**INTRODUCTION**

A robot obstacle detection system comprising: A Robot housing which navigates with respect to a surface; a sensor subsystem having a defined relationship with respect to the housing and aimed at the surface for detecting the surface. The sensor subsystem including: An optical emitter which emits a directed beam having a defined field of emission, and a photon detector having a defined field of view which intersects the field of emission of the emitter at a finite region; and a circuit in communication with the detector for redirecting the robot when the surface does not occupy the region to avoid obstacles.

Obstacle sensors are nothing but the IR pair. As the transmitter part travel IR rays from to receiver here also transmitter send the data receiver but these IR pair are places beside each other. So whenever the obstacle sensor got an obstacle in between its way the IR rays reflects in a certain angle.

**PROJECT BRIEF**

**AIM**

The aim of this project is to design an **“DIFFERENTIAL DRIVE ROBOTIC ROVER”**

In this project mainly when ever robot senses any obstacle automatically diverts its position. Robot consists of two motors, which control the side pair wheels of each and help to move left or right or backward and forward and follow its path. Robot senses the object with help of obstacle sensor. IR pair is used for detecting the obstacle. The two basic parts for working with IR are the emitter and the detector. The emitter is typically an LED that emits near-infrared light.

In this project we develop a robot such that it will be moving according to path assigned to it if at all there is any obstacle in between then the robot stops and change its direction. This sort of project is very much useful in the industries where the automated supervision is required.

**OBJECTIVES**

* To have basic idea about IC L293D DC motor control.
* To understand the working and construction of the Obstacle

Avoidance Car.

* To have an idea about Microcontroller.
* Knowledge in selection of components according to the function

and requirements.

* To have a basic idea in Mechatronics System Design.
* Exposure in trying out new methods and rectification of the system.
* Troubleshooting where ever necessary.

**PROJECT TARGET**

” To construct an Obstacle avoidance car using Motor controller IC.”

**PROJECT LIMITATION**

* Separate power sources are required to control the Motor and

Motor controller IC.

* To have a basic idea in Mechatronics system design.
* New methods and rectification of the system.

**PROJECT DETAILS**

**PROJECT RELEVANCE**

In robotics, obstacle avoidance is the task of satisfying some control objective subject to non-intersection or non-collision position constraints. Normally obstacle avoidance is considered to be distinct from path planning in that one is usually implemented as a reactive control law while the other involves the pre-computation of an obstacle-free path which a controller will then guide a robot along. A practical real-time system for passive obstacle detection and avoidance is presented.

In this project mainly when ever robot senses any obstacle automatically diverts its position to left or right and follows the path. Robot consists of two motors, which control the side pair wheels of each and help in moving forward and backward direction. Robot senses the object with help of obstacle sensor. IR pair is used for detecting the obstacle. The two basic parts for working with IR are the emitter and the detector. The emitter is typically an LED that emits near-infrared light.

**DESIGN STEPS**

**BLOCK DIAGRAM**

**(Fig 1)**

The above shown is the block diagram for the Differential Drive Robotic Rover. It consists of five modules.

1. Power Supply Unit
2. Battery Charger Unit
3. IR Sensor Circuit
4. Microcontroller Unit
5. Motor Driver and DC Motor Assembly unit

These are the hardware of the project.

**BLOCK DIAGRAM DESCRIPTION**

**1. POWER SUPPLY UNIT:**

Power supply is a supply of [electrical power](http://en.wikipedia.org/wiki/Electrical_power). There are many types of power supply. Most are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can break down into a series of blocks, each of which performs a particular function.

For the working of the Differential Drive Robotic rover we require two voltage ranges.

1. 5V Supply for Sensor and Microcontroller circuit.
2. 12V Supply for the motor driver circuit.

Since the Rover is moving we can’t use the supply directly from the mains. We require a Battery and a charger to charge the battery. We requires 12V battery charger to charge the battery. We also require a power source of 5V to give to the IR Sensor Circuit and to Microcontroller. For this we require a 5V source. Since we are having a 12V supply we can take a parallel connection using a 5V voltage regulator.

**POWER SUPPLY WORKING:**

The transformer is 230V AC supply. Transformers work only with AC and this is one of the reasons why mains electricity is AC. We are using steps down transformer because to step down high voltage AC mains to low voltage AC (i.e.; 230V to18V). This transformer fed into rectifier. In bridge rectifier there are several ways of connecting diodes to make a rectifier to convert AC to DC and it is most important and it produces full-wave with varying DC so that we go for smoothing capacitor it smooth the DC from varying greatly to a small ripple. But here also small ripple is there. By using regulator we can eliminate the ripple. In regulator to set DC output to a fixed voltage.

