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Gesture Controlled Robot using Arduino UNO and Nano Boards

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Abstract: Technology has playing a very significant role in improving the quality of life. The increase in human-machine interaction in our daily lives have made user machine interfacing more important. Physical gestures as intuitive expressions will greatly ease the interaction process enable humans to more naturally command computers or machines. In this project, we have designed a simple hand gesture-controlled robot using Arduino boards. This hand gesture-controlled robot is based on Arduino UNO, Arduino Nano, Micro Electro Mechanical Sensor (MEMS), Zigbee module for wireless communication and motor driver circuit. MEMS is a 3-axis Accelerometer and 3-axis Gyroscope sensor used to detect the moment of the hand.

Keywords: Gesture control, Arduino boards, MEMS sensor, etc.

I. BLOCK DIAGRAM AND EXPLANATION

In order to understand the principle of operation of hand gesture robot, let us divide the project in to two parts. Transmitter works on power bank and receiver is works on 9 V rechargeable battery.

A. Transmitter Part

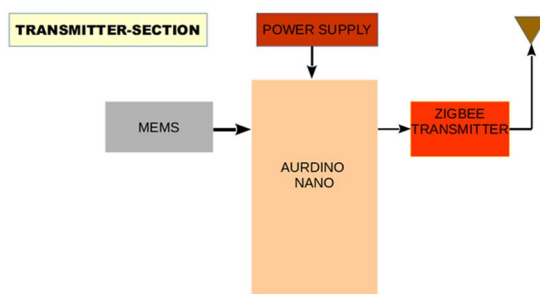


Figure 1. Transmitter Block Diagram

The transmitter circuit is mounted on the gloves which will be wearied by the user. On this glove, we have mounted the Arduino NANO board with MEMS (accelerometer) sensor, ZigBee transmitter and connection for power supply. MEMS works on the principle of acceleration. This will sense the motion of the hand by three angles of the axis. MEMS output is given to the Arduino Nano board. This contains the predefined programme which gives the actions to be performed. Through the ZigBee, command will be transmitted to the ZigBee receiver. Where ZigBee receiver is placed on the robotic car.

B. Receiver Part

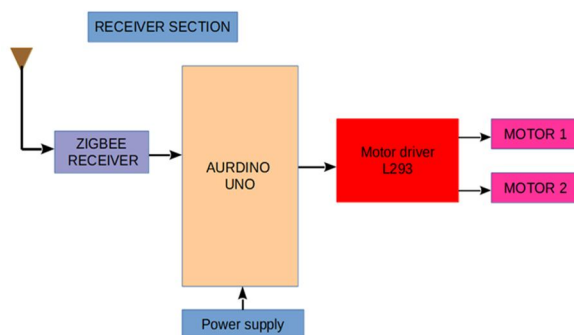







Figure 2. Receiver Block Diagram

In this part, after receiving the command it is given to the Arduino UNO board. The microcontroller will fetch the data and give it to the motor driver circuit. The motor driver circuit will give rotation direction to DC gear motor to move the robot in four directions. According to the tilting of the hand, the robot will move in any of the four direction.

Below table shows the hand gesture and appropriate robot's moment.

Sr. No.	Hand Gesture	Robot Moment
1	Forward 	Robot will move in a forward direction.
2	Backward 	Robot will move in a backward direction.
3	Right 	To take a right turn tilt your hand in right direction.
4	Left 	To make a left turn tilt your hand in left direction.
5	Stop 	Stable parallel to earth moment of the hand will stop the robot.

Photograph of the Project



Figure 3. Project Module

C. Hardware Requirements

- 1) Arduino Uno Board
- 2) Arduino Nano Board
- 3) MEMS
- 4) ZigBee wireless trans-receiver
- 5) Motor Driver Circuit (L293D)
- 6) DC Motor
- 7) Power Supply for transmitter and receiver part separately.
- 8) Gloves to mount transmitter part.

D. Software Requirements

Arduino Uno and Arduino Nano requires the programming. That programming can be done in the Arduino IDE software. This platform comes with inbuilt functions and commands that play important role for debugging, editing and compiling the code in the environment. This environment supports both C and C++ languages.

Figure 4 shows the flow chart of the project. Here MEMS sensor output given to the Arduino Nano board. It will process the sensed data and transmit to the Robo car. According to the input motor M1 and M2 will rotate and car will operate.

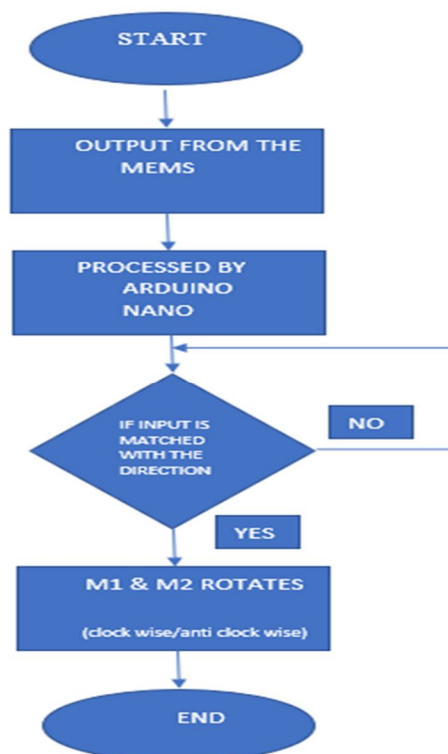


Figure 4. Flow chart

E. Application

Using hand gesture movements, we can control the robot in four direction.

1) Advantages

- a) Easy to control.
- b) It is helpful for physically challenged persons.

2) Limitations

- a) The moment of the robot is limited only in 4 directions.
- b) We cant verify the robot car moving in correct direction or not, because it don't have any feedback mechanism.
- c) The robot car can control only in line of sight that is 15 to 20 meters.



II. CONCLUSION

The gesture-controlled robot using Arduino has been successfully implemented. This project is user friendly and easy to operate. The robot is responding very well. According to the moment of the hand robot car is changing its direction.

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