

Article

Smart Garbage Monitoring System

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How to cite this article:

Salian S, Singh S, Naik A. Smart Garbage
Monitoring System. *J Adv Res Microelec VLSI*
2020; 2(2): 19-22.

Date of Submission: 2020-12-03

Date of Acceptance: 2020-12-19

A B S T R A C T

The aim of this system is to construct innovative system to overcome the problems which is related to the garbage. This system is motivated from normal garbage collection system. Here, there is a new mechanism to handle overloaded garbage tank. This mechanism is nothing but the 'compressing mechanism' and the main purpose of this system to monitor garbage and whenever the garbage tank is full it starts its mechanism. This mechanism compresses the garbage and formed sheets. There are various sensors are used to monitor every condition of garbage tank and sheet collection bin. It is based on the PIC Microcontroller and GPRS Modem. Data which is to be obtained by monitoring garbage tank and sheets collection tank are uploaded to the web server via GPRS Modem. This system specially designed to reduce human efforts and to increase garbage tank capacity in overcrowded area. It uses concept of Internet of Things.

Keywords: PIC Microcontroller, IR Sensor, Ultrasonic sensor, GPRS Module, Compressor

Introduction

The term of Internet of Things (IoT) was first invented in 1998 which is a network of networks where characteristically, a large number of objects or sensors are connected complete communications and information infrastructure to make available value-added facilities. It assured in creating a world where all the objects around us are connected to the web and thus the communication to every other with minimal human intervention. The aim is to make a far better world for citizenry, where the objects around us understand our desire and hence act accordingly with nonexplicit instructions. Smart bin targets an important aspect of its solution the gathering of waste. Smart bin bears following features

- Pioneering design to reduce chances of collaboration of waste with atmospheric agents.
- Compaction of waste to increase capacity of trash bin.
- Wireless status update to the central municipal server.
- Easier provision for removal of bin.

In this paper IOT Garbage Monitoring framework might be

an inventive framework which can assist with remaining the urban communities clean. This framework screens the refuse receptacles and illuminates about the degree of trash gathered inside the trash containers through a web page. The website page gives a graphical perspective on the junk containers and features the refuse gathered in shading request to bring up the degree of trash gathered. IR sensors and ultrasonic sensors are likewise useful for this framework. The IR Sensor-Single is a general assurance nearness sensor. Here, we use it for collision detection. The module comprises of an IR emitter and IR receiver pair. The high precision IR receiver constantly detects an IR signal. Ultrasonic fluctuating module make available 2cm 400cm non-contact width function, the vacillating precision can reach to 3mm. The modules comprise ultrasonic transmitters, receiver and control circuit.

Problem Statement

India faces the issue of disposal of 0.9 million ton of waste it produces daily. Everyday garbage is produced from industries, workplaces and houses to dispose of. The common collection methods for waste disposal in India

are Door to door collection, Community Bins etc. These bins provided by a town or city's municipality has more garbage around it than in it. Uncollected wastes often end up in drains causing blockages that result in flooding and unsanitary conditions. Flies and mosquitoes breed in some constituents of solid wastes and they are amazingly effective vectors that spread disease.

Literature Study

This idea is motivated from the systems which are already used in Municipal Corporation. This project implements the little bit new idea, mechanism to improve system work and efficiency. The following table gives the overview of others system which are like this system table no. various papers used different mechanism to implement garbage tank. For this purpose, no of processors and communication devices used according to the specifications and applications. System became more reliable due to the use of various types of sensors, Table 1.

