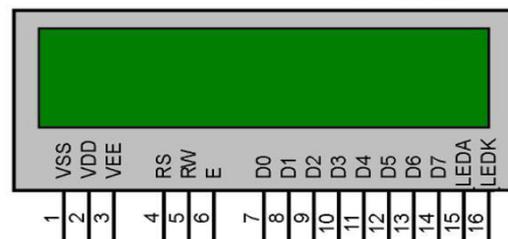
GSM Modem: GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote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



Fig.3 SIM900A GSM modem

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 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 Contrast Adjust Pin (Pin 3 or VEE) is usually given from a Potentiometer and will control the contrast of the actual display when the POT is adjusted. There are 8 data pins for transmitting 8bits of data i.e., 1 byte of data at a time. The LCD can be used in either 8bit mode or 4bit mode. The remaining three pins i.e. RS (Pin 4), RW (Pin 5) and E (Pin 6) are called the Control

Pins and are very important pins. The RS pin, which is short for Register Select pin, is used to select either Instruction Register when it is LOW or Data Register when it is HIGH. The RW pin or the Read/Write Pin is used for selecting Read Mode or Write Mode. When RW is HIGH, read mode is selected and data is read from the register. When RW is LOW, write mode is selected and data can be written in to the register. Since we are using the write mode only, we can connect the RW pin to ground (through a pull down resistor). The Enable (E) pin, as the name indicates, is used to enable the execution of the data or instructions. The data or instruction are executed by the LCD module only when a HIGH to LOW pulse is given to the Enable pin i.e. only on the falling edge of a pulse.

Arduino Mega 2560 Board: As shown in Fig.5 the Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The major advantage is control multiple appliances with a single board.

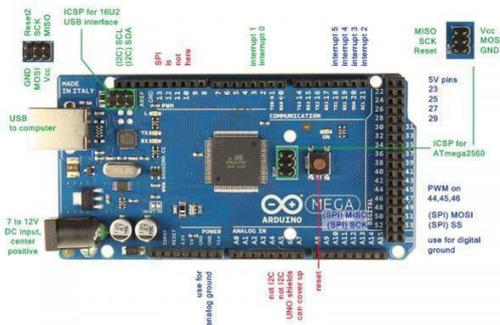


Fig.5 Arduino Mega 2560 Board

Specifications	Arduino mega2560
Processor	ATmega 2560
Flash Memory	256 KB
Data Memory	8 KB
EEPROM	4 KB
Digital I O Pins	54
PWM outputs	15
Analog outputs	16
Clock Speed	16 MHz
Serial Ports	4

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.

DESIGN AND IMPLIMENTATION

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.

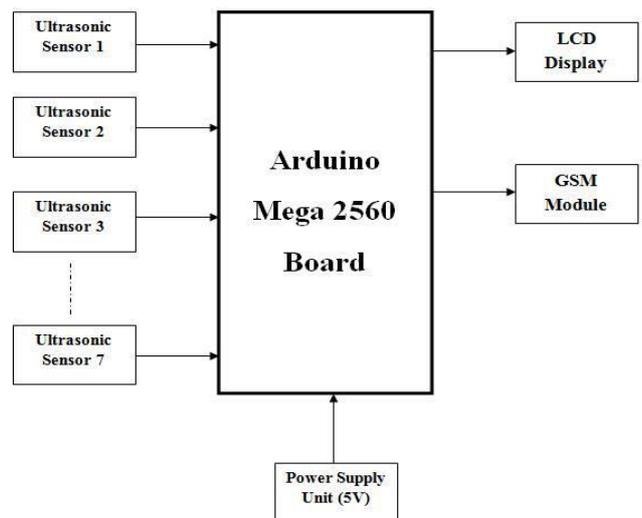


FIG.6 BLOCK DIGRAM OF GARBAGE MONITORING SYSTEM

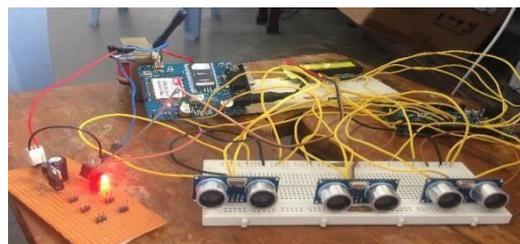


Fig. 7 Implementation of Garbage monitoring system

DESCRIPTION OF PROJECT: In first phase of project ultrasonic sensor emits the waves by transmitter and receives it back after reflection and thus calculates the distance of a particular object. Second phase of project includes functionalities of Arduino 2560. Arduino Mega 2560 is used for managing and handling all the process from displaying the garbage level on LCD screen to sharing the location with higher authorities.

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.

FUTURE SCOPE

There is a great scope for the modifications of the Garbage monitoring system in future. The system can be improved by adding new functionalities like line follower robot to it, when the bin is full directly it is dumping on tipper.

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