

Advanced Dustbin Management System

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Abstract— This project basically based on technological implementation on dustbin or garbage Collection system, applied with advance system management to collect garbage or wastage in Rural / Urban area of the city. This whole concept is implemented with simple micro controller based circuit with sensor unit and GSM as well RFID access system. When the garbage or wastage in the dustbin is full, sensor will give the output and dustbin window will be closed and give alert to the system by simple SMS, Collection person will access this dustbin by this RFID tag to collect the wastage. This whole system consisting following components.

Key words: GSM Module, IR Sensor, RFID Module, Arduino Board, DC Motor, L293D Motor Driver Circuit

I. INTRODUCTION

Our aim to publish this paper to overcome land pollution in India have large number of land pollution So, Nowadays, we know that many diseases occurred due to the earlier behavior of the Dustbin or Conveyer. In general, we all are involved in this kind of diseases. And also in our nation, the “Clean India Movement” is recently started. So In order to support our nation in the sense of clean the India, we decide to make “Advanced Dustbin Management System” which reduces the garbage spread on the land or around the Dustbin area. This idea is one kind of reduced the dirt as well as epidemic. It consists of some well-known components to implement whole concept.

A. Problem Specification

In this application, it is must be maintain the whole system when dustbin is full for example, when dustbin is full, the system should be closed the or of dustbin and also send the status to wander or collection person using GSM module but after these process, if that person will not collect the garbage from dustbin in a specific time, then it could be creates the number of issues. RFID tag required for open the door of dustbin. So the major approach that without RFID tag the door of dustbin will not open. If garbage collection person lost the tag then it creates number of issues. Hence we can say that the system should be used efficiently by us.

B. Materials/Tool Required

In this project we required Arduino IDE software for the programming of control the sensor as well as motor. We also used a Proteus circuit designing tool for the designing of the circuit diagram.

II. IMPLEMENTATION

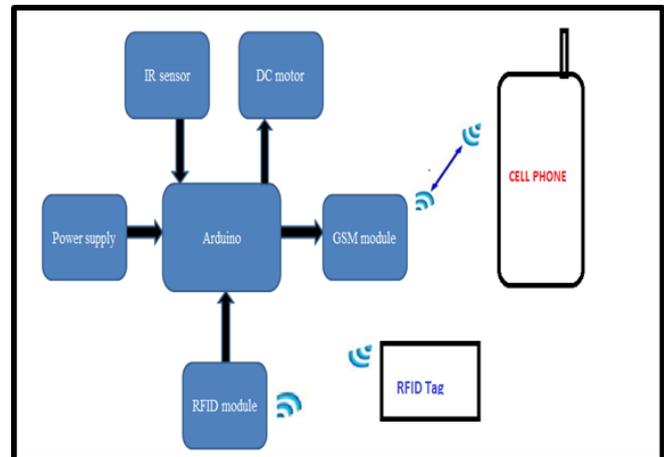


Fig. 1: Transmitter & Receiver Section

The Advanced Dustbin management System is mainly divided into two parts. One is Transmitter section while another is receiver section. The transmitter section consist of Arduino Uno Board, IR sensor module, DC motor, L293D motor driver IC, GSM module, RFID module, power supply unit. The receiver section consists of Cellphone.

A. Transmitter & Receiver

Main function of Transmitter section is starts with IR sensor which is used to indicate the level of garbage in dustbin. This sensor is connected to Arduino board. The Arduino board is the heart of the system because it controls all the function of the system. The Arduino board detects the response of sensor and according to response of sensor; Arduino board will control the DC motor. Arduino generate a command signal to driving circuit which controls the DC motor. Arduino board also sends command to the GSM module. GSM module is used to transmit the status of Dustbin. The second part of project is receiver part. It consists of Cellphone, RFID Tag. When the GSM Module will send status of the Dustbin from the receiver side, then it would be transfer into Cellphone in the form of message. This message gives information about level of Dustbin to the cellphone of garbage picker. Then according to the message arrived from transmitter, the garbage picker want to go and would be collect the garbage from the Dustbin in the specific time. Here, the word specific time used is most important for this system. The reason behind this is that if garbage picker is not go to collect the garbage in specific time, then we know that the Dustbin is already closed and it will never open without RFID Tag, so at that time, if any person want to throw waste into that particular Dustbin. Then, think that what will happened, it might be creates number of issues. Hence we can say that the garbage collection person must want to be aware about him/her work.

