Obstacle Avoider

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1 Introduction

Technology is taking the front edge in the globalisation of the digital world. Robotics, the future sun of technology is the art of reducing human effort. Meanwhile, one more technology emerging is the automation. The collaboration of both locomotive robotics and automation is our project. We use a micro-controller in controlling the action of robot. With the help of an ultrasonic sensor we measure the distance. The ultrasonic sensor is basically a transducer which converts the time into distance. It uses the principle of reflection finding out the obstacle. The sensor is basically a transducer, which converts travel time into distance. The biggest advantage of this project is that it reduces human effort. Further, in future we want to implement this project model on a large scale by the means of Google maps for real time needs which leads to the development of driver-less vehicles.

2 Components Required:

2.1 Arduino Nano

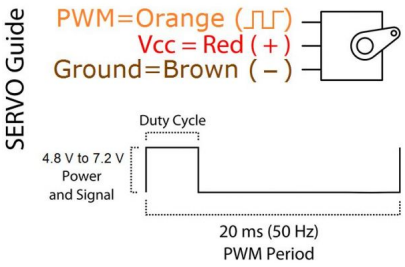
(Micro-controller)

Arduino Nano (http://avrchip.com/arduino-nano-datasheet-and-tutorial/) is a micro-controller which is derived from the family of Atmega 328 (for datasheet: https://www.microchip.com/wwwproducts/en/ATmega328); a product of the company Atmel Electronics. Basically a micro-controller is a user friendly electronic device which is generally used to perform a specific task. Here, task may be either one time or an infinite number of times, it is user controllable. User will have to code the required task in the form of an assembly language (or language with effective to the micro-controller, mostly a high level language). The micro-controller converts the code written into its understandable language and performs the task as per the code written by the user.

2.2 Ultrasonic Sensor(HCSR04):

An Ultrasonic sensor (for datasheet: http://www.datasheetcafe.com/hc-sr04-datasheet-detector-sensor/) is used to measure distance of any object which is near to it or approaching it. As mentioned above, it is a transducer which converts time of light travelling to and fro into distance in centimetres or inches. It has three main units which are, the transmitting unit, the receiving unit, and the controlling unit. The transmitting unit transmits the light on a trigger obtained through the trigger pin of the sensor. The trigger is basically obtained from one of the pins of the micro-controller. On transmitting, the light obviously meets some object which indeed reflects the light back. Now the receiving unit is active in sensing the reflected light back. The control unit thus receives the data from the receiving unit in the form of time. The distance is computed by the control unit as follows: Distance= time of travel * velocity of light. Note: The transmitting and receiving units are active in work only when the light travelled is of the same range approximately. If the received signal is not in range with the transmitted signal the control unit is not driven to work.

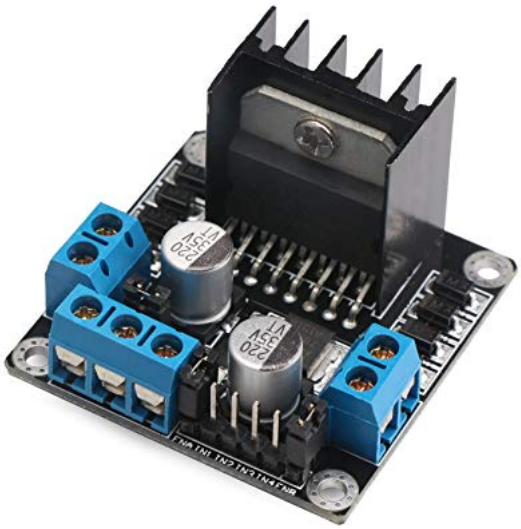
2.3 Servo Motor(MG996R):



A Servo motor (for specifications: http://www.datasheetcafe.com/mg996r-datasheet-digital-servo/) is a closed loop control system indeed a rotary controllable device. It is basically a motor whose principle is converting electrical energy into mechanical form. The speciality of this device it controls the mo-

tor's rotary movement based on angular scale (like 0 to 180 degrees) and the velocity, acceleration. It is a closed loop control system. There are two units in main one the control unit and the other the feedback unit. The control unit is a specialised electric brain which controls the motor's action. It does all the control action on the basis of arguments received from the feedback unit. The feedback unit is designed such that it uses various sensors like potentiometer to keep the track of elements like distance, angle, velocity, acceleration. The feedback unit eliminates the noise and passes data to the control unit. The control unit finds the difference (precisely speaking error) and performs the required so as to compensate the difference.

