

Smart Electronic Garbage Management System- Based IOT

Pankaj Agarwal, Shreeya Sharma, Lavanya Gupta, B. Manideep

Abstract: This paper aims to provide an overview of the voluntary approaches towards enhancing the design of a smart dustbin for the implementation of advanced waste management systems. In most of the places, the Municipal garbage bins are overflowing and they are not cleaned at proper time. As a result of which the consequences are severe. It includes overflow of garbage which results in land pollution, spread of diseases, also it creates unhygienic conditions for people, and ugliness to that place. There needs to be system that gives prior information of the filling of the bin that alerts the municipality so that they can clean the bin on time and safeguard the environment. To avoid all such situations we intend to propose a solution for this problem "Smart Garbage Bin", which will alarm and inform the authorized person by buzzer and alert system when the garbage bin is about to fill. To avoid all such unhygienic circumstances we are going to implement a project based on iot called smart trash management by interfacing an trash bin with infrared sensors, lcd, buzzer, wifi modules via an arduino atmega. The current status of trash bin is depicted by sensors and automatically updates garbage level on html page with the help of a wifi module. The main objective of this paper is to propose a plan to reduce human effort and resources along with the enhancement of smart city vision and to maintain a pollution free environment around our homes and specially in public places

Keywords: Smart Garbage Bin, Level of Garbage Detection, Wifi Module, Update Garbage level, Buzzer and Alert System, Smart City Vision.

I. INTRODUCTION

Trash and garbage is a common sight in urban and rural areas of India. It is a major source of pollution. Indian cities alone generate more than 100 million tons of solid waste a year. Street corners are piled with trash. Public places and sidewalks are despoiled with filth and litter, rivers and canals act as garbage dumps. In part, India's garbage crisis is from rising consumption. India's waste problem also points to a stunning failure of governance. The tourism regions in the country mainly hill stations are also facing this issue in the recent years. In 2000, India's Supreme Court directed all Indian cities to implement a comprehensive waste-management programmed that would include household collection of segregated waste, recycling and composting.

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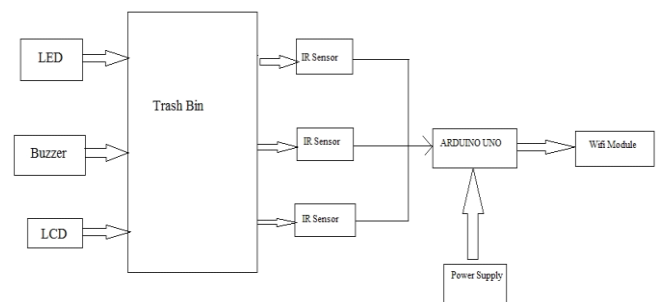
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These directions have simply been ignored. No major city runs a comprehensive programmed of the kind envisioned by the Supreme Court. This is not an original idea, for the implementation of smart garbage bin; the idea has existed for many years, After the IoT field finding its grip in our lives. This is, however an original plan for designing a smart garbage bin with IR sensor and Wi-Fi module for transmission of data. Keeping these causes and statistics in mind, we have tried to incorporate a mechanism which mandates the need of implementation of such smart electronic dustbins which can protect our surroundings from hazardous conditions. In case of an overflow in dustbin, we have implemented a buzzer system which warns the surrounding through wifi module. In most of the cases, overflowing bins ends up inviting stray dogs, rats, mosquitoes spreading dangerous diseases like malaria, plague, etc.. With this, municipality would be warned as the dustbin reaches certain levels and can take necessary steps to dump it properly. It automatically sends details or level of garbage on a webpage with the help of a wifi module using the same IP address of the router. Considering Wifi module, we chose it as the platform for transmission of data regarding garbage level. The information is sent to the authorities for immediate action.

II. METHODOLOGY



Through our project, we are trying to implement a system in the dustbin with the objective to avoid its overflow, thus causing various diseases. Also, enhancing the environment with neatness. The system architecture is divided into various parts- LCD, LED, BUZZER, IR SENSORS, ARDUINO UNO, POWER SUPPLY, WIFI MODULE.

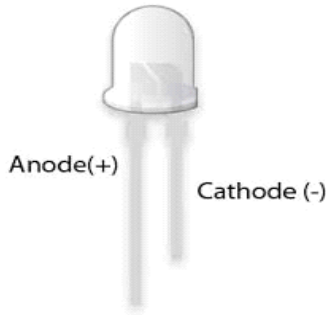
- The garbage will be put inside the trash bin and its level will be detected by the infrared sensors.
- The LED will light up at different levels, indicating the amount of trash bin filled up by garbage.
- The LCD will display the capacity of the trash bin filled up by garbage.
- When the trash bin is filled up to 80% of its capacity, the buzzer will start ringing.

