

OBJECT FOLLOWING ROBOT

PROJECT REPORT

TITLE OF THE PROJECT:

Object following robot

❖ ABSTRACT

A robot which can help us in many fields like carrying items, work with more accuracy in lesser time in every kind of works. A robot that can help us in hospital or bringing medical items in any emergency case will be more helpful for a doctor in emergency cases. This type of robot having so many benefits and it will be helpful in the future. This type of robot can be close to object is much possible. This useful project is made to attempts to follow the right object or obstacle. In this robot, infrared sensors or used to move the robot in both the direction and ultrasonic sensor for both the forward and reverse direction. Used the Arduino Uno microcontroller as the brain of this project. This robot is driven with four dc motors and it is controlled by a motor driver shield with ATmegaL293d. The main objective of designing this useful project is to make our life better and luxurious. In this project robotic car sense the object by IR sensor automatically and follow the object and obstacles. This type of robot will be more useful and it will be a trend in the future.

KEYWORDS:

Artificial intelligence, Human following, Human tracking, Ultrasonic sensor, IR sensor, Arduino micro controller

❖ INTRODUCTION:

In this high technology, a robot must be able to detect and follow humans. A robot that can detect and follow human or obstacle within a specific range is called 'Human Following Robot'.

Robots are used to change people's lives and make people's life luxurious. A robot that can use in shopping time which carries items, and follow human without any remote more useful. A robot that can use in the hospital to bringing medicine with more accuracy and fast. The human following robot has many works like work as trolley, structure in hospital, and a small basket with a car and so on.

Now in this changing world, people are started to lives with robot-like humans following robots for their luxurious life. This project named called human following robot because it can follow humans with the help of IR sensors and can co-exist with humans and help humans in any kind of work with more accuracy and in lesser time.

The human following robot can use in the defense sector also to carry weapons for the soldiers. This type of robot can sense obstacles and humans automatically and it can use in the future in our cars. An human following robot can be modified in the future with more developed components and can make it more advance. This robot can be enhanced by structure by adding more components like camera, tracking device and make it more beautiful and workable. This robot will be more trends in our future.

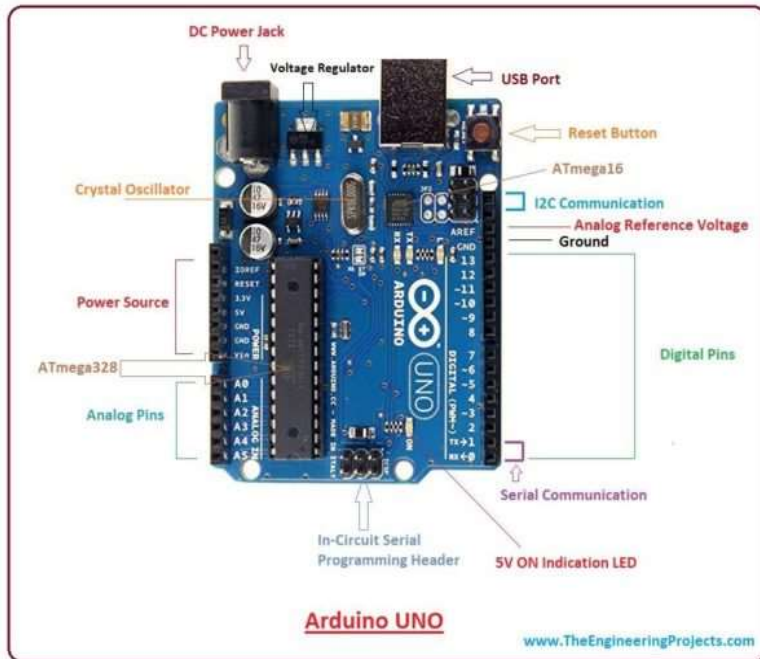
❖ COMPONENTS REQUIRED:

The human following robot has the following main components are:

1. Arduino Uno
2. L293D Motor driver
3. Infrared Sensors
4. Ultrasonic Sensor
5. Servo Motor
6. Four DC Geared Motors
7. Four wheels
8. Robot Chassis
9. Jumper wires
10. 18650 batteries
11. Switch
12. Tools Needed

❖ SPECIFICATIONS:

1. ARDUINO UNO:



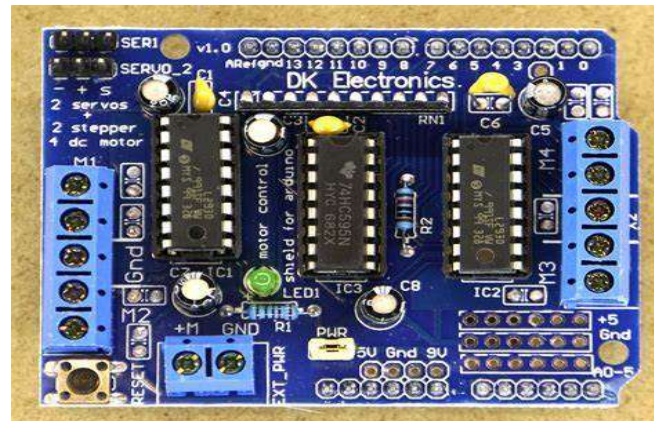
It is the brain of our project. It can give all the command to their sub ordinate components which should be operated by the human behavior. And it also gives feedback to the other components and human. So that it can be used as a medium of communication between human and robots & vice versa. . It has specification of 8 bit CPU, 16 MHZ clock speed, 2 KB SRAM 32 KB flash Memory, 1 KB EEPROM