B. Architecture

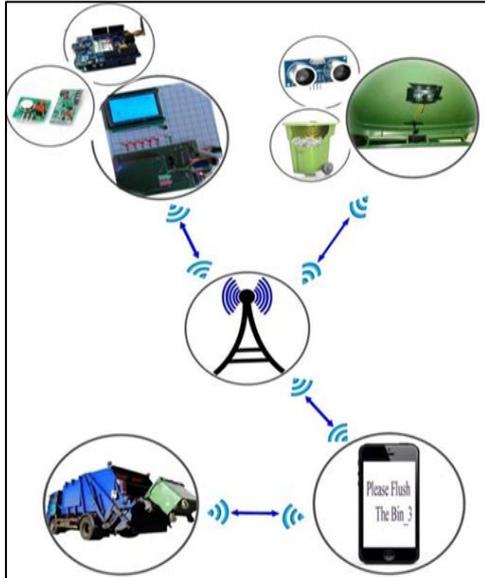


Fig. 2: Architecture

III. ABOUT COMPONENT

The following components are used in our project

- 1) Arduino board (AT mega328p)
- 2) Infrared sensor (IR sensor)
- 3) GSM module
- 4) DC motor
- 5) Motor driver IC (L293d)
- 6) RFID module

A. Arduino Board

The Arduino Uno is a microcontroller board based on the ATmega328p. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs (A0 & A5), 4 UARTs, 16 MHz crystal oscillator, 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 [1].



Fig. 3: Arduino board

- 1) Microcontroller ATmega328P
 - Operating Voltage 1.8 – 5.5V
 - Input Voltage (recommended) 7-12
 - Digital I/O Pins 14 (of which 6 provide PWM output)

- Analog Input Pins 6 (A0 – A5)
- Flash Memory 32 KB of which 8 KB used by boot loader
- SRAM 2 KB
- EEPROM 1 KB
- Clock Speed 16 MHz

B. Infrared Sensor (IR Sensor)

An Infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. This type of sensor measures only infrared radiation, rather than emitting it, that is called as a passive IR sensor

