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Hand Gesture Robot

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***Abstract*: we want to introduce "A Hand Gesture Robot", based on the control interface for navigating a car robot. This wireless gesture controlled robot is an easy user friendly way to interact system and robot.**

In this project, a mobile robot is controlled by the gesture made by Bluetooth is designed.

The gesture controlled robot is wireless operated robot and it has two parts transmitter and receiver .an accelerometer is used to detect the tilting position of your hand and a Bluetooth.

It is useful for moving heavy loads from one place to another.

***Keywords*: Hand gesture robot**

1. Introduction

Now-a-days, robotics are becoming one of the most advanced in the field of technology. The applications of construction, defense and also used as a fire fighting robot to help the people from the fine accident. But controlling the robot with a remote of a switch is quite complicated. So, a new project is developed that is, an accelerometer based gesture control robot. The main goal of this project is to control the movement of the robot with hand using Bluetooth. In this project the android smart phone is used as a remote control for operating the robot. Android is a software stack for mobile devices that includes an operating system and key applications. Android boasts a healthy array of connectivity options, including Wi-Fi, Bluetooth, and wireless data over a cellular connection

2. Gesture recognized robot using Arduino

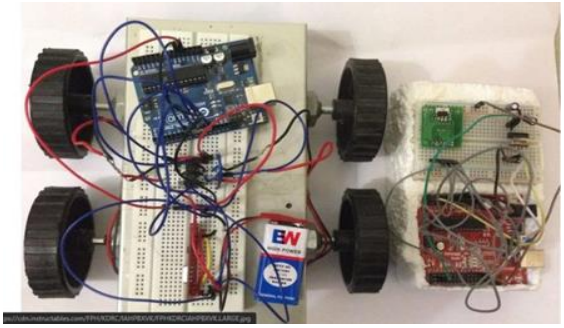

Fig. 1. Hardware setup

This gesture controlled robot uses Arduino, ADXL335 accelerometer and RF transmitter-receiver pair.

We will divide the entire robot into 3 parts the transmitter, the receiver and the robot.

The different gestures that have been mapped to the direction of the both are,

Hand parallel to the ground-stationary
Hand tilted forward-forward
Hand tilted backward-backward
Hand tilted right-right
Hand tilted left-left

A. Step-1: Materials required

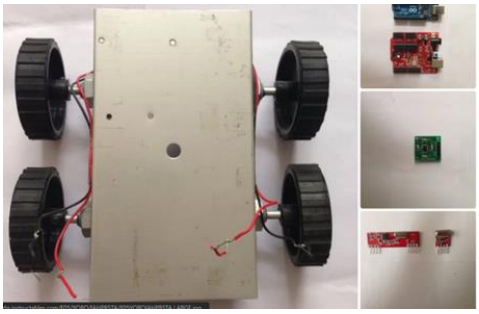

Fig. 2. Materials required

For transmitter:

- Arduino Uno
- ADXL335 accelerometer
- 433 MHz RF transmitter
- Breadboard

For receiver and robot:

- Arduino Uno
- 433 MHz RF receiver
- L293D motor driver IC
- Chassis and wheels
- 2 DC motors
- Breadboard
- jumper wires and 9V batteries

Instead of using the Arduino and breadboard in transmitter like I did, you may instead use an ATMega328p, which can be programmed from the Arduino board and solder it along with RF transmitter and ADXL335 on a per board. The per board can then be attached to a glove. However here I've used a remote controller like setup with the gestures the same.

B. Step-2: Assembling the robot

Fix the wheels on the chassis.
Mount the DC motors on the back wheels and use dummy wheels for the front.

Mount the L293D IC on the breadboard and place it on the chassis

Place the Arduino on the chassis and make the connections of L293D as follows,

4, 5, 12, 13 to GND

1,9,16 to VCC (5V)

3, 6 to left motor (output)

11, 14 to right motor (output)

2, 7, 10, 15 to pins 8, 9,10,7 of Arduino (inputs)

8 to 9V battery

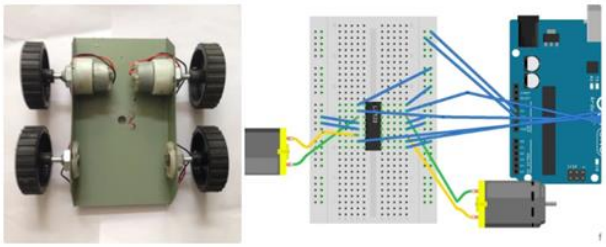

Fig. 3. Assembling the robot

C. *Step-3: Determining the direction of robot*

You can learn more about L293D from internet.

Basically, the motor rotates when the inputs supplied are opposite.

For example, high, low may rotate the motor in clockwise while low, high in anti-clockwise.

If both inputs are same then motor does not rotate.