**2. BATTERY CHARGER UNIT**

**CIRCUIT DIAGRAM FOR POWER 12V BATTERY CHARGER**



Fig (2)

**COMPONENT DESIGN FOR POWER SUPPLY:**

The power supply design has got two steps:-

A. Selecting the value of transformer.

B. Selecting the value of regulator circuit.

**13.5V DC POWER SUPPLY DESIGN**

While making a charger we have to consider the potential difference between the charger and the battery .Because current will flow from high value to lower value.

(Note; charger should have high value)

For a 2V battery we required 2.15V for charging (2.15V is deciding the manufacturer). 12V battery requires 2.15V × 6 cells = 12.9V. While charging time discharging will occur. For avoiding the discharging we are using a diode (fig 2 - D5) in the circuit and its having the voltage drop of 0.7V. Now we required 12.9V+0.7V=13.6V. So we selected the voltage as 13.5V

Current required for LED=10mA

**Value of R1,**

V/I=13.5V/10mA

=1.3KΩ

P =VI

=13.5×10mA

=1.35mW

Power rating should be 4 times greater so P=1.35mW×4

P = 0.05W

Standard value = 0.25W = 1/4 W

**FINDING THE VALUE OF C3**

O/P resistor R = O/P voltage

O/P current = 13.5/1A = 13.5 Ω

Time constant = RC = 13.5×C

Time constant = 1mS

Therefore C = 1×10̄̄³S/13.3 Ω = 740μF

Standard value = 1000μF

Therefore C3 = 1000μF, 43V

**VOLTAGE REGULATOR CIRCUIT DESIGN**

From Data sheet of voltage regulator:-

Vref = 1.25volts

Iadj = 100μA

Assume:- R1 = 220Ω

Vout = Vref (1+R2/R1) + (Iadj) R2

13.5V = 1.25 × (1+R2/220) + (100×10 -6) R2

13.5V – 1.25V = 1.25R2/220 +0.1×10 -3 R2

12.25V = 5.69× 10 -3 R2+0.1 × 10-3 R2

12.25V = 5. 79 × 10-3 R2

R2 = 12.25/5.79×10-3

R2 = 2.2kΩ

**CURRENT LIMITING**

Output current= 1A

Transistor volt for 2N2222 = 600mV

So, R3 = 0.6V/1A(ohms law R = V/I)

R3 =0.6Ω

R4 = 2R3

R4 =2×0.6Ω

**TRANSFORMER DESIGN FOR 12V BATTERY CHARGER**

Required output voltage =13.5V / 1A D.C

The regulator output is less than 3V of the regulator input.

So the regulator input = 13.5V+1.5V=15V

So Vdc =15V

Vrms =Vdc/0.9

So Vrms=15/0.9

Vrms = 16.66V

10% margin voltage = 16.66+10% of 16.66

= 16.66+1.66=18.32V

Transformer: - 230V / 18V, 1A

**BILL OF MATERIAL FOR BATTERY CHARGER**

|  |  |  |  |
| --- | --- | --- | --- |
| **SL. NO** | **ITEM DESCRIPTION** | **SYMBOL** | **QUANTITY** |
| 1 | TRANSFORMER 230/18V 1A | TR1 | 1 |
| 2 | DIODE 1N4007 | D1-D5 | 5 |
| 3 | ELECROLYTIC CAPACITOR 1000µF | C1,C3 | 2 |
| 4 | CERAMIC CAPACITOR 0.1µF | C2,C4 | 2 |
| 5 | 3 TERMINAL REGULATOR LM 317 | LM 317 | 1 |
| 6 | TRANSISTOR 2N2222 | Q3 | 1 |
| 7 | RESISTOR 0.6Ω,1/4W,CFR | R1 | 1 |
| 8 | RESISTOR 100Ω,1/4W,CFR | R2 | 1 |
| 9 | RESISTOR 1.2KΩ,1/4W,CFR | R3 | 1 |
| 10 | RESISTOR 220Ω/,14W,CFR | R4 | 1 |
| 11 | RESISTOR 1KΩ/,14W,CFR | R5 | 1 |
| 12 | LED RED 5mm | RED LED | 1 |
| 13 | SIL C0NNECTOR | J1-J4 | 4 |

**3. IR SENSOR CIRCUIT**

The obstacle senor is used avoiding the robot from the clash to any external devices (or) that is like walls, any obstacle which comes in its way. Here we are using the IR communications .the transmitter and the receiver parts. The transmitter produces the IR rays and they are received by the receiver section.