- A message, indicating that the trash bin is almost filled up, will be sent to the desired device using the wifi module Node Mcu.

III. CIRCUIT DIAGRAMS

LED A light-emitting diode (LED) is a semiconductor device that emits visible light when an electric current passes through it. The light is not particularly bright, but in most LEDs it is monochromatic, occurring at a single wavelength.

- The output from an LED can range from red (at a wavelength of approximately 700 nanometers) to blue-violet (about 400 nanometers). Some LEDs emit infrared energy (830 nanometers or longer); such a device is known as an *infrared-emitting diode* (IRED).



- An LED or IRED consists of two elements of processed material called P-type semiconductors and N-type semiconductors.

Arduino UNO/Genuino Uno is based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, 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 a AC-to-DC adapter or battery to get started.. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases.



A. Specification:

Microcontroller	A Tmega 328p
Operating Voltage	5V
Input Voltage (recommended)	7-12V

Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P), 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
LED_BUILTIN	13
Length	68.6 mm
Width	53.4 mm
Weight	25 g

B. Programming:

The Arduino/Genuino Uno can be programmed with the (Arduino Software(IDE)). Select "Arduino/Genuino Uno from the Tools > Board menu (according to the microcontroller on your board).The ATmega328 on the Arduino/Genuino Uno comes preprogrammed with a bootloader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol.

C. Warnings:

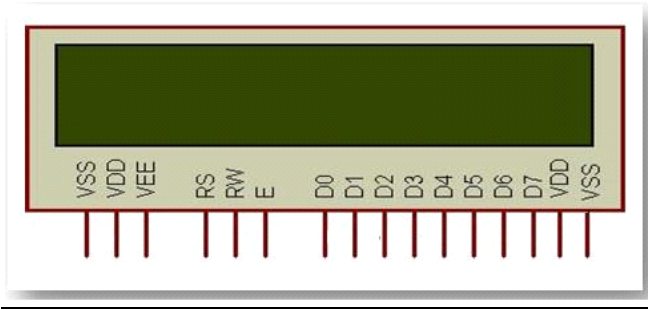
The Arduino/Genuino Uno has a resettable polyfuse that protects your computer's USB ports from shorts and over current.

LCD (Liquid Crystal Display) It is an electronic display screen module. A LCD 16x2 display is a basic module. The modules have been chosen over seven segments and many multi segmented LEDs. There are economical and easy to program and have no limitations of displaying special as well as custom characters, animations and etc. A **16x2 LCD** can display about sixteen characters per line. There are two such lines. Command and Data are the two registers of the LCD. 16x2 LCD has 2 horizontal line which comprising a space of 16 displaying character.



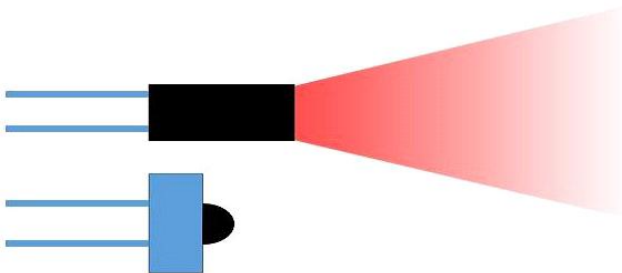
It has two type of register inbuilt that is

- Command Register- Command register is used to insert a special command into the LCD.
- Data Register- While Data register is used to insert data into LCD.

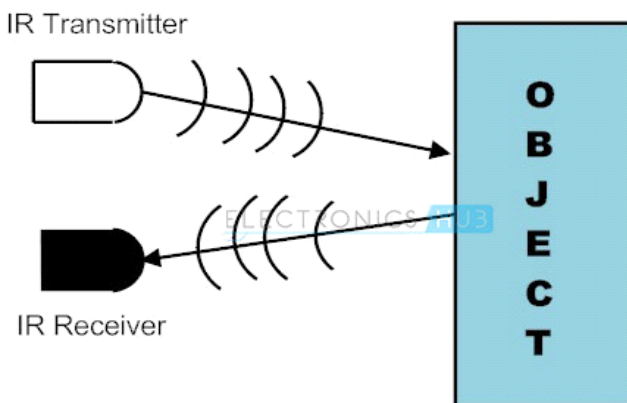


D. Pin Diagram of LCD:

- **IR Sensors** It uses a light sensor to detect a selected light wavelength in the Infra-Red (IR) spectrum. Infrared sensor is a sensor that used to detect present and absent of a particular object. It use a specific light in the Infrared spectrum. An LED released an infrared light and the light emitted will be detect by the sensor. Fig shows there is no object present in front of the sensor whereas Figure shows there is an object present in front of the sensors.



