

SMARTBIN

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Abstract:

Rapid increase in population leads to waste generation. From the past survey, waste generated in India is at the range of 200-870 grams per day and its rate is increasing by 1.3% per capita per annum. The worst thing is that some portion of waste is burned only on streets and dumpsites, which release harmful furan and dioxins in the environment. This harmful gas leads to various types of chronic and respiratory diseases. So, a smart waste management system, which can be effectively use in parties, colleges, railway station to ensure proper cleanliness. This paper presents an Arduino based smart dustbin which can operate via GSM and line follower robotic system. Arduino Uno is used to read the dustbin levels with the help of Ultrasonic sensor. After 100% filling of waste, a message is sent to waste management department to collect that waste for proper disposal.

Keywords — **Arduino , GSM Module , Ultrasonic sensor.**

Introduction

This paper presents a smart waste monitoring and collecting system. It's a common sight to see dustbin placed on streets get overflow and large number of insects and mosquito breed on it. These leads to various types of diseases. It's quite a big challenge for every roof and corner of world to eradicate these issue. The dustbins are properly managed and information is seen regularly and the municipality officer make immediate response by intimating to truck driver. The truck driver will go immediately and collect the waste form the dustbin. The dustbins are integrated with ultrasonic sensor, GSM module and line follower circuit to compensate this issue.

Our Prime Minister of India, SRI Narendra Modi has introduced the development of smart cities In India. City administration needs understanding of the generating reports, control over pricing. District administrations are interested in controlling the process of waste collection, checking quality of service, quick and legal ways for solving disputes and problems.

This paper will give the efficient way to keep the environment clean and green. Citizens will have a better service, lower cost and easy accessible system to ensure cleanliness of society

HARDWARE IMPLEMENTATION

The hardware realization of the proposed Smart dustbin monitory system is detailed below

Arduino Controller

An Arduino is an open source microcontrollerboard . There are so many Arduino boards are available in market like UNO, MEGA, Mico, Nano, Yun, Esplora, Pro mini, and Lilly pad. In this paper, we are use an Arduino Uno

Board .The Arduino Uno is a microcontroller board based on the ATmega328 . It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, 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. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8PU2 programmed as a USB-to- serial converter.

2 ULTRASONIC SENSOR

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. The Ultrasonic Sensor sends out a high-frequency sound pulse and then times how long it takes for the echo of the sound to reflect back. The sensor has 2 openings on its front. One opening transmits ultrasonic waves, (like a tiny speaker), the other receives them, (like a tiny microphone).

The speed of sound is approximately 341 meters (1100 feet) per second in air. The ultrasonic sensor uses this information along with the time difference between sending and receiving the sound pulse to determine the distance to an object. It uses the following mathematical equation:

Distance = Time x Speed of Sound divided by 2

Time = the time between when an ultrasonic wave is transmitted and when it is received

You divide this number by 2 because the sound wave has to travel to the object and back.

