DEEPAK GUPTA

Mr. WASIM

Line Following Robot

Robots have been fascinating us from years to now. They are the part of our life in fields like research, development, medicine, defence or even novels and movies. Robots have simplified our job to great extent. They have provided efficient, reliable and safe mode of working hands to human beings. Due to robotic only, men is now able to perform distant operations. Mars Rover is one the example of distant operation being carried out by men.

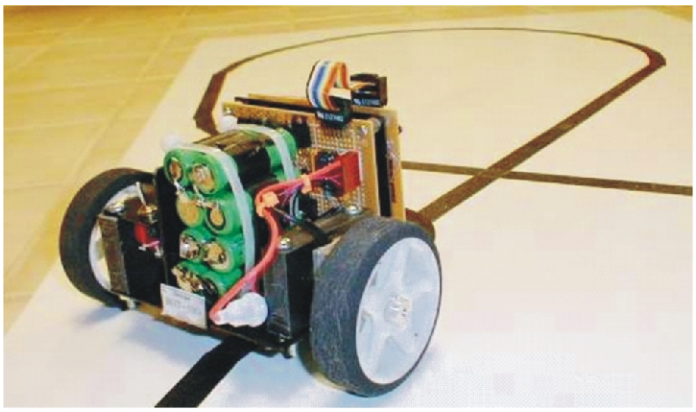
The line follower is one of the self operating robot that follows a line that drawn on the floor. The basic operations of the line following are as follows:

Capture line position with optical sensors mounted at front end of the robot. Most are using several number of photo-reflectors, and some leading contestants are using an image sensor for image processing. The line sensing procss requires high resolution and high robustness.

Steear robot to track the line with any steearing mechanism. This is just a servo operation, any phase compensation will be required to stabilize tracking motion by applying digital PID filter or any other servo argolithm. Control speed according to the lane condition. Running speed is limited during passing a curve due to friction of the tire and the floor.

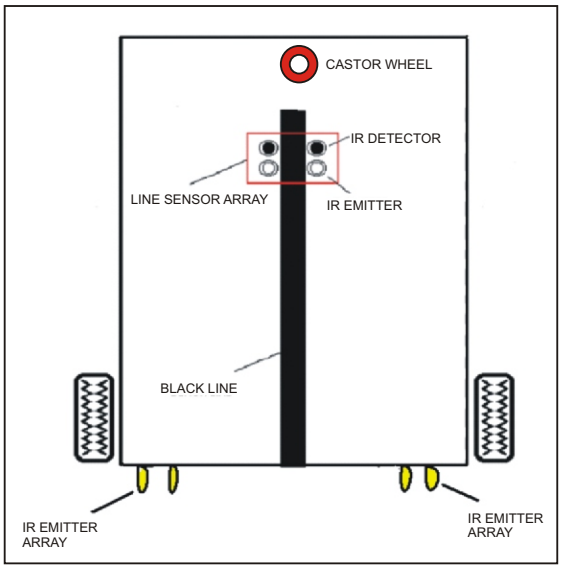
This system can be of great use in large industries where goods are needed to transport along a predefined path, thereby increasing the productivity and efficiency of the industries and could be helpful in enhancing the research work in space technology. To accomplish this we have used a 8051 Microcontroller ,which makes the Robot Autonomous. We have used some electronic components viz. ULN2803 IC (Motor Driver IC), LM324 IC (Comparator), 7805 IC (Voltage Regulator).