2.4 Motor Driver (L298N):



Motor driver(datasheet: https://www.st.com/resource/en/datasheet/l298.pdf) is an electronic device which comes into picture when the voltage to drive motors is insufficient. The working of motors is possible only when the voltage is sufficient. If Arduino is used we power it up with voltage of 3.3 V, which is deficient for the motors to run. A motor driver uses this voltage by regulating, amplifying and supplying it to the motors. It has three units mainly the input unit, output unit and the control unit. Input unit takes the input from the micro-controller and gives it to the control unit. Control unit regulates, amplifies and supplies the voltage to the output unit. The output unit drives the motors. The motor driver is a hardware module which consists of an integrated circuit l293d, which generally is the initial unit from which the driver l298n is developed. The l293d is responsible integrated circuit for the motor driving purpose.

2.5 DC Motors:

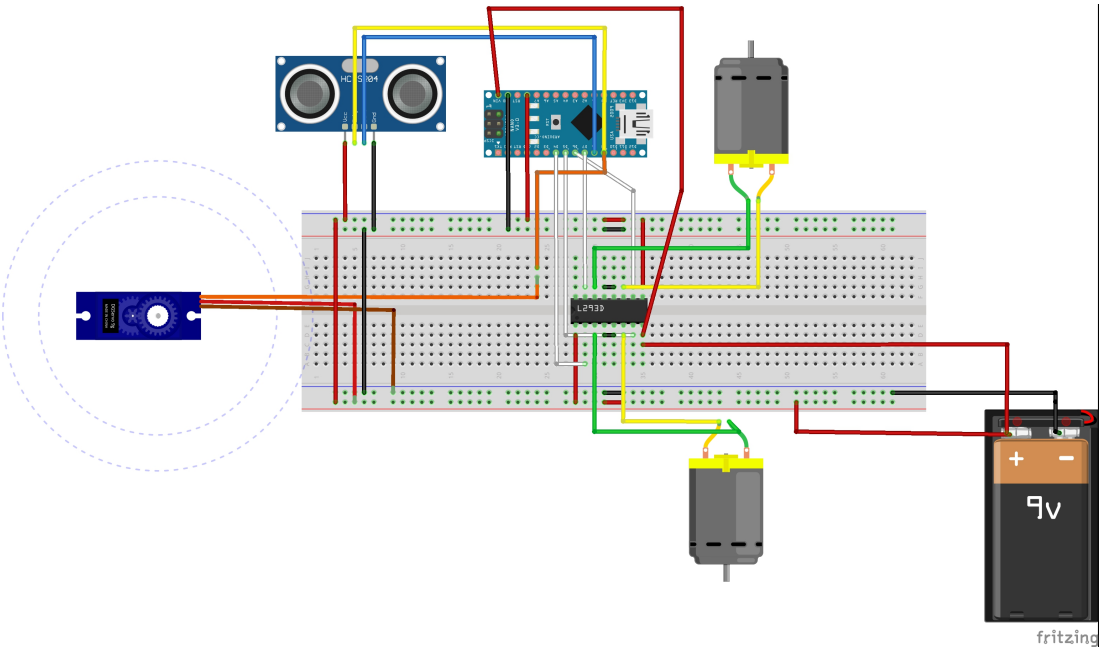
DC motors (for specifications: http://www.learningaboutelectronics.com/Articles/DC-motor-specifications.php) are electro-mechanical devices which convert electrical energy into mechanical form. It is polarity sensitive. To obtain the reverse movement we need to reverse the polarity.

2.6 Bread Board:

Bread Board is an electric junction contact which is basically the wiring of the conductors all over it in order to perform electronic operations.