It consists of four connection points

- 1 VCC
- 2 ECHO
- 3 TRIG
- 4 GND

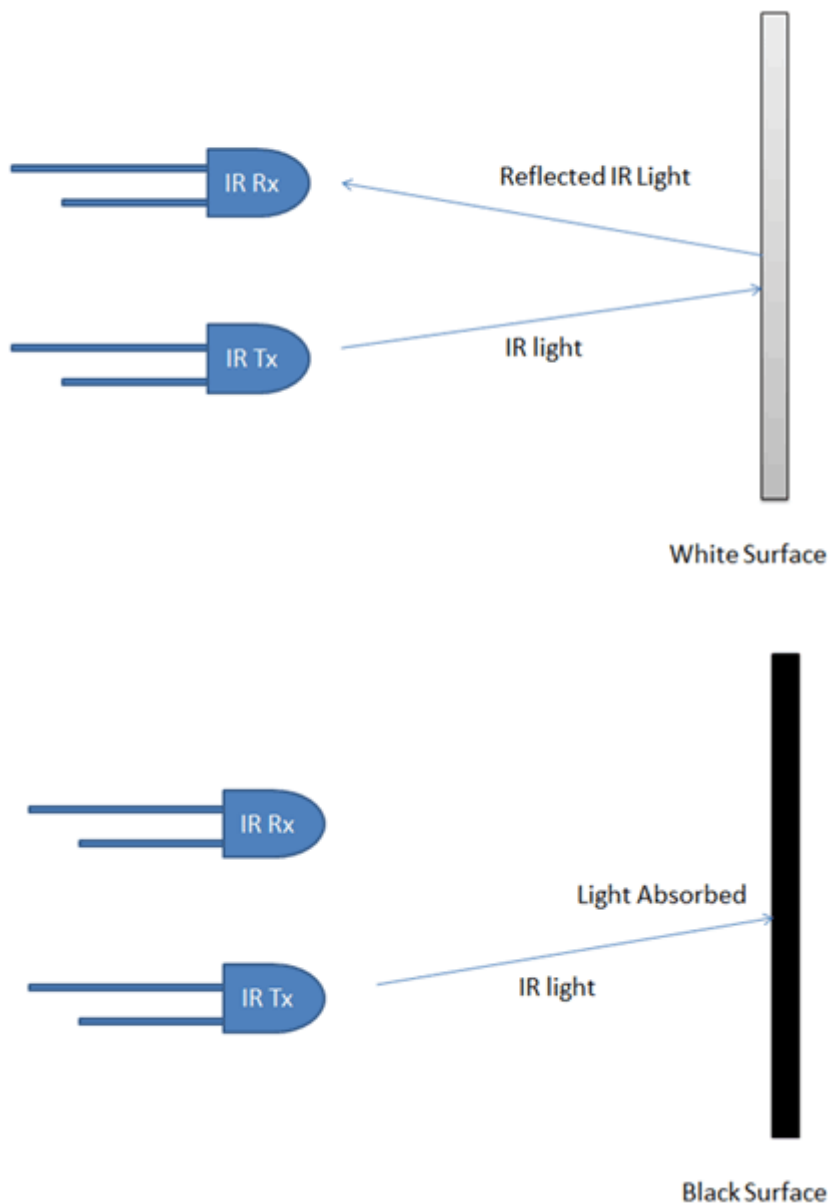


Line follower

Line follower Robot is a machine which follows a line, either a black line or white line. Basically there are two types of line follower robots: one is black line follower which follows black line and second is white line follower which follows white line. Line follower actually senses the line and run over it.

Concept of line follower

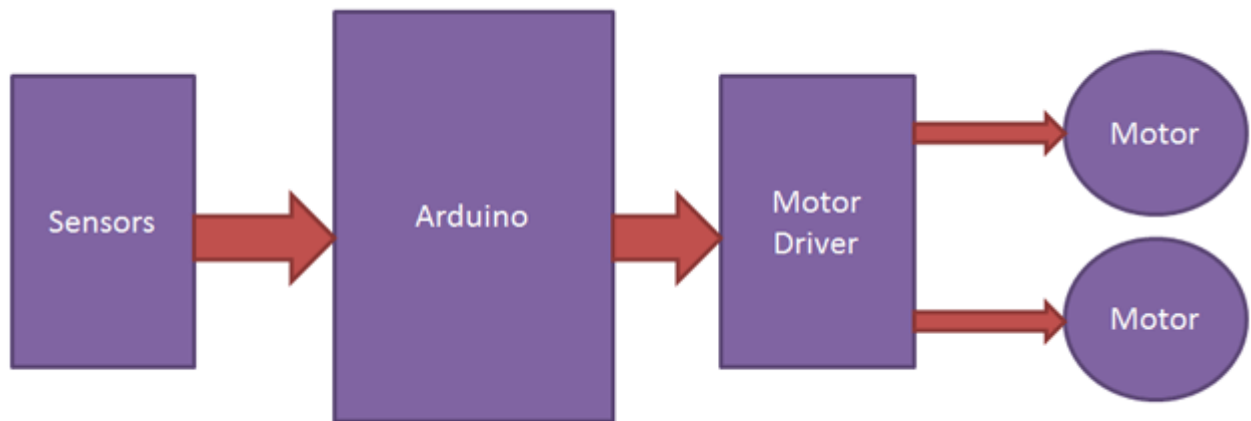
Concept of working of line follower is related to light. We use here the behavior of light at black and white surface. When light fall on a white surface it is almost full reflected and in case of black surface light is completely absorbed. This behavior of light is used in **building a line follower robot**.