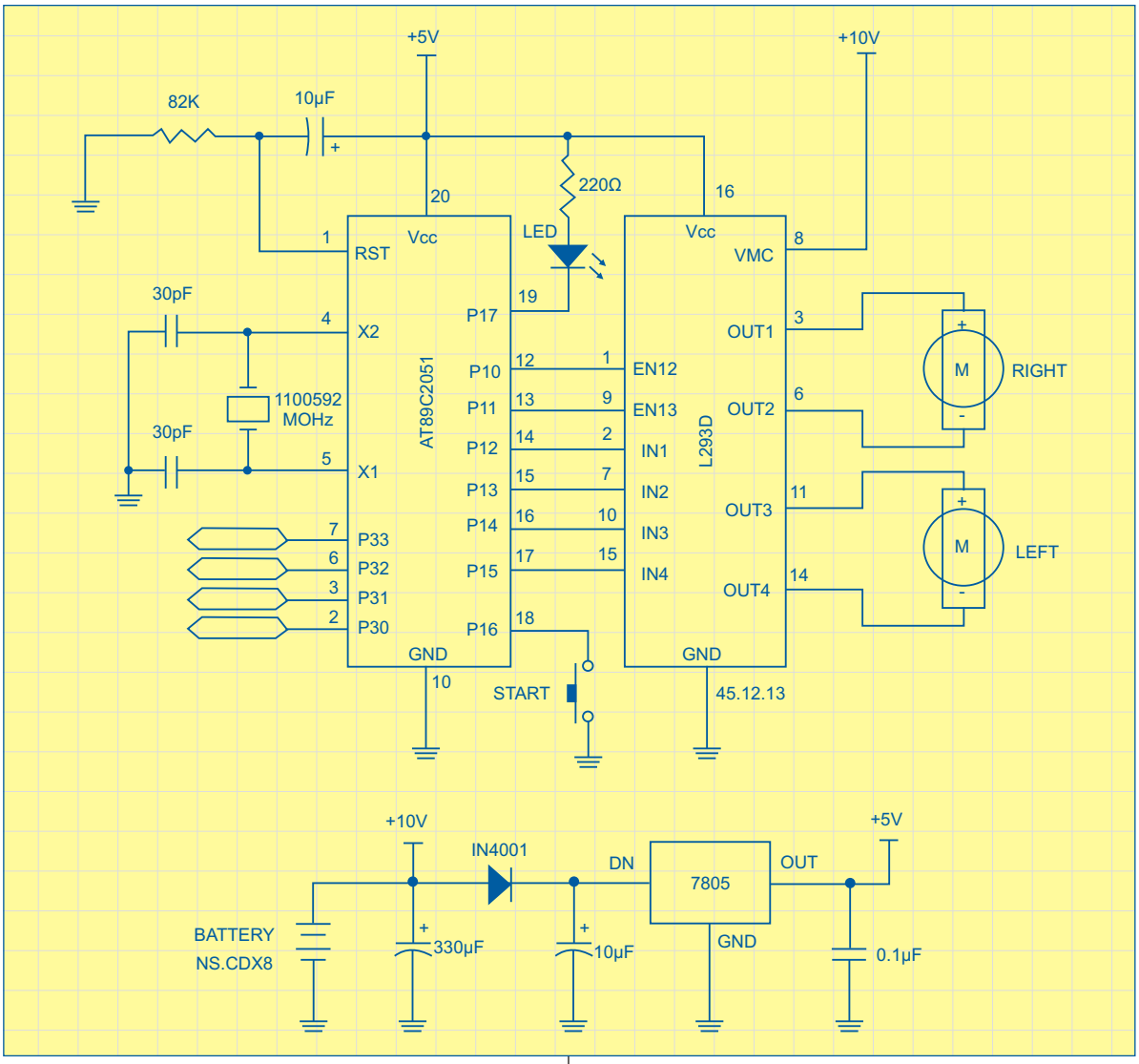
For setting the communication between the robots , we use a infrared emitters which is mounted at the tail of line following robot. They are uniformly spaced apart at a distance of 0.8 cm. The infrared sensors have the quality that they are unidirectional



i.e. they emit the light in a straight line . So ,by using this property , we used them as the communication network . For detecting , we use three detector in each of the two other robot . These detectors are mounted in the middle of their front . They are uniformly spaced apart at a distance of 0.8 cm

They are usually set in such a way that when line following robot move in a curved path , the angle made by the emitter to both the detector is 120 degree . Hence , by the use of this communicaton behaviour , we are able to make our project





successfully .

Components used

1: 8051 MICROCONTROLLER

Intel 8051 is CISC architecture which is easy to program in assembly language and also has a good support for High level languages. The memory of the microcontroller can be extended up to 64k. This microcontroller is one of the easiest microcontrollers to learn. The 8051 microcontroller is in the field for more than 20 years. There are lots of books and study materials readily available for 8051.The best thing done by Intel is to give the designs of the 8051 microcontroller to everyone. So it is not the fact that Intel is the only manufacture for the 8051 there more than 20 manufactures, with each of minimum 20 models. Literally there are hundreds of models of 8051 microcontroller available in market to choose. Some of the major manufactures of 8051 are Atmel, Philips & Dallas.

