

Automatic Garbage Maintenance System

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Abstract: — Factors like economics and population density affects waste management methods and also it complicates the current situation which tends to vary from region to region. The overflow of garbage in public areas creates the unhygienic conditions in the nearby surrounding. To avoid such conditions, 'The automatic garbage maintenance system' is proposed. In this proposed system, the level of garbage is detected with the help of Sensors and communicated to the authorized control room through GSM system. Also, accumulation of garbage in a particular corner is avoided by rotating or tilting it with the motor. Microcontroller is used to interface the sensor system with GSM system. A GUI is also developed to monitor the desired information related to the garbage for different selected locations.

Keywords: -- GSM, IR level Sensors, GUI, Motors

I. INTRODUCTION

Due to rapid population growth, waste management has become a global problem. The Central Public Health and Environmental Engineering Organization has estimated that waste generation in India is as much as 62 million tonnes per day.[1] These statistics mean that India could be generating as much as 27 million more tons of waste than the U.S per year.



Fig. 1. Arduino uno R3 Board

Government of India have struggled for years to find a way to manage the country's ever increasing amount of garbage. According to the survey carried out in 2014 the garbage produced in Chennai is 6404 tons per day. Solid Waste Management (SWM) expenditure outlay in the year 2012-13 is Rs.19479.3 Million. But still the overflow of garbage prevails. To avoid this issue, the automatic garbage maintenance system is being developed[2]. System description is discussed in section II. Section III includes the block diagram of the project

work, Section IV includes implementation of the project and section V include graphical user interface.

II. SYSTEM DISCRPTION:

For the garbage detection, weight sensors can be used. It gives the weight of the garbage in the dustbin[3]. But it doesn't provide any information about the level of the garbage in the dustbin. So Infrared (IR) sensor is used to detect level of garbage[7]. Also a motor is used to rotate or tilt the dust bin if garbage is being accumulated in one particular corner. IR sensor radiates light which is invisible to the human eye because it is at infrared wavelengths, but it can be detected by electronic devices. IR sensor section consists of the IR transmitter and IR receiver. IR transmitter consists of LED which send the IR beam. To receive this beam IR receiver, TSOP1738 is used. The output of TSOP1738 directly connected to the microcontroller and it has high immunity against ambient light and other electrical disturbances. It is able to transfer data up to 2400 bits per second. It needs the power supply of 5V. Output of receiver will be low when 38 KHz infrared light fall on it. IC 555 is used to design the IR transmitter of 38KHz.

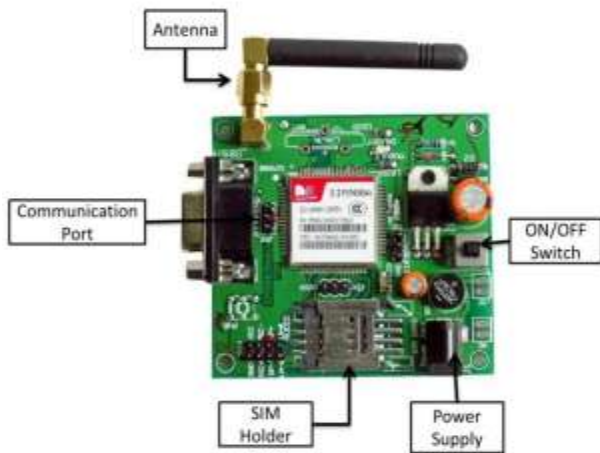


Fig. 2. GSM Modem

Microcontroller is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. It is used in automatically controlled products and devices, such as automobile engine control systems, remote controls appliances, power tools and other embedded systems. Microcontroller Arduino uno R3 is used in this work. Figure1 shows the Arduino uno R3 board used for programming which includes Microcontroller Ardino Uno R3. This Microcontroller is a high-performance 8-bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities, 1KB EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, SPI serial port, 6-channel 10-bit A/D converter For communication purpose ZigBee technology can also be used in the transmitter section [4].

ZigBee is a wireless networking standard that is aimed at remote control and sensor applications which is suitable for operation in harsh radio environments and in isolated locations. But, the disadvantage of ZigBee is short range, low complexity, and low data speed[6]. A GSM modem is a specialized type wireless modem that works with a GSM wireless network. It accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. A GSM modem can be an external device or a PC Card. An external GSM modem is connected to a computer through aserial cable or a USB cable. When a GSM modem is connected to a computer, this allows the computer to communicate over the mobile network. While these GSM modems are most

frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS message. GSM Modem sends and receives data through radio waves. In this project GSM 900 modem is used to send the message which is shown in figure 2. It consists of a GSM/GPRS modem with standard communication interfaces like RS-232 (Serial Port), USB, so that it can be easily connected to the other devices. A rotator is used to rotate the bin if the garbage is accumulated at particular corner. Since the garbage can is provided with the wheels, rotation can be done easily. A stepper motor is attached with the wheels for rotation. The power supply circuit is also built in the module that can be turn ON by using a suitable adaptor.