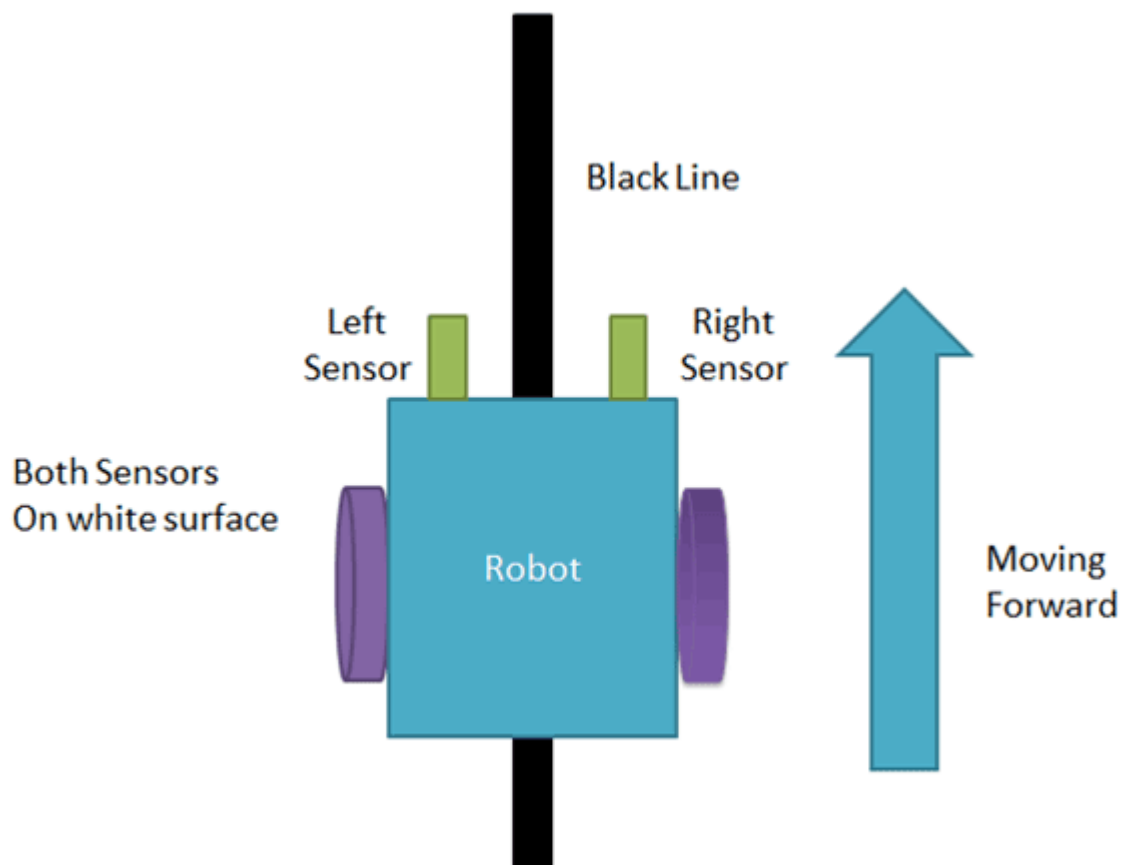
In this **arduino based line follower robot** we have used IR Transmitters and IR receivers also called photo diodes. They are used for sending and receiving light. IR transmits infrared lights. When infrared rays falls on white surface, it's reflected back and caught by photodiodes which generates some voltage changes. When IR light falls on a black surface, light is absorb by the black surface and no rays are reflected back, thus photo diode does not receive any light or rays.

Here in this arduino line follower robot when sensor senses white surface then arduino gets 1 as input and when senses black line arduino gets 0 as input.