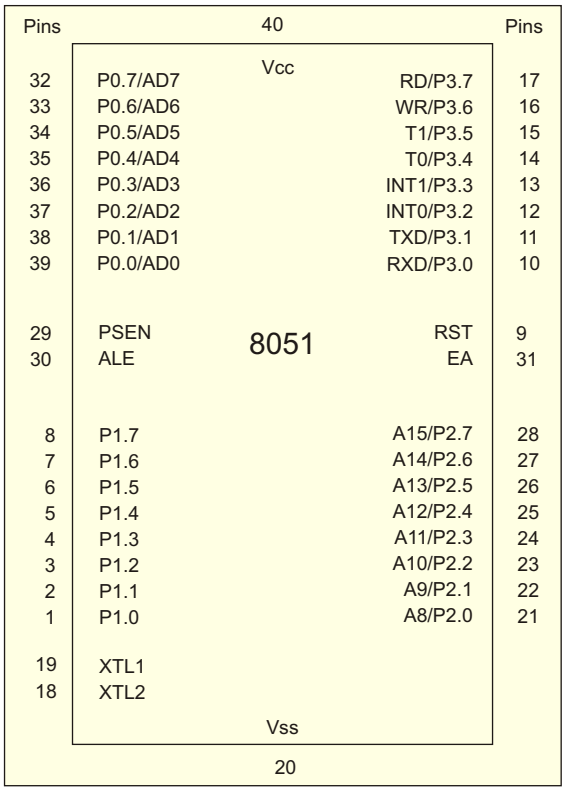
The features of the 8051 are :

- 4K Bytes of Flash Memory
- 128 x 8-Bit Internal RAM
- Fully Static Operation: 1 MHz to 24 MHz
- 32 Programmable I/O Lines
- Two 16-Bit Timer/Counters
- Six Interrupt Sources (5 Vectored)
- Programmable Serial Channel
- Low Power Idle and Power Down Modes

The 8051 has an 8-Bit CPU that means it is able to process 8 bit of data at a time. 8051 has 235 instructions.

2:ULN2803

The ULN2801A-ULN2805Aeach contains eight Darlington transistors with common emitters and



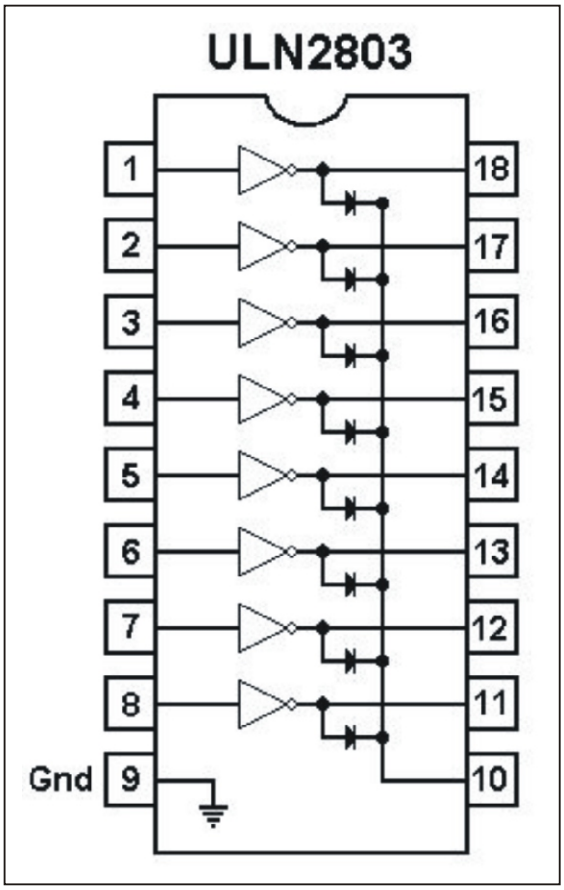
integral suppression diodes for inductive loads. Each Darlington features a peak load current rating of 600mA (500mA continuous) and can withstand at least50V in the off state. Outputs may be paralleled for higher current capability. The output of the ULN2803 is "inverted". This means that a HIGH at the input becomes a LOW at the corresponding output line. e.g. If the motor line connected to pin 1 goes HIGH, pin 18 on the ULN2803 will go LOW (switch off). The ULN2803 is described as a "8-line driver". This means that it contains the circuitry to control eight individual output lines, each acting independently of the others. The IC can be thought of a 8-line 'black box'.