**CIRCUIT DIAGRAM OF IR SENSOR CIRCUIT**

****

Fig (3)

**CIRCUIT DIAGRAM DESCRIPTION**

In the fig (3) you can see two IR LEDs (Tx) with a resistor and phototransistor (Rx) in series. When the infrared rays are reflecting and fall in to the photo transistor, it will give the signal to the microcontroller unit .The two resistors are used in the circuit for protecting the IR LED and the phototransistor

Make single Led / Phototransistor sensors for front left and front right. This will allow him to avoid crashing into obstacles when his rangefinder/object tracker is looking elsewhere.

Note that the phototransistors are slightly forward of the blue LEDs. This helps stop stray light from the LEDs being detected

**BILL OF MATERIAL FOR IR SENSOR CIRCUIT**

|  |  |  |  |
| --- | --- | --- | --- |
| **SL. NO** | **DESCRIPTION** | **SYMBOL** | **QUANTITY** |
| 1 | LED EMITTER LTE 4208 | Tx | 2 |
| 2 | PHOTOTRANSISTOR LTR 4206 | Rx | 2 |
| 3 | RESISTOR 100Ω,1/4W ,CFR | R6,R8 | 2 |
| 4 | RESISTOR 20KΩ1/4W ,CFR | R7,R9 | 2 |
| 5 | SIL CONNECTOR 3PIN | J5,J6 | 2 |

**4. MICROCONTROLLER UNIT**

It is the heart of the circuit. Because it will control all the operations of a circuit to get the accurate result. Here we are using AT89C51 controller. The microcontrollers have 40 pins and 4 ports. Each port consists of the 8 pins. Generally the controller works on the transistor logic. According to our requirement we selected the microcontroller AT89c51

**CIRCUIT DIAGRAM OF MICROCONTROLLER UNIT**



Fig (4)

**STUDY OF MICROCONTROLLER AT89C51:**

• Compatible with MCS-51 Products

• 8K Bytes of In-System Programmable (ISP) Flash Memory

• Endurance: 1000 Write/Erase Cycles

• 4.0V to 5.5V Operating Range

• Fully Static Operation: 0 Hz to 33 MHz

• Three-level Program Memory Lock

• 256K Internal RAM

• 32 Programmable I/O Lines

• 3 16-bit Timer/Counters

• Eight Interrupt Sources

• Full Duplex UART Serial Channel

• Low-power Idle and Power-down Modes

• Interrupt Recovery from Power-down Mode

• Watchdog Timer

• Dual Data Pointer

• Power-off Flag

**PIN CONFIGURATION OF 89C51 MICROCONTROLLER:**

Fig (5)

**Pin Description:**

**VCC 40:**

Supply voltage.

**GND 20:**

Ground.

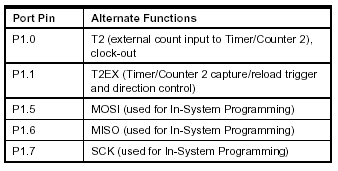
**Port 0 (32-39):**

Port 0 is an 8-bit open drain bi-directional I/O port. As an output port, each pin can sink eight TTL inputs. When 1s are written to port 0 pins, the pins can be used as high impedance inputs. Port 0 can also be configured to be the multiplexed low order address/data bus during accesses to external program and data memory. In this mode, P0 has

internal pull-ups. Port 0 also receives the code bytes during Flash Programming and outputs the code bytes during program verification. External pull-ups are required during program verification

**Port 1 (1-8):**

Port 1 is an 8-bit bi-directional I/O port with internal pull-ups. The Port 1 Output buffers can sink/source four TTL inputs. When 1s are written to Port 1 pins, they are pulled high by the internal pull-ups and can be used as inputs. In addition, P1.0 and P1.1 can be configured to be the timer/counter 2 external count input (P1.0/T2) and the timer/counter 2 trigger input P1.1/T2EX), respectively, as shown in the following table. Port 1 also receives the low-order address bytes during Flash programming and verification.



**Port 2 (21-28):**

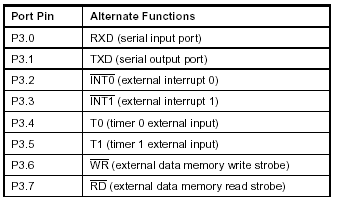
Port 2 is an 8-bit bi-directional I/O port with internal pull-ups. The Port 2 output buffers can sink/source four TTL inputs. When 1s are written

to Port 2 pins, they are pulled high by the internal pull-ups and can be used as inputs. Port 2 emits the high-order address byte during fetches from external program memory and during accesses to external data memory that uses 16-bit addresses (MOVX @DPTR). In this application, Port 2 uses strong internal pull-ups when emitting 1s. During accesses to external data memory that use 8-bit addresses

(MOVX @ RI), Port 2emits the contents of the P2 Special Function Register. Port 2 also receives the high-order address bits and some control signals during Flash programming and verification.