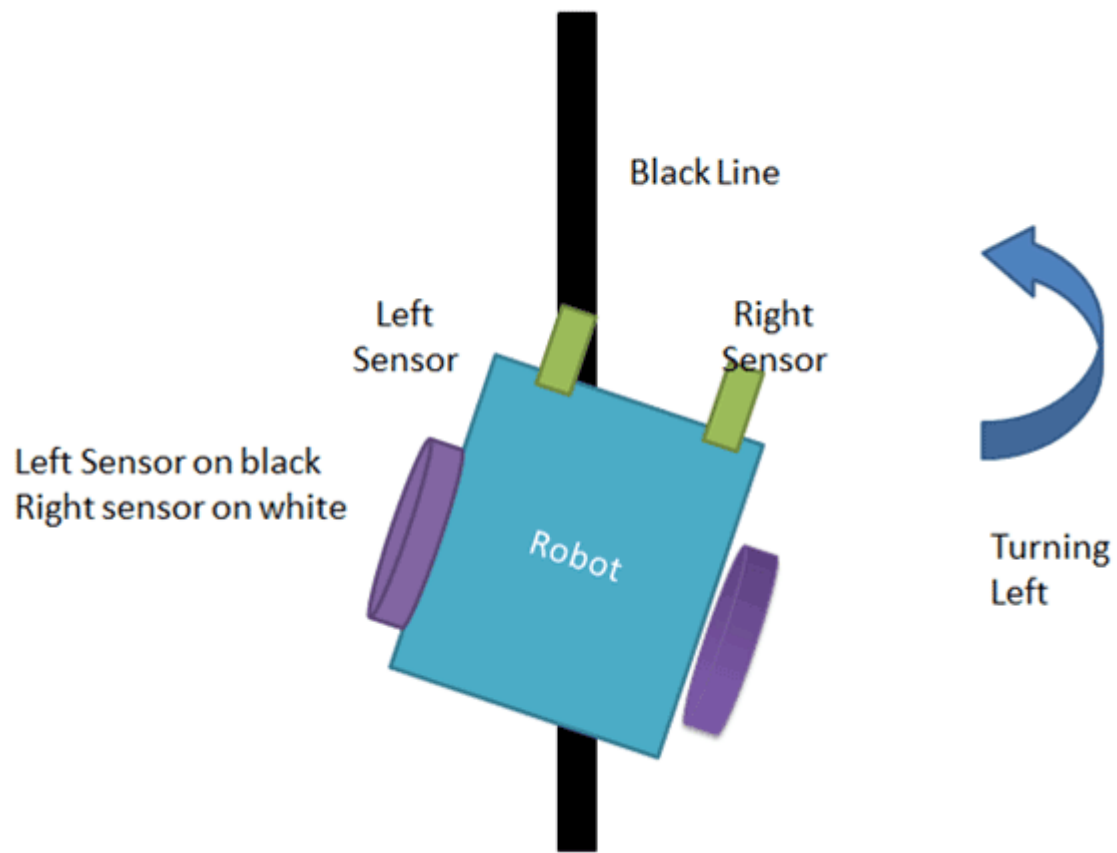
Working of line follower is very interesting. Line follower robot senses black line by using sensor and then sends the signal to arduino. Then arduino drives the motor according to sensors' output.