2. DC MOTOR:



DC Motor is a device that converts any form of energy into mechanical energy or imparts motion. In constructing a robot, motor usually plays an important role by giving movement to the robot. Here 4 DC motor are used to drive the robot.

3. MOTOR DRIVER:



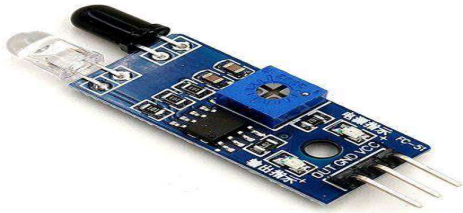
The Motor Shield is a driver module for motors that allows you to use Arduino to control the working speed and direction of the motor. . The Motor Shield can either be powered by Arduino directly or by an external 6V~15V power supply via the terminal input. Here Motor Driver Board is designed to Work with L293D IC

4. *ULTRASONIC SENSOR:*



An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. The working principle of this module is simple, it sends an ultrasonic pulse out at 40 kHz which travels through the air and if there is an obstacle or object, it will bounce back to the sensor. By calculating the travel time and the speed of sound, the distance can be calculated.

5. IR SENSOR:



IR sensor is an electronic device , that emits the light in order to sense some object of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation. These types of radiations are invisible to our eyes, but infrared sensor can detect these radiations. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode

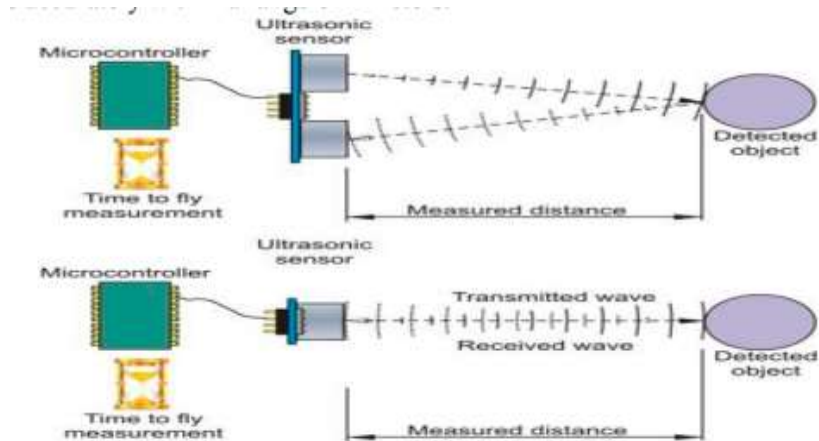
6. SERVO MOTOR



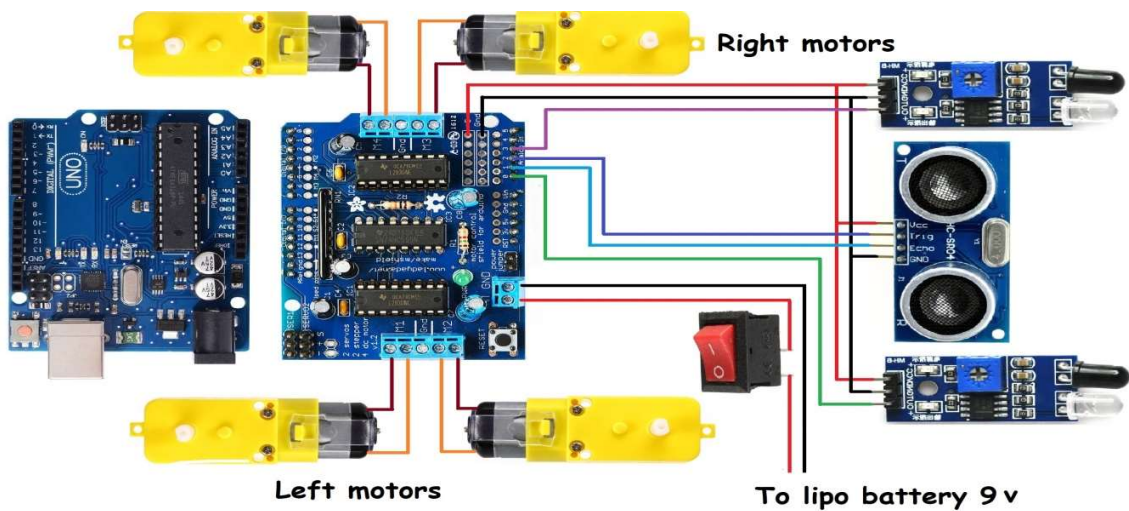
The SG90 9g Mini Servo motor is a 180° rotation servo. It is a Digital Servo Motor that receives and processes PWM signal faster and better. It equips sophisticated internal circuitry that provides good torque, holding power, and faster updates in response to external forces.