**Port 3 (10-17):**

Port 3 is an 8-bit bi-directional I/O port with internal pull-ups. The Port 3 output buffers can sink/source four TTL inputs. When 1s are writ 1s are written to Port 3 pins, they are pulled high by the internal pull-ups and can be used as inputs. As inputs, Port 3 pins that are externally being pulled low will source current (IIL) because of the pull-ups. Port 3 also serves the functions of various special features of the AT89S52, as shown in the following table. Port 3 also receives some control signals for Flash programming and verification.



**RST**

Reset input. A high on this pin for two machine cycles while the oscillator is running resets the device.

**ALE/PROG**

Address Latch Enable (ALE) is an output pulse for latching the low byte of the address during accesses to external memory. This pin is also the program pulse input (PROG) during Flash programming. In normal operation, ALE is emitted at a constant rate of1/6 the oscillator frequency and may be used for external timing or clocking purposes. Note, however, that one ALE pulse is skipped during each access to external data Memory. If desired, ALE operation can be disabled by setting bit 0 of SFR location 8EH. With the bit set, ALE is active only during a MOVX or MOVC instruction. Otherwise, the pin is weakly

pulled high. Setting the ALE-disable bit has no effect if the micro controller is in external execution mode.

**PSEN**

Program Store Enable (PSEN) is the read strobe to external program memory. When the AT89S52 is executing code from external program memory, PSEN is activated twice each machine cycle, except that two

PSEN activations are skipped during each access to external data memory.

**EA/VPP**

External Access Enable. EA must be strapped to GND in order to enable the device to fetch code from external program memory locations starting at 0000H up to FFFFH. Note, however, that if lock bit 1 is programmed, EA will be internally latched on reset. A should be strapped to VCC for internal program executions. This pin also receives the 12-voltProgramming enables voltage (VPP) during Flash programming.

**XTAL1**

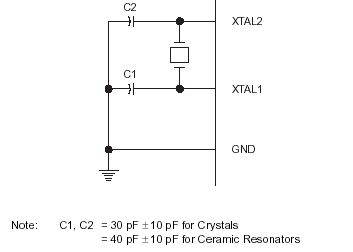
Input to the inverting oscillator amplifier and input to the internal clock operating circuit.

**XTAL2**

Output from the inverting oscillator amplifier.

**Oscillator Characteristics:**

XTAL1 and XTAL2 are the input and output, respectively, of an inverting amplifier that can be configured for use as an on-chip oscillator, as shown in Figure 1. Either a quartz crystal or ceramic resonator may be used. To drive the device from an External clock source, XTAL2 should be left unconnected while XTAL1 is driven.



Oscillator Connections

**Special Function Register (SFR) Memory:**

Special Function Registers (SFR s) are areas of memory that control specific functionality of the 8051 processor. For example, four SFRs permit access to the 8051’s 32 input/output lines. Another SFR allows the user to set the serial baud rate, control and access timers, and configure the 8051’s interrupt system.

**Accumulator:** The Accumulator, as its name suggests is used as a general register to accumulate the results of a large number of instructions. It can hold 8-bit (1-byte) value and is the most versatile register. The “R” registers: The “R” registers are a set of eight registers that are named R0, R1. Etc. up to R7. These registers are used as auxiliary registers in many operations.

The “B” registers: The “B” register is very similar to the accumulator in the sense that it may hold an 8-bit (1-byte) value. Two only uses the “B” register 8051 instructions: MUL AB and DIV AB.

**Data Pointer:**

The Data pointer (DPTR) is the 8051’s only user accessible 16-bit (2Bytes) register. The accumulator, “R” registers are all 1-Byte values. DPTR, as the name suggests, is used to point to data. It is used by a number of commands, which allow the 8051 to access external memory.

**Program counters & Stack pointer:**

The program counter (PC) is a 2-byte address, which tells the 8051 where the next instruction to execute is found in memory. The stack pointer like all registers except DPTR and PC may hold an 8-bit (1-Byte) value.

**Memory:**

Special Function Registers (SFRs) are areas of memory that control specific functionality of the 8051 processor. For example, four SFRs permit access to the 8051’s 32 input/output lines. Another SFR allows the user to set the serial baud rate, control and access timers, and configure the 8051’s interrupt system.

**Timer 2 Registers:**

Control and status bits are contained in registers T2CON and T2MOD for Timer 2. The register pair (RCAP2H , RCAP2L) are the Capture / Reload registers for Timer 2 in 16-bit capture mode or 16-bit auto-reload mode .

**Interrupt Registers:**

The individual interrupt enable bits are in the IE register . Two priorities can be set for each of the six interrupt sources in the IP register.