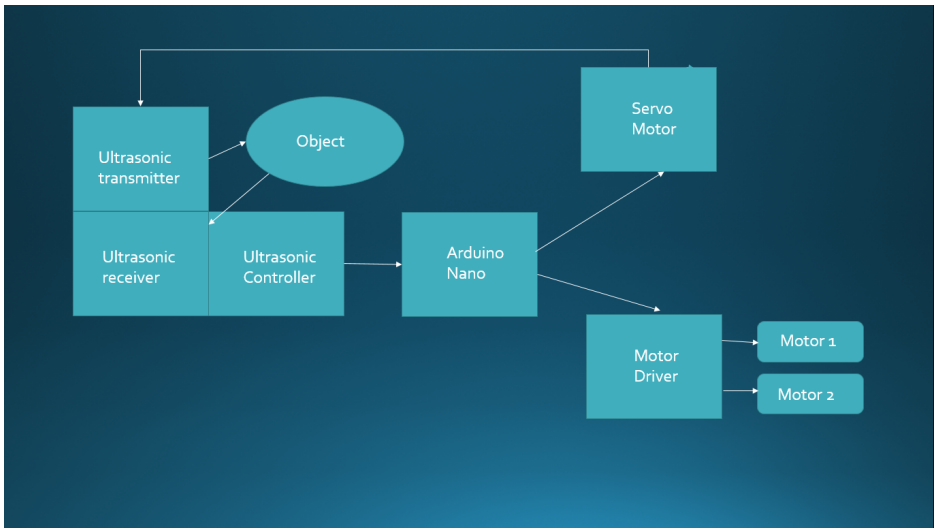
2.7 Jumper Wires:

3 FRTIZING DIAGRAM:



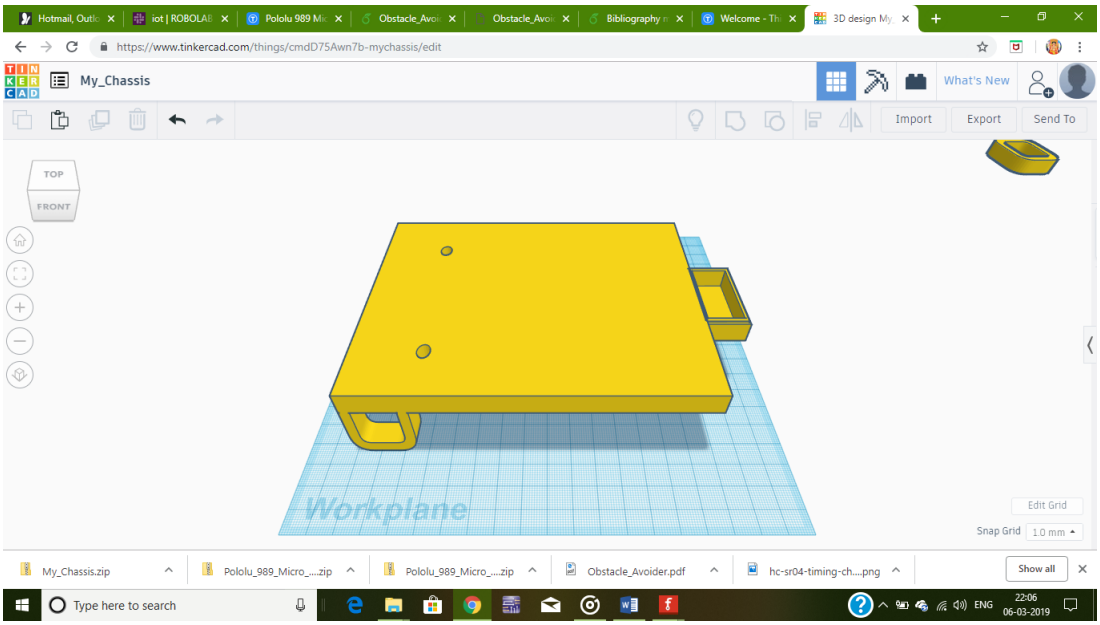
Physical connection orientation of the components to form an obstacle avoider.

4 BLOCK DIAGRAM:



Schematic overview of the obstacle avoider in elemental blocks.

5 Robot Chassis Design Layout:



Chassis built using tool Tinkercad.