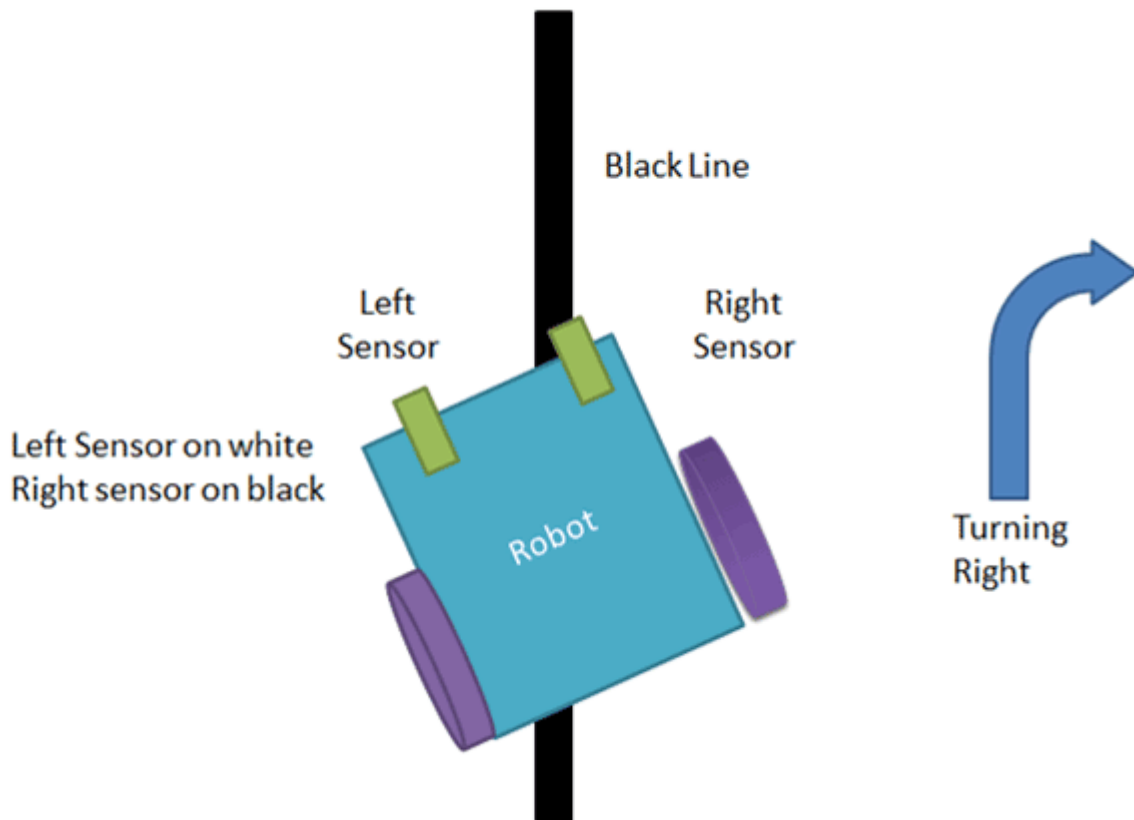
Here in this project we are using two IR sensor modules namely left sensor and right sensor. When both left and right sensor senses white then robot move forward.



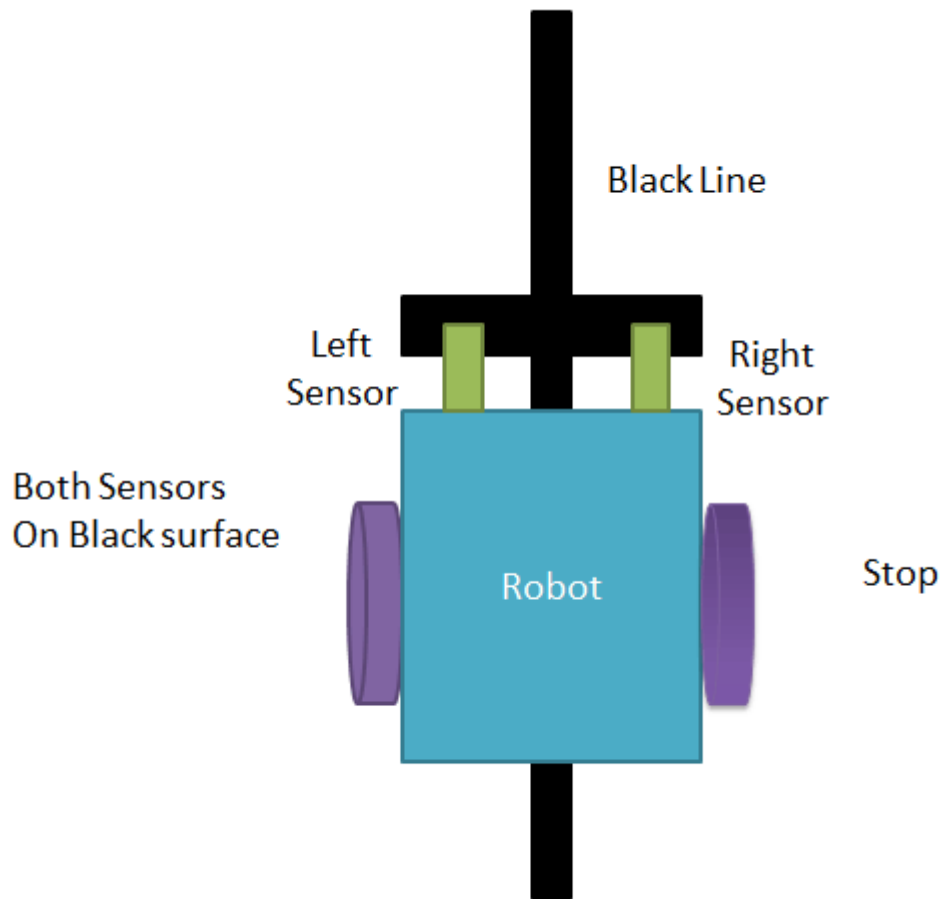
If left sensor comes on black line then robot turn left side.