# Timer 2:

# Timer 2 is a 16-bit Timer / Counter that can operate as either a timer or an event counter. The type of operation is selected by bit C/T2 in the SFR T2CON. Timer 2 has three operating Modes : capture , auto-reload ( up or down Counting ) , and baud rate generator . The modes are selected by bits in T2CON. Timer2 consists of two 8-bit registers, TH2 and TL2. In the Timer function, the TL2 register is incremented every machine cycle. Since a machine cycle consists of 12 oscillator periods, the count rate is 1/12 of the oscillator frequency.

In the Counter function , the register is incremented in response to a 1-to-0 transition at its corresponding external input pin , T2 .When the samples show a high in one cycle and a low in the next cycle, the count is incremented . Since two machine cycles (24 Oscillator periods ) are required to recognize 1-to-0 transition , the maximum count rate is 1 / 24 of the oscillator frequency . To ensure that a given level is sampled at least once before it changes , the level should be held for at least one full machine cycle.

**BILL OF MATERIAL FOR MICRO CONTROLLER UNIT**

|  |  |  |  |
| --- | --- | --- | --- |
| **SL. NO** | **ITEM DESCRIPTION** | **SYMBOL** | **QUANTITY** |
| 1 | MICROCONTROLLER 89c51 | AT89c51 | 1 |
| 2 | 3 TERMINAL REGULATOR LM7805 | LM7805/ T0220 | 1 |
| 3 | CRYSTAL 11.08MHz | CRYSTAL | 1 |
| 4 | ELECTROLYTE CAPACITOR 1000µF/25V | C5,C7 | 2 |
| 5 | CERAMIC CAPACITOR 0.1 µF/25V | C6,C8 | 2 |
| 6 | CERAMIC CAPACITOR 10 µF/25V | C9 | 1 |
| 7 | CERAMIC CAPACITOR 30 pF/25V | C10,C11 | 2 |
| 8 | RESISTOR 100Ω,1/4W,CFR | R10 | 1 |
| 9 | RESISTOR 560Ω,1/4W,CFR | R11 | 1 |
| 10 | RESISTOR 8.2KΩ,1/4W,CFR | R12 | 1 |
| 11 | LED5mm | RED LED | 1 |
| 12 | LED5mm | GREEN LED | 1 |
| 13 | SWITCH(SPST),5A/250V | SW2 | 1 |
| 14 | SIL CONNECTOR(2 PIN) | J7-J9 | 3 |
| 15 | SIL CONNECTOR(3 PIN) | J10,J11 | 2 |
| 16 | SIL CONNECTOR(5 PIN) | J12 | 1 |

**5. MOTOR DRIVER AND ASSEMBLY UNIT:**

Motor Controller is used as a driver circuit for motors. To move the robot in four different directions we definitely need H-bridge as an interfacing circuit between controller and motors. By comparing the motor voltage (the voltage required for the working of our dc geared motor) and drivers data sheets.

Here we are using a motor Driver IC L293D as the motor controller. 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.

**CIRCUIT DIAGRAM OF MOTOR DRIVER UNIT**

****

Fig (6)

[Electric motor](http://en.wikipedia.org/wiki/Electric_motor), a machine that converts electricity into a mechanical motion.

The brushed DC motor is one of the earliest motor designs. Today, it is the motor of choice in the majority of variable speed and torque control applications.









**ADVANTAGES:**

* Easy to understand design
* Easy to control speed
* Easy to control torque
* Simple, cheap drive design

**PARAMETRS OF THE DC MOTRS:**

* Direction of rotation
* Motor Speed
* Motor Torque
* Motor Start and Stop

**BILL OF MATERIAL FOR MOTOR DRIVER UNIT**

|  |  |  |  |
| --- | --- | --- | --- |
| **SL. NO** | **ITEM DESCRIPTION** | **SYMBOL** | **QUANTITY** |
| 1 | H-BRIDGE IC L293D | L293D | 1 |
| 2 | MOTOR 12V DC MOTOR 45 rpm | MI-M2 | 2 |
| 3 | SIL CONNECTPR (2PIN) | J13-15 | 3 |
| 4 | SIL CONNECTPR (5PIN) | J16 | 1 |

**CIRCUIT SCHEMATIC**

****

Fig (7)

**SCHEMATIC EXPLANATION (WORKING):**

In this project we are controlling three industrial devices. To control the robot we are using 8051microcontroller which is 40-pin controller, Power supply, and L293D h-bridge and obstacle senor.

The microcontroller is 40-pin DIP has divided into four 8-bit ports (P0, P1, P2 and P3), remaining are: reset (pin-9)-is connected to +5v power supply through reset switch, a capacitor and a resistor. Pin-18(XTAL2) and pin-19(XTAL1) are connected to a crystal circuit. The +5v is connected to 40th pin and 20th pin is connected to GND of the controller. Pin-31of microcontroller is connected +5v V cc. Port3 pins has different functionality for each, we can use them for special purpose.