6 Connections:

Arduino Nano:

5V to +ve of Battery
Gnd to –ve of Battery
D4 to IN1 of motor driver
D5 to IN2 of motor driver
D6 to IN3 of motor driver
D7 to IN4 of motor driver
D8 to echo pin of Sensor
D9 to trigger pin of sensor

Motor Driver:

EN1 and EN2 to V in of Nano
OUT1 and OUT2 to motor1
OUT3 and OUT4 to motor2
VCC to +ve of battery
Gnd to –ve of Battery

Servo Motor:

VCC to +ve of battery
Gnd to –ve of battery
IN to trig of sensor

Sensor:

VCC to +ve of battery
GND to –ve of battery

7 Working and Results:

The sensor senses the time and converts it into distance. The distance now in the Arduino code is set with a threshold value say 25 cm. If the distance is greater than the threshold the motor driver activates the motors to move in forward direction. If the distance measured is lesser than the threshold then the servo motor changes the left dc motor backwards and the right motor runs forward such that the rotation is in right direction deviating from the obstacle. Thus resulting in the obstacle avoidance.The following are the graphs of the ultra sonic sensor which represent the working and timing diagrams.

Figure 1: Plot between distance measured and time taken by the sensor.

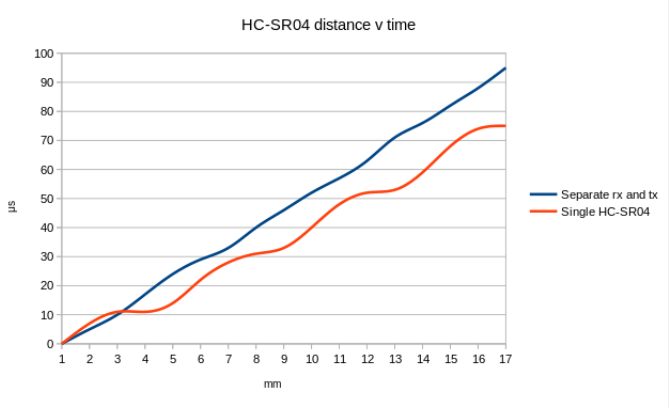
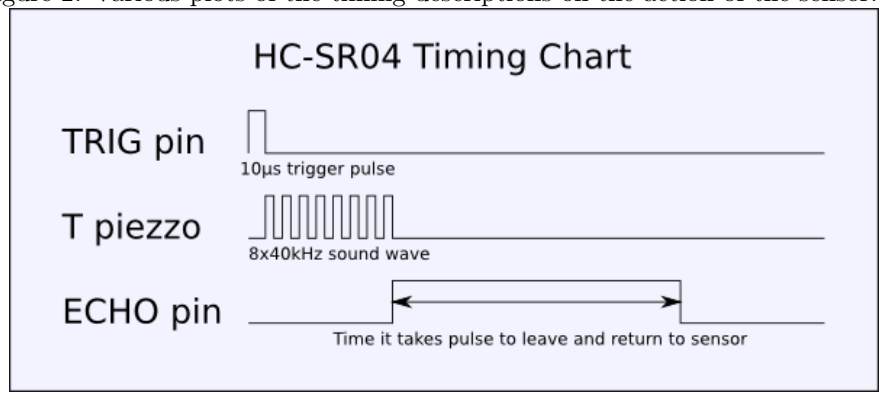


Figure 2: Various plots of the timing descriptions on the action of the sensor.



The obstacle avoiding robot is thus in full action with the task of moving with a collision-free mode of mobility. It is observed that the obstacle avoiding

robot works on the programmed stuff by the user, which indeed is an advantage for the developers to design it in the way they want, thus upholding all the essential necessary protocols it is ready to run.

8 Advantages:

1. It is automatic, no requirement of human power.
2. Efficient with negligible delay.
3. User Friendly, the user can manipulate it based on his own needs.
4. It can task bi-functionally, both with human and without human.

9 Applications:

1. Driver-less automobiles.
2. Integration with voice controlled auto-mobiles .
3. Military Requirements.
4. Path tracers.

10 References:

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