Table 1.Literature Study

Sr. No.	Title of Ref. paper	Technology used	Work done	Remark
1	IOT Based waste management for smart city. (Parkash.PG Diploma Student,Dept. of Embedded System Design, NIELIT, Calicut, Kerala, India) (Prabha V.IPG Diploma Student, Dept. of Embedded System Design, NIELIT, Calicut, Kerala,India)	Arduino Software is used with the help of Microcontroller 8051. And ARM7 is also used.	In this system Zigbee, ARM 7 and GSM is used to monitor garbage tank continuously. Sensors are placed at the neat position on garbage tank, when sensor sense garbage level it provides information to the ARM 7.	Data can be detected wirelessly, sensor always monitor the level of garbage.
2	Smart Dustbin-An Efficient Garbage Monitoring System (Monika K A, NikithaRao, Prapulla S B, ShobhaG. Department Comp. Science and Engg. R V College of Engineering, India)	GSM 900 is used. Minimal no smart bins is used instead of no of plenty dustbin placed in improper fashion.	GSM 900 is used for sending message purpose. For standard communication purpose GSM/GPRS is used and for interfacing MAX 232 is used.	No of advantages can be obtained such as durability, affordability etc. only using a smart bins.
3	IOTBased Intelligent Bin for Smart Cities (Meghana K C, Dept of Electronics & Comm. Engg S. J. B Institute of TechnologyBengaluru, India) (Dr. K R Nataraj Dept of E&TcEngineering S. J.B Institute of Tech. Bengaluru, India)	For the communication purpose GSM,zigbee module is used. ARM dual core processor is used for monitor purpose and various sensors are used like IR Sensor.	This system provides total guidance of garbage management system, and takes preventive action when garbage tank is completely filled.	This paper gives the solution related to the time and garbage vehicles management.

Block Diagram

This system is basically based on PIC16F877A Microcontroller. The input from various sensors goes to the microcontroller and output of microcontroller is given to the GPRS module and Compressor. The actual block diagram of system shown in Figure 1.

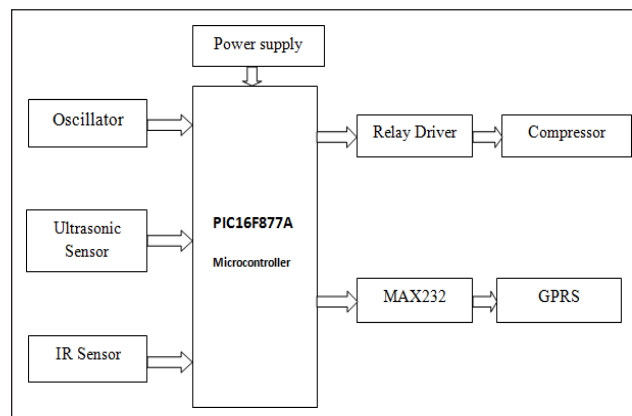


Figure 1.Block Diagram of Smart Garbage Monitoring System

Proposed Work

This system is fundamentally contingent on PIC Microcontroller, GPRS Model. The connection amid them is can be done with the help of MAX 232.

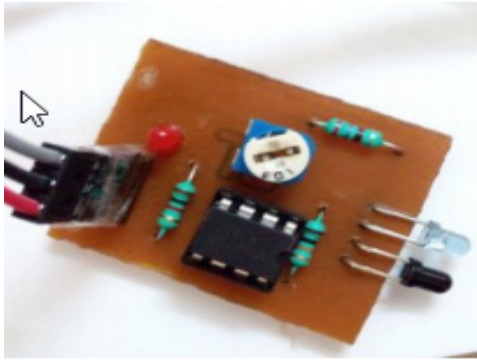
Hardware prerequisite is, PIC Microcontroller, DC Motor, IR Sensor, Ultrasonic Sensor, GPRS Module, Regulator IC. Software obligation for the system is Orcade software, MPLAB IDE Software.

PIC Microcontroller

The PIC16F876/873 devices come in 28-pin packages and the PIC16F877/874 devices come in 40-pin packages. The Parallel Slave Port is not applied on the 28-pin devices. Nearby are three memory blocks in each of the PIC16F87X MCUs. The Program Memory and Data Memory have detached buses so that concurrent access can occur and is detailed in this section. The PIC16F87X devices have a 13-bit program counter proficient of addressing an 8K x 14 program memory space. The PIC16F877/876 devices have 8K x 14 arguments of FLASH program memory, and the PIC16F873/874 devices have 4K x 14. Accessing a location overhead the really practical address will reason a wraparound. The RESET vector is at 0000h and the interrupt vector is at 0004h.

IR Sensor

The IR Sensor is a common-purpose sensor. Here we use this IR sensor for collision detection. The IR Sensor module consists pair of an IR emitter and IR receiver. The high precision IR receiver constantly detects an IR signal. The module contains LM324 comparator IC for the comparison of threshold value and output value. The output of sensor is high whenever its IR frequency and low otherwise. The on- board LED indicator helps user to check status of the sensor without using any additional hardware. Power consumption of this pair is comparatively low and output of this pair is can be obtain in digital form. Following table no.1 shows the pin configuration of IR sensor.



