

Dust Bin Monitoring System

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Abstract: As the second most populous country in the world India face a major problem in waste management. As of now there are traditional waste management systems like periodic and routine clearing by the various civic bodies like the municipal corporation. But even though these routine maintenances is carried out we often come across overflowing garbage bins from which the garbage spills on to the streets. This happens because as of now there is no system in place that can monitor the garbage bins and indicate the same to the corporation. In this project, we aim at an automatic garbage level detecting system informing the concerned authorities timely and also classification among the wastes aiding efficient waste management.

Index Terms: GSM, IR Module, PIC Microcontroller.

I. INTRODUCTION

In the present scenario, we only have conventional garbage disposal by periodic overflowing checks by local authorities, leading to garbage bins. All types of wastes are also seen to be dumped together. In this project, we aim at an automatic garbage level detecting system informing the concerned authorities timely and also classification among the wastes aiding efficient waste management. Here we are classifying waste into 3 categories:

- Biodegradable waste
- Recyclable waste
- Plastic waste

Whenever the garbage is full information can be send to the concerned authority to clean the bin. Here we use a low maintenance recent communication development like GSM. GSM is used in the project as a communication back bone for the whole system for various reasons like low cost, easy to implement and less signal deterioration. Hence these networks can work even with very low power. Suppose this project is being implemented in a city and the different garbage bins placed at different locations within a city send messages indicating the garbage levels in the respective bins to a local corporation office and at the same time to the head office as well. This adds to the social relevance of the project as it can also act as an automatic double check on the efficient functioning of the local authorities by the head office.

For the implementation over a wide area, we may resort to the use of flexible connecting networks like MANET. Thus a dynamic multihop network may be setup which allows internode communications and a GSM modem may be provided to a root node where the messages forwarded from all other nodes may be combined and then send to the destination. This results in increased complexity of the networks and also adds to the installation cost.

In the proposed project for security purposes, the keypad and the LCD display may be interfaced only during the initial setup and then they may be removed. This thus allows only authorized users to alter the installed system.

II. SYSTEM WORKING

A. BLOCK DIAGRAM

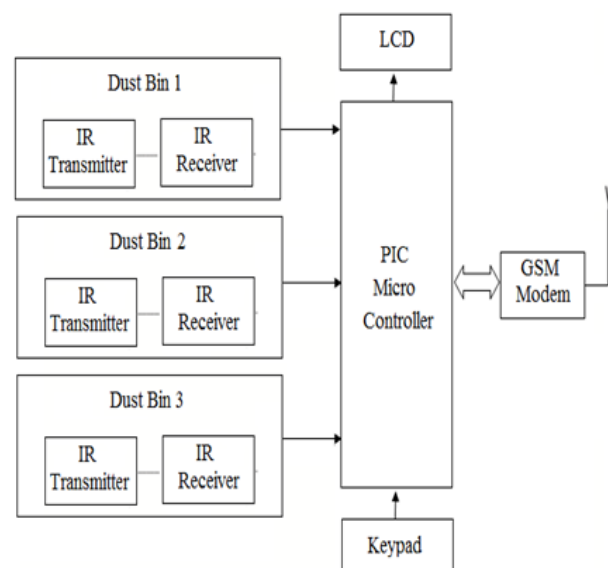


Fig.1. Block diagram

B. BLOCK DIAGRAM DESCRIPTION

In case of a high signal from the IR module, we consider the garbage is empty. When the IR rays are cut, it gives a low signal, and if it persists for 10 seconds, the garbage is full and the message is send to the concerned authorities. If the low signal persists for less than 10 seconds, the interrupt is considered to be an error and is discarded. The dustbin full signal reaches the microcontroller which is then displayed on the LCD screen. The dustbin full message indicating the corresponding bin is then send to the GSM modem which is then forwarded to the authorized user. The message can be passed on to N number of users. The mobile number of the permanent users is included in the code burned into the microcontroller chip. In the long run the mobile number of the temporary users may be newly entered or altered with the help of the interfaced keypad.

C. FLOW CHART OF CODE

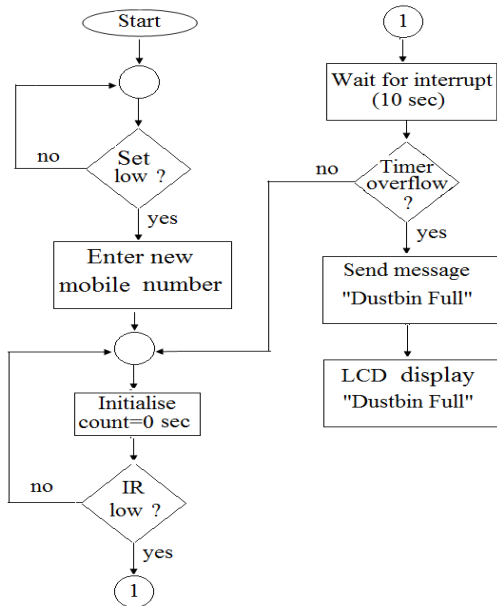


Fig.2. Flowchart

III. MOTIVATION

One of the most common scenarios in residential and over populated urban areas are garbage bins overflowing on to the streets causing environmental pollution and unhygienic living conditions. This is mainly due to the conventional periodic cleaning routines by the local authorities without taking the waste disposal rate of the respective areas into account. There are also chances of unwanted manual checks in areas where the garbage bins have not yet been filled. This gave rise to the need of an automatic garbage bin monitoring system which provides timely updates to the concerned authorities. Thus the waste disposal rate of the region is also taken into consideration which avoids the unwanted periodic checks by the local authorities.