III. BLOCK DIAGRAM:

A. Transmitter sections: The Figure 3 shows the block diagram of transmitter section. Level detector consists of IR sensors which is used to detect the level of the garbage in



Fig. 3. Transmitter Section

The dustbin. The output of level detector is given to microcontroller. Four IR sensors are used to indicate the different levels of the amount of the garbage collected in the dustbin which is placed in public area. Control room via GSM module as shown in figure 6.

B. Recevier sections: The figure 4 shows the block diagram of receiver section. At receiver, control room is present where all the activities are manage. The number of the control room is depends on the dustbins present in the area. The person sitting in the control room monitors the entire system. A GSM Module is connected to the computer of the control room through microcontroller [5]. The entire system is monitor by the person sitting in the control room. The same GSM Module is used to send the message to the contractor for cleaning the dustbin. GUI is developed using MATLAB software. This GUI will be displayed on the computer screen in the control room to display the status of the garbage level in the dust bin as

shown in figure 6.

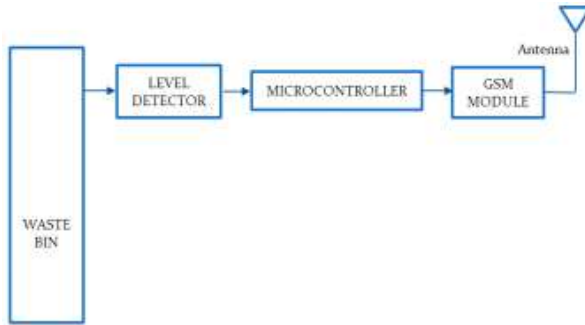


Fig. 4.Receiver Section

IV. IMPLEMENTATION OF PROJECT:

The figure 5 shows the circuit diagram of IR transmitter using the IC 555. Since the PCM carrier frequency of TSOP1738 is 38 KHz, so to transmit the accurate beam, IC555 is used in “Astable Multivibrator” mode. This is achieved by using two resistors (R1 and R2) and the capacitor (C). The value of resistors and capacitors are calculated using the following equations.

$$T_{high} = 0.693(R1+R2)C, T_{low} = 0.693R2 C$$

$$T = T_{high} + T_{low}, F = 1/T$$

Where T_{high} and T_{low} are the time period for which the output of IC555 is HIGH and LOW respectively; T is total time period of the output of IC555 and “F” is the output frequency. Output of the circuit shown in figure 5 is IR beam and it is taken from IR LED. Furthermore this beam is used to detect the garbage level. The IR sensor arrangement is act as level detector. When the garbage is accumulated to a certain level the rotator rotates and the dust bin is rotated or it is tilted so that the level is maintained. The output of level detector is given to the microcontroller (as shown in figure 3). 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) v1.6.1. 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.

V. GRAPHICAL USER INTERFACE:

GUI is a graphical user interface which provides a user friendly environment to carry certain operations. The GUI for smart garbage management system proposed by authors is developed using MATLAB 2010 software and discussed in this section. In this paper, GUI is used to display different parameters and information regarding the garbage and garbage collection viz. location of dustbin, status of the dustbin, date & time of garbage collection. The GUI has also the provision to display the name and mobile number of the contractor, who is responsible for cleaning the dust bin of particular location.

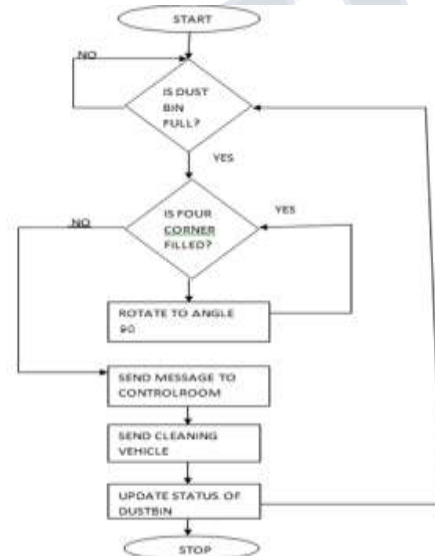


Fig. 5. Flow chart of working

VI. CONCLUSION

This paper shows the implementation of garbage management system using IR sensor, microcontroller, rotator and GSM module[7]. This system assures the cleaning of dustbins soon when the garbage level reaches its maximum. If the dustbin is not cleaned in specific time, then the record is sent to the higher authority who can take appropriate action against the concerned contractor. This system also helps to monitor the fake reports and hence can reduce the corruption in the overall management system. This reduce the total number of trips of garbage collection vehicle and hence reduce the overall expenditure associated with the garbage collection. It ultimate helps to keep cleanness in the society. Therefore, the smart garbage management system makes the garbage collection more efficient The

use of solar panels in such systems may reduce the energy consumption. Such systems are vulnerable to plundering of components in the system in different ways which needs to be worked on.



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