Types of IR Sensors - Infrared sensors can be passive or active. Passive infrared sensors are basically Infrared detectors. Passive infrared sensors do not use any infrared source and detects energy emitted by obstacles in the field of view. They are of two types: quantum and thermal. Active infrared sensors consist of two elements: infrared source and infrared detector. Infrared sources include an LED or infrared laser diode. Infrared detectors include photodiodes or phototransistors. The energy emitted by the infrared source is reflected by an object and falls on the infrared detector.



IR Transmitter is a light emitting diode (LED) which emits infrared radiations. Hence, they are called IR LED's. Even though an IR LED looks like a normal LED, the radiation emitted by it is invisible to the human eye.

The picture of a typical Infrared LED is shown below.



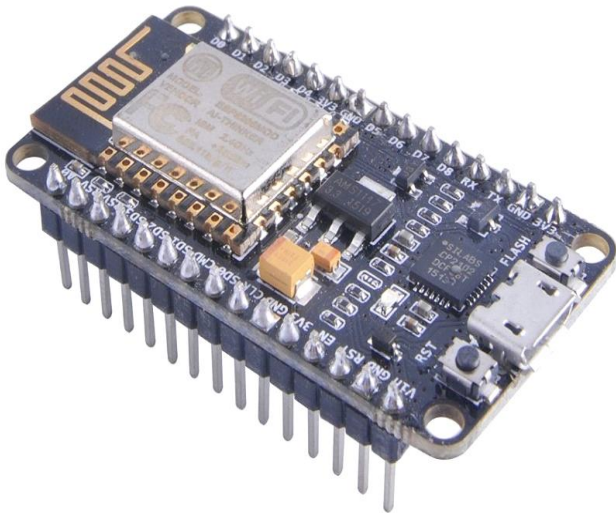
There are different types of infrared transmitters depending on their wavelengths, output power and response time. IR transmitters can be found in several applications. Some applications require infrared heat and the best infrared source is infrared transmitter. When infrared emitters are used with Quartz, solar cells can be made.

IR Receivers are also called as infrared sensors as they detect the radiation from an IR transmitter. IR receivers come in the form of photodiodes and phototransistors. Infrared Photodiodes are different from normal photo diodes as they detect only infrared radiation. The picture of a typical IR receiver or a photodiode is shown below.



Different types of IR receivers exist based on the wavelength, voltage, package, etc. When used in an infrared transmitter – receiver combination, the wavelength of the receiver should match with that of the transmitter.

- **Wifi Module (Node Mcu)** is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The WIFI is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each WIFI module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much Wi-Fi-ability as a WiFi Shield offers (and that's just out of the box)! The WIFI module is an extremely cost effective board with a huge, and ever growing, community. This module has a powerful enough on-board processing and storage capability that allows it to be integrated.



BUZZER: is a mechanical, electromechanical, magnetic, electromagnetic, electro-acoustic or piezoelectric audio signalling device. A piezo electric buzzer can be driven by an oscillating electronic circuit or other audio signal source. A click, beep or ring can indicate that a button has been pressed.



E. Working of Buzzer:

- A buzzer takes some sort of input and emits a sound in response to it. They may use various means to produce the sound; everything from metal clappers to electromechanical devices. A buzzer needs to have some way of taking in energy and converting it to acoustic energy.

IV. IMPLEMENTATION CONCERNS

Urbanization is at its rapid growth stage around the world, as more number of people desire to live in the city lights with more opportunities for growth and success. Cities are expanding like never before to accommodate this growth and in this process the concept of smart cities came into action. The parameter like cleanliness and hygiene are the topic of concern in these smart cities and concrete measures should be taken for that. Also, the growth should go hand in hand with the green environment and research should be further done on such technology. Our work is a small but efficient step towards cleanliness and we believe that this paper would encourage people to do good work on the similar topics. We have successfully made and tested the model of our smart bin so we believe with encouragement from the side of government we can successfully transform this model into product.

V. FUTURE SCOPE

Smart dustbin helps us to reduce the pollution. Many times garbage dustbin is overflowing and many animals like dog or rat enters inside or near the dustbin. This creates a bad scene. Also some birds are also trying to take out garbage from dustbin. This project can avoid such situations. And the message can be sent directly to the cleaning authorities to empty the dustbin before its overflow.

VI. CONCLUSION

This project work is the implementation of smart garbage management system using IR sensor, microcontroller and Wi-Fi module. 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 reduces the total number of trips of garbage collection vehicle and hence reduces the overall expenditure associated with the garbage collection. It ultimately helps to keep cleanliness in the society. Therefore, the smart garbage management system makes the garbage collection more efficient. Such systems are vulnerable to plundering of components in the system in different ways which needs to be worked on.

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