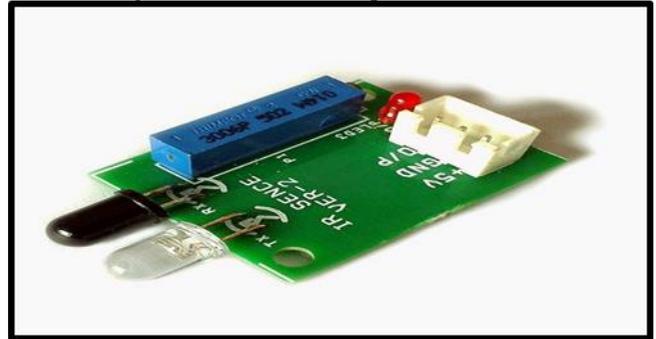


Fig. 4: IR sensor

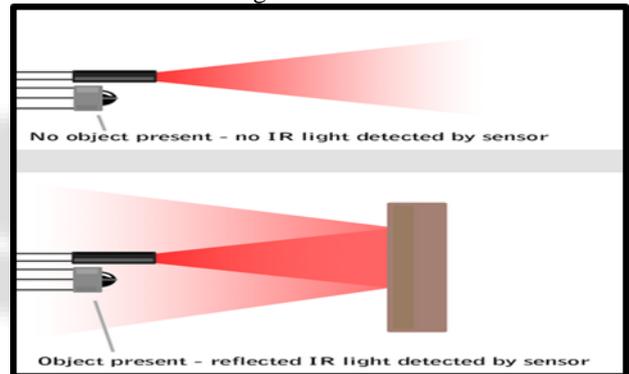


Fig. 5: Infrared sensor sense the object

Basically IR Sensor module contains transmitter and receiver section. An infrared led is used as a transmitter which transmits light while photo detector is used as a receiver which can detect light reflect back from any obstacles. When an Infrared led transmits the light, there are two possibilities. One possibility is no obstacles across it and another one is obstacle exist across infrared led. If an obstacle does not exist, then reflection of light is not occurred. That means there is no detection of light at the receiver side. If an obstacle exists across infrared led, then reflection of light is occurred. That means receiver would detects the lights and these both principles are most important to indicates the levels of garbage in Dustbin.

C. GSM Module

GSM/GPRS Modem-RS232 is built with Dual Band GSM/GPRS engine- SIM900A, works on frequencies 900/1800 MHz the Modem is coming with RS232 interface, which allows you connect PC as well as microcontroller with RS232 Chip (MAX232). The baud rate is configurable from 9600-115200 through AT command. The GSM/GPRS Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS, Voice

as well as DATA transfer application in M2M interface. The onboard Regulated Power supply allows you to connect wide range unregulated power supply. Using this modem, you can make audio calls, SMS, Read SMS; attend the incoming calls and internet act through simple AT commands [8].



Fig. 6: GSM module

D. DC Motor

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of current flow in part of the motor. DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications. The working of DC motor is based on the principle that, when a current-carrying conductor is placed in a magnetic field, it experiences a mechanical force [6]. Electric motors run by electromagnetism. In the case of a PMDC {Permanent Magnet DC} Motor, motion is produced by an electromagnet (armature) interfacing with a fixed field magnet. In a brushed motor, electrical current flows through the motor terminals in the end cap assembly that comes in contact with the armature assembly through the carbon brushes or brush leaves. The electrical current powers the coils generating a magnetic field causing the armature to rotate as it interacts with the magnets encased in the housing assembly Fleming's Left Hand Rule help to determine the direction of the force, the current and the magnetic flux [7].



Fig. 7: DC Motor

E. L293d

It is a motor driver IC to drive the all motor which is used in this project. The Device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads and switching power transistors. To simplify use as two bridges each pair of channels is equipped with an enable input. A separate supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included. This device is suitable for use in switching applications at frequencies up to 5 kHz. The L293D is assembled in a 16 lead plastic package which has 4 center pins connected together and used for heat sinking. The L293DD is assembled in a 20 lead surface mount which has 8 center pins connected together and used for heat sinking [3].

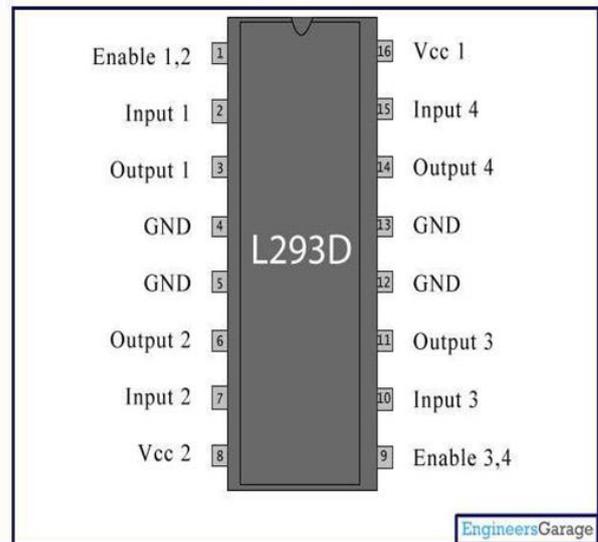


Fig. 8: Pin configuration of L293d

F. RFID module



Fig. 9: RFID module

This is a low frequency (125 KHz) RFID reader with serial output with a range of 8-12cm. It is a compact unit with built in antenna and can be directly connected to the PC using RS232 protocol. This module is used whenever the garbage picker wants to clear the Dustbin. This is used for authentication. When authorized tag will come into the region of RFID module, the door of dustbin should open. This function is added because no one can throw garbage into

dustbin when it already full if this function will run properly.[2]

