Gesture Recognition Based Autonomous Moving Car

Author(s): 1Awnind Abhay Shrivastava, 2Fazal Mahfooz

Affiliation: 1Department of Electronics and Communication Engineering K.C.C Institute of Technology and Management affiliated to AKTU, Knowledge Park III, Greater Noida, India
  2Embedded Engineer at i3indya Automations, i3indya group, Preet Vihar, Laxmi Nagar, Delhi-110092

Abstract—Gesture recognition means response to the change in spatial position of an object by the system being manipulated. There are two end the receiving one and the transmitting one. The Transmitting end having three-axis accelerometer interfaced with arduino nano ATMega328 board as input and a NRF24L01 as output. The Receiving end having NRF24L01 as input interfaced with arduino nano and two motors connected as output.

Keywords—NRF-24L01, AVR, ATMega328, Accelerometer, L293D, Hand Gesture, Fritzing

INTRODUCTION

Gesture recognition is an alternative way for communicating with our system. It can be a better way to manipulate our system than the conventional cognition methods. The main qualities of a good gesture recognition system is its ability to accurately interpret gestures and a fast response to input data. Controlling any system which can be an industrial robot, a medical instrument or a military asset becomes arduous as the complexity increases. The operator has to deal with a lot of switches and controllers on the interface. A little mistake can cost a lot if the robot is doing some task demanding utmost delicacy.

Our project deal with a human gesture based small prototype. We have made a small robot which is being controlled by our gesture. We have installed two micro controllers on each receiving and transmitting end. The transceiver used in this prototype is NRF (Nordic Radio Frequency) which is sending data from accelerometer to our receiver end of the system.

FRAMEWORK

In this Project we use a hand glove equipped with an accelerometer. The accelerometer gives a numerical data corresponding to every hand gesture which is accepted by arduino nano and transmitted to receiving end with the help of NRF (Nordic Radio Frequency). The receiving end receives the data also through a NRF then NRF forwards the data to arduino nano which then commands the L293D to rotate the motors in response to gestures.

Arduino nano

0.7 inch x 1.7 inch is a smaller board for small size projects. The nano can perform every function that can be performed by Arduino uno. Arduino nano uses Atmega 328P-PU Micro controller. It also fits into the board quite easily. Arduino nano has in-built ADC so it can accept multiple values between 0-5V which and map it into digital signals which can be understood by computer. It has total of 30 pins out of which 8 are analog pins, 14 digital pins, 2 Ground pins, then there is 3V3, AREF, +5V, VIN, RESET. Out of 14 digital pins 6 of them are PWM that is using digital pins to give an impression of analog output.

nRF24L01

This is a low power single chip 2.4 GHz transceiver.

L293D

L293D is a 16 pin IC. It is used to drive inductive loads like DC and stepping motors and switching power transistors.

In this project nRF24L01 has been used in Enhanced ShockBurst mode. The radio front-end utilises GFSK modulation and is configurable to 2Mbps of air data rate. Enhanced ShockBurst mode offers 1-32 bytes of Dynamic payload length, Automatic Packet handling, Auto
Packet transaction handling and 6 data pipe multiceiver for 1:6 star networks.

**CIRCUIT DIAGRAM**

**Transmitter**

Pins of nrf24L01 is connected as follows: MOSI of nrf is connected to MOSI of Nano and MISO of nrf is connected to MISO of Nano. nrf24L01 receives power from 3.3V voltage regulator. IC7805 receives power from 3.3V voltage regulator and its output pin is connected to one of five pin set. Accelerometer is connected with this five pins. Output of Power jack(J1) is connected to inputs of both 7805 and 3.3V voltage regulator. Output of accelerometer is connected to analog input pins of nano. Corresponding to each gesture a data is supplied to analog input pins. Nano is equipped with inbuilt analog to digital data converter. Digital data is sent to transmitter via nrf24L01.

The Arduino nano contains an inbuilt analog to digital conversion module. The data supplied by accelerometer is analog so it is given to analog pins. The number of elements in the sample space of the input provided by accelerometer is very large. So we set a resolution. The number of values used to replicate the analog data provide is called resolution. ADC conveys the analog data to corresponding digital values which is sent using nrf24L01 IC.

**Receiver**

Receiver is also equipped with nrf24L01 IC. When address at transmitter and receiver matches the communication between our car and hand gesture input end begins.

The connection for nrf24L01 is same as in transmitter. The MOSI and MISO is connected to MOSI and MISO of arduino nano respectively. The nrf24L01 here also receives power from 3.3 V voltage regulator.

IC 7805 receives power from output end of power jack and supplies power to L293D IC. Output pin of IC 7805 is connected pins enable 1 and enable 2.

L293D is used to drive motors. Connection of its enable pins is described above. It receives power from IC 7805. Pins D8, D7, D6, D5 of Arduino nano is connected to pins in1, in2, in3 and in4 of L293D respectively.

Pins out 1, out 2 of L293D drives motor 1 and out 3 and out 4 drives motor 2.

The data received by the nrf24L01 IC on receiving end is fed to Arduino nano, which processes it and forward it to L293D IC to drive motors according to users gesture.

**ADDITIONAL EXTENSIONS**

Temperature and humidity sensors can be used on the car to monitor weather. Cameras can installed to use the car as a remotely controlled spy using gestures. Mind Flex or EEG can be used on the input side to control the car using brainwaves. Car can also be controlled with a GUI designed using MATLAB.

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**CONCLUSION**

In this paper the development of hand gesture recognition based method is proposed to control the dynamics of a car using Arduino nano. The feasibility of the proposed method can be verified using the module developed in this paper.

**REFERENCES**