An obstacle sensor is connected to the robot so that it protects the robot from clashing to any obstacle. Here the obstacle senor is IR pair the transmitter is IRLED and the receiver part is the photo diode, which are connected to the port1 to the pins (p1.0, p1.1).

One more IC we are using on this project is L293D; main purpose of this IC is to drive motors in any direction. By using this IC we can drive two motors. These motors are connected to pins 3, 6 and pins11, 14 of the L293D IC. Pins 4, 5 and 12, 14 are shorted with ground. The IC works at +5v supply it’s connected to pin-16.Pins1, 8, 9 are shorted with pin-16. Pins 2,7,15 and 10 are input pins of L293D are connected to microcontroller.

The pins 2, 7, 15 and 10 are connected to 21, 22, 24 and 23 pin of microcontroller respectively. Here the h bridge is connected to the port 2 pins (p2.0, p2.1, p2.2, p2.3).

**M****ECHANICAL DESIGN OF ROBOTIC ROVER**

**(TOP VIEW)**

**Rover Base:**

**L Clamp & U Clamp:**

**PROJECT LAYOUT**

**BILL OF MATERIALS MISCELLANEOUS**

|  |  |  |
| --- | --- | --- |
| **SL. NO** | **DESCRIPTION** | **QUANTITY** |
| 1 | POWER CORD | 5Mts |
| 2 | 3PIN PLUG | 1 |
| 3 | 12V SLA BATTERY | 1 |
| 4 | BATTERY CONNECTOR | 4 |
| 5 | GENERAL PURPOSE PCB 15x10 | 1 |
| 6 | GENERAL PURPOSE PCB 5x3 | 2 |
| 7 | GENERAL PURPOSE PCB 7x5 | 2 |
| 8 | CONNECTING WIRE | ---- |
| 9 | SOLDERING STATION | ---- |
| 10 | SOLDERING IRON | ---- |
| 11 | HEAT SINK | 2 |
| 12 | WIRE CONNECTOR | ---- |
| 13 | PCB BASE | ---- |
| 14 | FINE STRIPPER | 1 |
| 15 | TYRE ф7cm | 2 |
| 16 | HYLUM SHEET 200x180mm | 1 |
| 17 | 3mm ALUMINIUM SHEET | ------ |
| 18 | NUT & BOLT | ------ |
| 19 | INSULATION TAPE | ----- |

**SOFTWARE LISTING**

#include<at892051.h>    // memory address in file at892051.h

main()

{

  while (1)

   {

   if (P1\_2==1)        // IF obstacle in right front

      P1\_3=1;          // left motor turn reversely

   if (P1\_2==0)       // If no obstacle in right front

       P1\_3=0;         // left motor turn forward

   if (P1\_4==1)      //  IF obstacle in left front

       P1\_5=1;         // right motor turn reversely

  if (P1\_4==0)      // If no obstacle in left front

       P1\_5=0;        // right motor turn forward

   }

}

#include<at892051.h>

void delay(unsigned int dly);

main()

{

  while (1)

  {

    if (P1\_2==1)

     {

      P1\_3=1;

     P1\_5=1;

     delay(100);       // car reverse a few seconds

      P1\_5=0;       // right motor go forward , car turn left.

      delay(40);        // delay seconds

   }

   if (P1\_2==0)       // If no obstacle in right front

      P1\_3=0;         // left motor go forward

      delay(1);        // wait for dispear of interference

   if (P1\_4==1)      //  if obstacle in left front

      P1\_5=1;        // right motor reverse

      delay(1);        // wait for dispear of interference

if (P1\_4==0)      // If no obstacle in left front

      P1\_5=0;         // right motor go forward

      delay(1);        // wait for dispear of interference

  }

}

void delay(unsigned int dly)  // function for delay

 {

   dly=dly\*300;

   while (dly>0)

      dly--;

}

#include<at892051.h>

void delay(unsigned int dly);

unsigned int aa;

main()

{

  while (1)

  {

   if (P1\_2==1)

   {

      P1\_3=1;

      P1\_5=1;

      delay(1);

      for (aa=1;aa<=5;aa=aa+1)

         {

          P1\_3=1;

          P1\_5=0;

          delay(40);

          P1\_3=0;

          P1\_5=1;

          delay(40);

         }

      P1\_5=0;

      delay(100);

   }

   if (P1\_2==0)

      P1\_3=0;

          delay(1);

   if (P1\_4==1)

      P1\_5=1;

          delay(1);

   if (P1\_4==0)

      P1\_5=0;

      delay(1);

  }

}

void delay(unsigned int dly)

  {

   dly=dly\*300;

   while (dly>0)

      dly--;

  }

**HARDWARE TESTING**

**1. Continuity test:-**

First of all we checked the PCB that all the tracks are as per the design of PCB and showing continuity with the help of multimeter and PCB layout.