If right sensor sense black line then robot turn right side until both sensor comes at white surface. When white surface comes robot starts moving on forward again.



If both sensors comes on black line, robot stops.



Gsm module

SIM300 is a Tri-band GSM/GPRS engine that works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS1900 MHz. SIM300 provides GPRS multi-slot class 10 capability and support the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4. With a tiny configuration of 40mm x 33mm x 2.85 mm, SIM300 can fit almost all the space requirement in your application, such as Smart phone, PDA phone and other mobile device. SIM300 provide RF antenna interface with two alternatives: antenna connector and antenna pad. The antenna connector is MURATA MM9329-2700. And customer's antenna can be soldered to the antenna pad. The SIM300 is designed with power saving technique, the current consumption to as low as 2.5mA in SLEEP mode

This GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily.

The modem can either be connected to PC serial port directly or to any microcontroller. It can be used to send and receive SMS or make/receive voice calls. It can also be used in GPRS mode to connect to internet and do many applications for data logging and control. In GPRS mode you can also connect to any remote FTP server and upload

files for data logging.

This GSM modem is a highly flexible plug and play quad band GSM modem for direct and easy integration to RS232 applications.

Supports features like Voice, SMS, Data / Fax, GPRS and integrated TCP/IP stack.

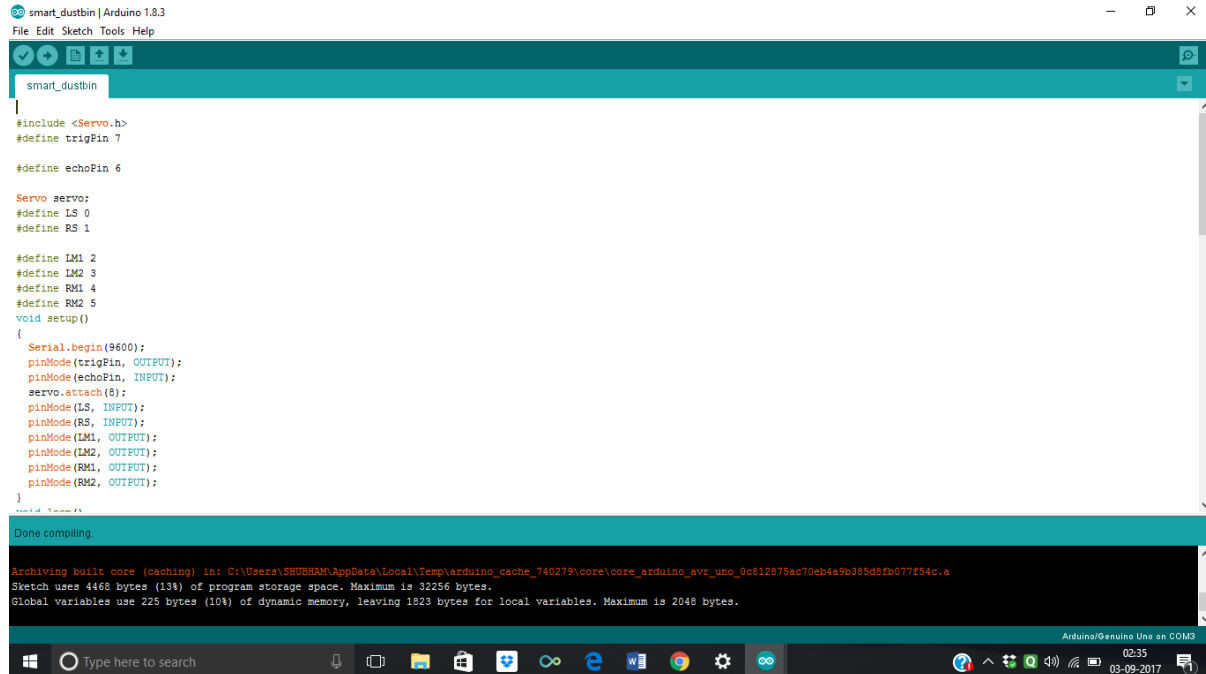
- Data / Fax, SMS, GPRS
- Integrated TCP / IP stack Features
- Quad Band GSM / GPRS 850 / 900 / 1800 / 1900 MHz
- GPRS multi - slot class 10 / 8 GPRS Mobile station class B Compliant to GSM Phase 2 / 2+ Class 4 (/ 900 Mhz) Class 1 (/ 1900 Mhz)
- Control via AT commands (GSM 07.07 , 07.05 and enhanced AT commands)
- Operation Temperature (-20 deg C to +55 deg C) Specifications for Voice Tricodec.
- Half rate (HR) Full rate (FR) Enhanced Full rate (EFR) Hands-free operation(Echo suppression) Specifications for Fax
- Group 3
- Class 1 Specifications for data GPRS class 10: max 85.6 kbps (downlink)
- PBCCH support Coding schemes CS 1, 2, 3, 4 CSD up to 14.4 kbps USSD Non transparent mode PPP - Stack