IV. HARDWARE DESCRIPTION

A. PIC16F877A

PIC 16F877A is one among the most advanced microcontrollers from Microchip. It is widely used for experimental and modern applications because of its low price, multiple features, high quality, and ease of availability. Its areas of applications are machine control applications, measurement devices, study purposes and so on. The PIC 16F877A includes all the components which modern microcontrollers normally have. The figure of a PIC16F877 chip is shown below.



Fig.3. PIC 16F877A

Some of its attractive features are high performance RISC CPU, clock input of 200MHz and an instruction cycle of 200ns. It can have up to 368x8bit of RAM (data memory), 256x8 of EEPROM (data memory) and 8kx14 of flash memory. It provides an interrupt capability up to 14 sources, wide operating voltage range from 2.0 – 5.56 volts and also low power consumption.

B. IR MODULE

Infrared radiation is the portion of electromagnetic spectrum with wavelengths longer than the wavelengths of visible light, but smaller than microwaves. The region roughly from 0.75 micrometre to 1000 micrometre constitutes the infrared region. It works with an operating voltage of 5v. Transmitter flashes an IR light in a particular pattern, receiver component can pick up and translate into an instruction. The detection range of the IR module is 1.5 m. The basic working of an IR module is to transmit the IR signal (radiation) in a direction and a signal is received at the IR receiver in the absence of obstacles. Else the IR radiation bounces back from the surface of the obstacle. The applications of the IR module include air conditioning control, TV control, and remote control.



Fig.4. IR Module

C. GSM MODULE

The GSM modem is used to send/receive messages and make/receive calls just like a mobile phone by using a SIM card by a network provider. The communication uses AT commands. GSM modem can work with any GSM network operator SIM card. The advantages of using this modem is that its RS232 port can be used to communicate and develop embedded applications like remote control and logging. It has a supply voltage between 3.4V and 4.5V. This modem can be either connected to PC serial port directly or to any microcontroller through MAX232. It is a highly flexible plug and play quad band SIM900A.



Fig.5. GSM Module

D. LCD MODULE

A liquid-crystal display (LCD) is a flat-panel display or other electronic visual display that uses the light-modulating properties of liquid crystals. Liquid crystals do

not emit light directly. It is very compact and light. It has low power consumption. Depending on the set display brightness and content being displayed, the older CCFT backlit models typically use 30–50% of the power a CRT monitor of the same size viewing area would use, and the modern LED backlit models typically use 10–25% of the power a CRT monitor would use.

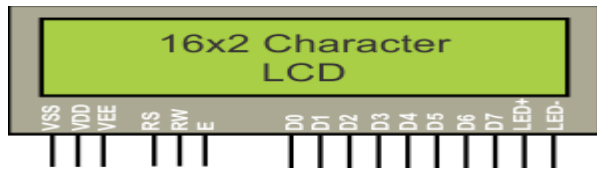


Fig.6. LCD Display

E. KEYPAD

A keypad is a collection of buttons or keys arranged in block or pad which usually bear digits, symbols and a complete set of alphabetical letters. If it mostly contains numbers, it can be called a numeric keypad. It is a limited but compact form of a keyboard which may be handheld with 12 or 16 numbers of pressure sensitive areas or captioned buttons. Keypads are found on alphanumeric keyboards, calculators, telephones, combination locks and digital door locks.

One can manually design a keypad with required number of keys. For security purposes one may not label the keys and thus the functioning of the keys are only known to the authorized users. Such keypads may be often used to prevent tampering or unauthorised access of secure systems.

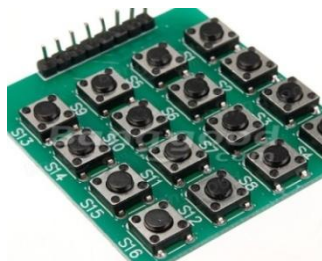


Fig.7. Keypad

IV. MERITS AND DEMERITS

MERITS

Automatic garbage level detection prevents overflow. The use of GSM for communication provides reliable data transmission over long range. By the implementation of this project, more than one receiver can be informed about the garbage overflow. It also aids in effective management of waste. Once installed, the maintenance cost of the system is low. In addition, there is also the provision to alter the receptors of the message, when required.

DEMERITS

To prevent any sort of tampering of the system by the public when kept in the open, the modules should be enclosed in a secured compartment providing access only to the authorized. Disposed large sized waste objects may obstruct the IR rays resulting in error messages.

V. FUTURE SCOPE

GPS can be used to pinpoint the exact location of the waste bin. Solar panels or nearby power lines can be used to power the entire system. Higher authorities can check the functioning of local bodies by monitoring the empty state of bins. One can incorporate an voice detection sensor IC to automatically open the lid upon voice activation. In an urban area with Wi-Fi access one can send the messages to the destination via the internet connectivity. When considering a region with excessive waste disposals, one can make use of a load cell by providing a threshold value to detect the full condition of the garbage bin and also provides more accurate results.

VI. CONCLUSION

It is an automatic dust bin monitoring system in order to detect the full condition of the garbage bins. This provides the authorized users timely updates of the status of the garbage bins and thus eliminates the need of periodic manual checks and overflowing garbage bins. This project also provides an additional feature to add new message receivers or alter the existing authorized users. It also aims at classification of different waste and thus promoting waste management.

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