**2. Short circuit test:-**

Then we checked the PCB for any unwanted short circuits with the help of multimeter and PCB layout.

**3. Soldering:-**

In the next step, we soldered the required components. And then checked that there are no any unwanted shorts occurred due to soldering without putting IC's and keeping power supply off.

**4. Power supply test:-**

In the next step, we put power supply on and checked whether required voltage is appearing at the required voltage is appearing at the required points i.e. +Vcc and GND at the respective points. We took care of not connecting IC's in the circuit while performing this test.

**5. Microcontroller test:-**

For testing the microcontroller, we wrote the square wave generation program for generating square wave on each port pin. Then we fed the program in microcontroller and checked the output with the

help of CRO by connecting the microcontroller in the circuit. We took care of not connecting any other IC in the circuit.

**PRECAUTIONS**

* Before starting the operation check the battery source. And ensure that enough voltage is available.
* Take care about the connection groundings.
* Ensure that the controller hardware connections are properly done.
* Check the connection and connect it properly.
* The sensors must be arranged in proper positions.

**APPLICATIONS**

* Obstacle sensing robot can be applied at the toys where small children will play.
* It can used for the army application we can add a cam to it.
* We can apply number pairs of IR pairs for the safe direction control of the robot.

**FUTURE ASPECTS**

**1. Adding a Camera:**

If the current project is interfaced with a camera (e.g. a Webcam) robot can be driven beyond line-of-sight & range becomes practically unlimited as networks have a very large range.

**2. Use as a fire fighting robot :**

By adding temperature sensor, water tank and making some changes in programming we can use this robot as fire fighting robot.

**COST ESTIMATION**

1. **BATTERY CHARGER**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NO** | **ITEM DESCRIPTION** | **RATE** | **QTY** | **TOTAL** |
| 1 | TRANSFORMER 230/18V 1A | 80 | 1 | 80.00 |
| 2 | DIODE 1N4007 | .50 | 5 | 2.50 |
| 3 | ELECROLYTIC CAPACITOR 1000µF | .50 | 2 | 1.00 |
| 4 | CERAMIC CAPACITOR 0.1µF | .25 | 2 | 0.50 |
| 5 | 3 TERMINAL REGULATOR LM 317 | 10 | 1 | 10.00 |
| 6 | TRANSISTOR 2N2222 | 10 | 1 | 10.00 |
| 7 | RESISTOR 0.6Ω,1/4W,CFR | .25 | 1 | 0.25 |
| 8 | RESISTOR 100Ω,1/4W,CFR | .25 | 1 | 0.25 |
| 9 | RESISTOR 1.2KΩ,1/4W,CFR | .25 | 1 | 0.25 |
| 10 | RESISTOR 220Ω/,14W,CFR | .25 | 1 | 0.25 |
| 11 | RESISTOR 1KΩ/,14W,CFR | .25 | 1 | 0.25 |
| 12 | LED RED 5mm | 1 | 1 | 1.00 |
| 13 | SIL C0NNECTOR | 6 | 4 | 24.00 |
|  | **TOTAL** | | | **130.25/-** |

1. **IR SENSOR CIRCUIT**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NO** | **ITEM DESCRIPTION** | **RATE** | **QTY** | **TOTAL** |
| 1 | LED EMITTER LTE 4208 | 2 | 2 | 4.00 |
| 2 | PHOTOTRANSISTOR LTR 4206 | 20 | 2 | 40.00 |
| 3 | RESISTOR 100Ω,1/4W ,CFR | .50 | 2 | 1.00 |
| 4 | RESISTOR 20KΩ1/4W ,CFR | .25 | 2 | 0.50 |
| 5 | SIL CONNECTOR 3PIN | 10 | 2 | 20.00 |
|  | **TOTAL** | | | **65.50/-** |