Working

This waste Management System via GSM Module to implemented the management of waste in real time using smart dustbin to check the level of waste in dustbin it's full or not. And line follower is used to move the smart dustbin in pre decided path.

When a person comes in in front of it , the ultrasonic sensor will send a signal to Arduino, and then it will send to line follower circuit which will stop the bot movement and the cap of dustbin gets open to collect the waste.

When the person move away from it , bot will start following the same path and the cap of dustbin will close. When the level of dustbin is full it will send a message to Municipal officer of that particular area and the contact detail of that Municipal office is preprogrammed now the officer will send the truck to collect the waste from it and send it for proper disposal.



```
smart_dustbin | Arduino 1.8.3
File Edit Sketch Tools Help

smart_dustbin

#include <Servo.h>
#define trigPin 7

#define echoPin 6

Servo servo;
#define LS 0
#define RS 1

#define LM1 2
#define LM2 3
#define RM1 4
#define RM2 5

void setup()
{
  Serial.begin(9600);
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
  servo.attach(8);
  pinMode(LS, INPUT);
  pinMode(RS, INPUT);
  pinMode(LM1, OUTPUT);
  pinMode(LM2, OUTPUT);
  pinMode(RM1, OUTPUT);
  pinMode(RM2, OUTPUT);
}

Done compiling.

Archiving built core (caching) in: C:\Users\SHUBHAM\AppData\Local\Temp\arduino_cache_740279\core\core_arduino_avr_uno_0c012875ac70eb4a9b385d0fb077f54c.a
Sketch uses 1468 bytes (13%) of program storage space. Maximum is 32256 bytes.
Global variables use 225 bytes (10%) of dynamic memory, leaving 1023 bytes for local variables. Maximum is 2048 bytes.
```

Advantage

This concept is useful to reduce the pollution.

It will stop the mosquitos, houseflies and other infected insects which breed on heap of waste.

It provides the better platform for proper waste disposal at proper time.

RESULT

The experimental model was made according to the circuit and the results was as expected. when a person comes in the path of moving bin it will stop to collect the waste and when the level of the waste is reach the limited level then via GSM a message will send for the proper waste disposal.

Conclusion

This project work is the implementation of smart garbage management system using IR sensor, microcontroller and GSM module. This system assures the cleaning of dustbins soon when the garbage level reaches its maximum.

Acknowledgement

I am grateful to the cooperation and constant encouragement from my honorable Prof. JITENDRA SINGH BAHADORIA. His regular suggestions made my work easy and proficient

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