Ultrasonic Sensor

This ultrasonic sensor module involves of transmitters, receiver and control circuit. Range of this module is 2cm - 400cm non-contact dimension function, the precision of varying can reach to 3mm. The rudimentary employed principle of ultrasonic sensor is, by using IO trigger gives minimum 10us high level signal to receiver of sensor and then transmitter of this module mechanically send 840 kHz signal and detect the pulse signal back.



GPRS Module

GPRS module is similar as over-all GPRS Modem, but amid of those there is main alteration, A GPRS Modem is can be outside equipment, while the GPRS Module is a module that can be combined inside apparatus. It can be entrenched part of any equipment. As GSM modem is a wireless modem henceforth it the whole thing with GSM networks. A Hayes modem sends and receives data through a secure telephone line while a GSM modem sends and receives data through radio waves that is chief change amid this modems.



Compressor

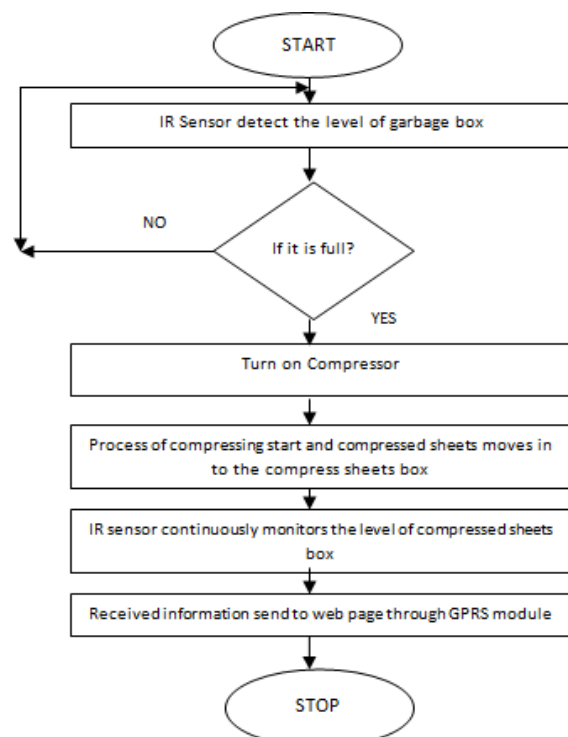
Air compressor it converts power in to the potential energy which is stored in pressurize air form. Compressor use stop button to stop motor when pressure reaches to its upper level. The two cylinders are used one for forward and backward movement and another is for upward and downward movement. By using tee both cylinders are connected to air compressor. Electric valve is also for to connect compressor tubes to cylinder. Upward and downward cylinder compressed the garbage and forward and backward cylinder move the formed sheet in to sheet collection been. For to compressed garbage 2 to 8 bar pressure is required. It will be changes regarding to garbage quantity and condition. Here, 5*2 electric valves is used to control, monitor the pressure which is comes from air compressor.

Flowchart and Algorithm

Algorithm

- Start
- Initialize the system.
- Use the ultrasonic sensor to know the level of garbage in garbage box.
- If it's full using compressing mechanism compress the garbage & form sheets.
- Check the level of sheets using IR sensor.
- Send the data level to the web source using GPRS module.
- Stop.

Flowchart



Advantages

- Data can be detected wirelessly; sensor always monitor the level of Garbage.
- No. of advantages can be obtained such as durability, affordability, etc. only using a smart bin.
- This paper gives the solution related to the time and garbage vehicles management.
- It has described the development of a smart garbage monitoring system, which is based on PIC microcontroller.
- It is very useful in improving the efficiency of solid waste disposal management especially in the flat residential area, where the garbage piles at the bins are one of the resident's major concerns owing to its ability to continuously measure the garbage level in the bin and alerting the municipality for immediate collection.

Conclusion

By implementing this system cost will reduce. Resource optimization can be done. This system is useful for increasing the capacity of garbage tank by using compressing method. The trash compactor is a machine that is used to compact garbage which is the main reason for this Project There are a lot of benefits from compacting the garbage and these benefits depend on the compression capability of this compactor.

Acknowledgment

We express our sincere thankfulness to our Mentor Prof. Sneha Rane for her successful guidance to our research paper. Without the help it would be a tough job for us to accomplish this task. We thank our mentor for his consistent guidance, encouragement, and motivation throughout our period of work.

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