❖ WORKING AND DESIGN

Our system consists of a four wheel robotic vehicle mounted with a separate microprocessor and control unit along with different sensors and modules i.e. ultrasonic sensor, infrared sensors which helps them to move with respect to people and objects in their surroundings. The above sensors work in unison with each other and helps the robot in its operation and to navigate its path by avoiding the obstacles and maintaining a specific distance from the object. We used ultrasonic sensor for obstacle avoidance and to maintain a specific distance for the object. The ultrasonic sensor works accurately within a range of 4 meters.



❖ CIRCUIT DIAGRAM



Human Following Robot

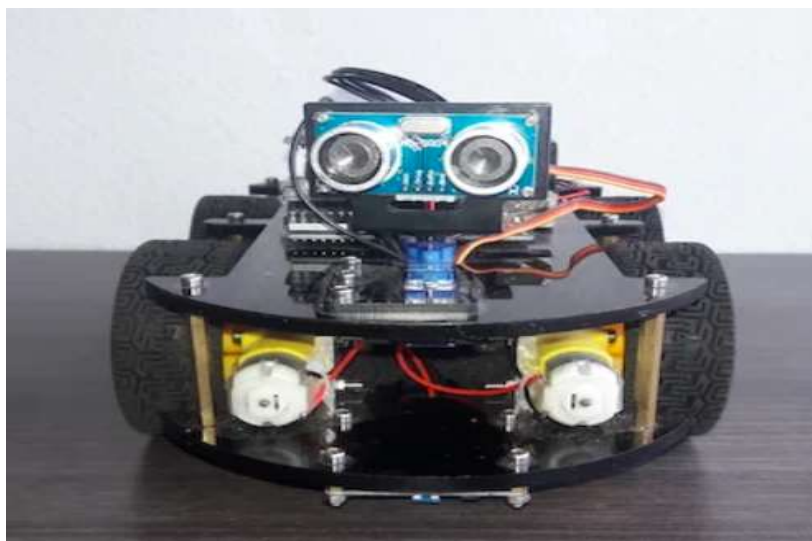
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❖ ULTRASONIC AND IR SENSOR PRINCIPLE:

This ultrasonic sensor is placed at the top of robot and pair of IR sensors are attached on either side of the ultrasonic sensor. We used ultrasonic sensor for obstacle avoidance and to maintain a specific distance for the object. The ultrasonic sensor works accurately within a range of 4 meters. Ultrasonic sensors operate by calculating the times differences. Infrared sensors detect the object's distance with infrared radiations when the beam from transmitter detects an object it returns to the receiver with an angle after reflection also known as method of triangulation this also helps in calculation of distance travelled by robot and eliminate any further error in the robotic movement due to displacement. IR sensor controls the movement of motors and ultrasonic sensor detects the obstacle and stops the motors

❖ RESULT

Different experiments were conducted and the performance of the object following robot was tested. Test was performed on the ultrasonic and infrared sensor. It was noted that the sensor was working accurately within a range of 4 meters. Then we performed the test to check whether the robot maintains a specific distance with the target object. Then we checked the serial communication between Arduino, motor shield and various motors. On the basis of results obtained from these tests and experiments, we made the necessary changes in the processing and control algorithm. After the completion, we observed that the results produced were very satisfying the robot was perfectly following the person wherever it goes. Hence the objective of implementing a good Human-Robot interaction was achieved



❖ FUTURE SCOPE:

There are many interesting applications of this research in different fields whether military or medical. A wireless communication functionality can be added in the robot to make it more versatile and control it from a large distance. This capability of a robot could also be used for military purposes. By mounting a real time video recorder on top of the camera, we can monitor the surroundings by just sitting in our rooms. We can also add some modifications in the algorithm and the structure as well to fit it for any other purpose. Eg: a vehicle follower. Similarly it can assist the public in shopping malls. So there it can act as a luggage carrier, hence no need to carry up the weights or to pull that. Using this algorithm the robot will automatically follow that person.

❖ CONCLUSION:

A successful implementation of a prototype of human following robot is illustrated in this paper. This robot does not only have the detection capability but also the following ability as well. While making this prototype it was also kept in mind that the functioning of the robot should be as efficient as possible. Tests were performed on the different conditions to pin point the mistakes in the algorithm and to correct them. The different sensors that were integrated with the robot provided an additional advantage. The human following robot is an automobile system that has ability to recognize obstacle, move and change the robot's position toward the subject in the best way to remain on its track. This project uses arduino, motors different types of sensors to achieve its goal. This project challenged the group to cooperate, communicate, and expand understanding of electronics, mechanical systems, and their integration with programming.