The main feature of IC are

- Eight Darlingtons with common emitters.
- Output current to 500mA.
- Output voltage to 50 V.
- Integral suppression diodes.
- Output can be programmed.
- Inputs pinned opposite outputs to simplify board layout.

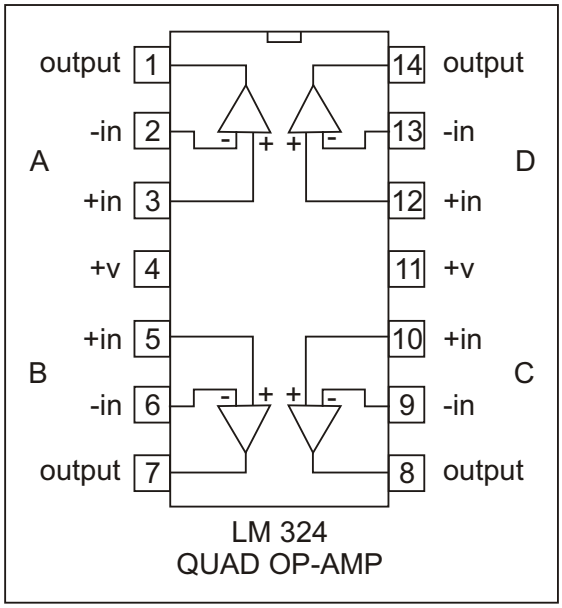
3:IC LM324

LM324 is an Quad Operational Amplifier .It is used as a simple ADC(Analog to digital converter)to create a digital signal and send to control stage of the robot .



The main features are given below :-

- The LM 324 is a QUAD OP-AMP.
- Minimum supply voltage 6v .
- Maximum supply voltage 15v .
- Max current per output 15mA .



• Maximum speed of operation 5MHz .

4:SENSORS

Sensor is a device that receives a signal (as heat or pressure or motion or light) and responds to it in a

distinctive manner. Sensors used in the robots works in the same way as the eyes in the human being.The sensors used are IR sensors.It emits and detects IR.

Program for Line Following Robot

```
#include<AT89x51.h>
void main()
{
 while(1)
{
if(P2_0==1&&P2_1==1)
{
P1_0=1;
P1_1=1;
P1_3=1;
P1_4=1;
} if(P2_0==0&&P2_1==1)
{
P1_0=0;
P1_1=1;
 P1_3=1;
P1_4=1;
}
if(P2_0==1&&P2_1==0)
{
P1_0=1;
P1_1=0;
P1_3=1;
P1_4=1;
}
if(P2_0==0&&P2_1==0)
{
P1_0=0;
P1_1=0;
 P1_3=1;
P1_4=1;
}
if(P2_0==0&&P2_1==1&&P2_2==0)
{
P1_0=1;
P1_1=1;
}
if(P2_0==1&&P2_1==0&&P2_2==0)
{
P1_0=0;
P1_1=1;
}
if(P2_0==0&&P2_1==0&&P2_2==1)
{
P1_0=1;
P1_1=0;
}
}
}
```

S.No.	COMPONENTS	SPECIFICATION	DIAGRAM
1	8051 Microcontroller	40 Pin DIP	
2	ULN2803 IC	18 Pin DIP	
3	LM324 IC	14 Pin DIP	
4	IR PHOTO RECEIVER		
5	IR PHOTO TRANSMITTER		
6	GEARED DC MOTOR	9-12 volts	
7	8051 PROGRAMMER		
8.	Variable Resistor	20 kilo ohm	
9.	Voltage Regulator(7805)	5 volts	
10.	Castor Wheel		
11.	Crystal	12 Mhz