The sketch in test.ino will help to determine for what inputs for the 2 motors wills the robot move forward. Copy and paste the code in test.ino it in Arduino IDE

In my case it was observed that the both will move forward pin 9 of Arduino is high, pin 8 is low (for left motor), pin 10 is high, pin 7 is low (for right motor). Try different combinations till you get desired direction. Similarly, for moving back the combination is high, low, low, high. The both will go right if left motor is moving and right is stopped by giving same inputs. Similarly, for left.

D. *Step-4: Interfacing ADXL335 with Arduino*

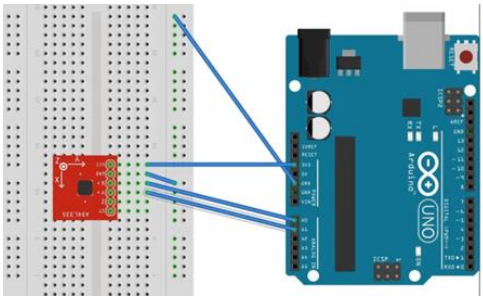

Fig. 4. Interfacing ADXL335 with Arduino

Mount the ADXL335 and on the breadboard.

The connections to Arduino should be as follows. The Arduino should be different from the one used in step 2.

ADXL335 ARDUINO

VCC 3.3 V

GND GND

X A0

Y A1

Z open

ST open

Now copy and paste the code in adxl335interface.ino and determine the threshold values for different gestures.

The code gives 2 values xval and yval which will have unique values for different gestures.

Determine the range of values of xval and yval when the hand is tilted forward, backward etc.

E. *Step-5: Interfacing RF Transmitter with Arduino*

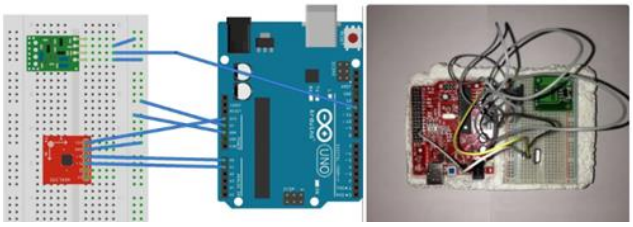

Fig. 5. Interfacing RF Transmitter with Arduino

Mount the RF transmitter on the breadboard in previous step and make connections as follows.

RF transmitter Arduino

GND GND

DATA D12

VCC 5V

Extract the Virtual Wire folder from the downloaded folder and paste it in arduino-1.6.1>libraries

Now program the arduino of the transmitter with the code given in transmitter.ino.

Basically what the code does is to map the different threshold values (for gestures) obtained in step 4 to different letters (stationary-'s' forward -'f' etc) which are then transmitted through the RF transmitter.

This step completes the construction of the transmitter.

F. *Step-6: The receiver*

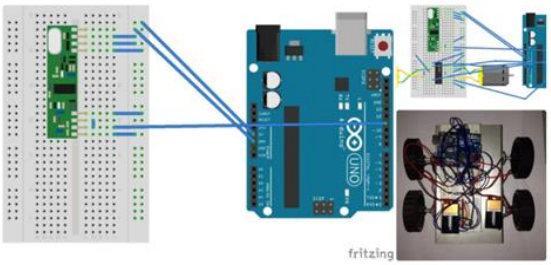

Fig. 6. The receiver

Mount the RF receiver on the breadboard of step 2. The connections to the Arduino used in step 2 are

RF receiver Arduino

VCC 5V

DATA D11

GND GND

Now program the Arduino with the code given in receiver.ino.

The code maps the different letters obtained from the receiver to the inputs for directions.

For instance, if the receiver receives the letter "f" corresponding to the both moving forward, it maps the letter "f" with the inputs low, high, high, low which are the required inputs for the both to move forward.

3. Working of Robotic Car

The working of robotic car is controlled by hand gestures. After recognition of gesture the command is send to the robotic car and the car will navigate according to the user command. Movement

commands are written as a function in robot specific language. We are using six predefined operations as follows “Start”, “Stop”, “Left”, “Right”, “Forward”, “Backward”.

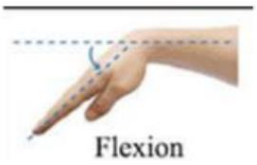

Fig. 7. Move forward

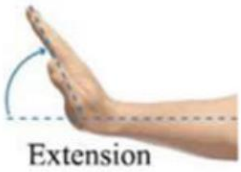

Fig. 8. Move backward

Fig. 9. Move right

Fig. 10. Move left

4. Conclusion

In this paper, I introduced a hand-gesture-based interface for navigating a car-robot. A user can control a car-robot directly by using his or her hand motions. In the future, I will directly use a mobile phone with an accelerometer to control a car-robot. I also want to add more hand gestures (such as the curve and slash) into the interface to control the car in a more natural and effective way.

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