IV. CIRCUITS, HARDWARE & SOFTWARE

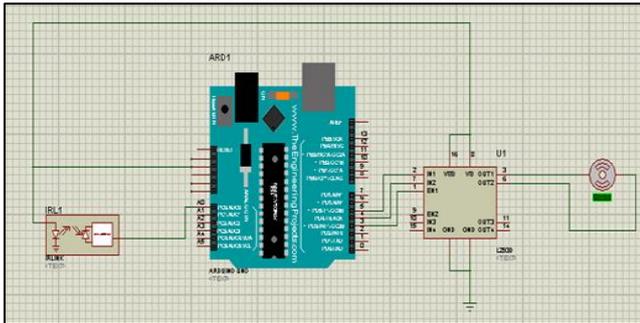


Fig -10: circuit design using Proteus



Fig. 11: Hardware Connection

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New_Coding_Dustbin_Management | Arduino 1.8.5
File Edit Sketch Tools Help
New_Coding_Dustbin_Management
SoftwareSerial mySerial(3, 2); // RX, TX

#define SS_PIN 10
#define RST_PIN 9
#define sensor A2
#define in1 A0
#define in2 A1
MFRC522 card(SS_PIN, RST_PIN);
byte uid[4];
int count=0,i=0,done=0;

void setup()
{
  pinMode(sensor, INPUT_PULLUP);
  pinMode(in1, OUTPUT); pinMode(in2, OUTPUT);
  Serial.begin(9600);
  mySerial.begin(9600);
  SPI.begin();
  card.PCD_Init();
  // digitalWrite(in1, HIGH); digitalWrite(in2, LOW);
  
```

Fig. 12: Programming done using Arduino software

V. CONCLUSION

Waste management is one of the primary problem that the world faces irrespective of the case of developed or developing country. The key issue in the waste management is that the garbage bin at public places gets overflowed well in advance before the commencement of the next cleaning process. It in turn leads to various hazards such as bad odor & ugliness to that place which may be the root cause for spread of various diseases. To avoid all such hazardous scenario and maintain public cleanliness and health this work is mounted on Advanced Dustbin Management System. The main theme of the work is to develop an Advanced Dustbin Management System for a proper garbage management. This system is developed for garbage clearance by giving an alert signal to the municipal office or to the cellphone of garbage picker for instant cleaning of dustbin with proper verification based on level of garbage filling. This process is aided by the IR sensor which is interfaced with Arduino UNO to check the level of garbage filled in the dustbin and sends the alert to the municipal cellphone once if garbage is filled. After cleaning the dustbin, the driver confirms the task of emptying the garbage with the aid of RFID Tag. RFID is a computing technology that is used for verification process and in addition, it also enhances the Advanced Dustbin Management system by providing automatic identification of garbage filled in the dustbin and sends the status of clean-up to the server affirming that the work is done. The real time status of how waste collection is being done could be monitored and followed up by the municipality authority with the aid of this system.

A. 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.

ACKNOWLEDGEMENT

We take an opportunity to acknowledge and extend my heartfelt gratitude to our guide and the pivot of this enterprise, Prof. Bhavna V Savaliya who is most responsible for help to over complete this work. He showed to different ways to approach the problems and the need to be persistent to accomplish over goal. We all are thankful to Director, Head of Department of Electronics and Communication Engineering for support to complete this work. We can also like to express thanks to DSTC, JUNAGADH providing necessary facilities. We can also convey our thanks to HOD, staff members and lab technicians of Department of Electronics and Communication and Engineering for their continue support

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