1. **MICROCONTROLLER UNIT**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NO** | **ITEM DESCRIPTION** | **RATE** | **QTY** | **TOTAL** |
| 1 | MICROCONTROLLER 89c51 | 48 | 1 | 48.00 |
| 2 | 3 TERMINAL REGULATOR LM7805 | 9 | 1 | 9.00 |
| 3 | CRYSTAL 11.08MHz | 6.50 | 1 | 6.50 |
| 4 | ELECTROLYTE CAPACITOR 1000µF/25V | .5 | 2 | 1.00 |
| 5 | CERAMIC CAPACITOR 0.1 µF/25V | .5 | 2 | 1.00 |
| 6 | CERAMIC CAPACITOR 10 µF/25V | .5 | 1 | .5 |
| 7 | CERAMIC CAPACITOR 30 pF/25V | .5 | 2 | 1.00 |
| 8 | RESISTOR 100Ω,1/4W,CFR | .5 | 1 | .5 |
| 9 | RESISTOR 560Ω,1/4W,CFR | .5 | 1 | .5 |
| 10 | RESISTOR 8.2KΩ,1/4W,CFR | .5 | 1 | .5 |
| 11 | LED5mm | 1 | 1 | 1.00 |
| 12 | LED5mm | 1 | 1 | 1.00 |
| 13 | SWITCH(SPST),5A/250V | 5 | 1 | 5.00 |
| 14 | SIL CONNECTOR(2 PIN) | 10 | 3 | 30.00 |
| 15 | SIL CONNECTOR(3 PIN) | 10 | 2 | 20.00 |
| 16 | SIL CONNECTOR(5 PIN) | 10 | 1 | 10.00 |
|  | **TOTAL** | | | **135.50/-** |

1. **MOTOR DRIVER UNIT**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NO** | **ITEM DESCRIPTION** | **RATE** | **QTY** | **TOTAL** |
| 1 | H-BRIDGE IC L293D | 80 | 1 | 80.00 |
| 2 | MOTOR 12V DC MOTOR 45 rpm | 150 | 2 | 300.00 |
| 3 | SIL CONNECTPR (2PIN) | 10 | 3 | 30.00 |
| 4 | SIL CONNECTPR (5PIN) | 10 | 1 | 10.00 |
|  | **TOTAL** | | | **420.00/-** |

1. **MISCELLENIOUS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NO** | **ITEM DESCRIPTION** | **RATE** | **QTY** | **TOTAL** |
| 1 | POWER CORD | 40/MTR | 5Mts | 200 |
| 2 | 3PIN PLUG | 40 | 1 | 40 |
| 3 | 12V SLA BATTERY | 450 | 1 | 450 |
| 4 | BATTERY CONNECTOR | 50 | 4 | 200 |
| 5 | GENERAL PURPOSE PCB 15x10 | 25 | 1 | 25 |
| 6 | GENERAL PURPOSE PCB 5x3 | 20 | 2 | 40 |
| 7 | GENERAL PURPOSE PCB 7x5 | 10 | 2 | 20 |
| 8 | CONNECTING WIRE | 25 | ---- | 25 |
| 9 | SOLDERING STATION | --- | ---- | --- |
| 10 | SOLDERING IRON | --- | ---- | --- |
| 11 | HEAT SINK | 2 | 2 | 4 |
| 12 | WIRE CONNECTOR | 2.5 | ---- | 2.5 |
| 13 | PCB BASE | 5.0 | ---- | 5 |
| 14 | FINE STRIPPER | --- | 1 | 1 |
| 15 | TYRE ф7cm | 45 | 2 | 90 |
| 16 | HYLUM SHEET 200x180mm | 35 | 1 | 35 |
|  | **TOTAL** | | | **1137.50/-** |

**OVERALL COST**

|  |  |  |  |
| --- | --- | --- | --- |
| **NO** | **NAME** | **RATE** | |
| 1 | BATTERY CHARGER | 130.25 | |
| 2 | IR SENSOR CIRCUIT | 65.50 | |
| 3 | MICROCONTROLLER CIRCUIT | 135.50 | |
| 4 | MOTOR ASSEMBLY | 420.00 | |
| 5 | MISCELLANIOUS | 1137.00 | |
|  | **TOTAL** | | **1888.25/-** |

**CONCLUSION**

The project is “**obstacle detection and avoidance robot**” is practically proved by using the IR pairs for sensing the robot, L293D for the driving the dc motor, dc motor is used for the movement of the robot with the help of the micro controller.

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* [www.google.com](http://www.google.com)

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* ELECTRONICS FOR YOU

**THE END**

**DATASHEETS**

**DATASHEET INDEX**

|  |  |
| --- | --- |
| **SL NO** | **NAME** |
| **01** | **OBSTACLE AVOIDANCE** |
| **02** | **OBJECT DETECTION** |
| **03** | **DIODE** |
| **04** | **CAPACITOR** |
| **05** | **RESISTOR** |
| **06** | **IR LED** |
| **07** | **PHOTO TRANSISTOR** |
| **08** | **MICROCONTROLLER 89C51** |
| **09** | **VOLTAGE REGULATOR LM7805** |
| **10** | **CRYSTAL OSCILLATOR** |
| **11** | **MOTOR DRIVER L293D** |
| **12** | **12V DC GEARED MOTOR** |