Wireless gesture control vehicle

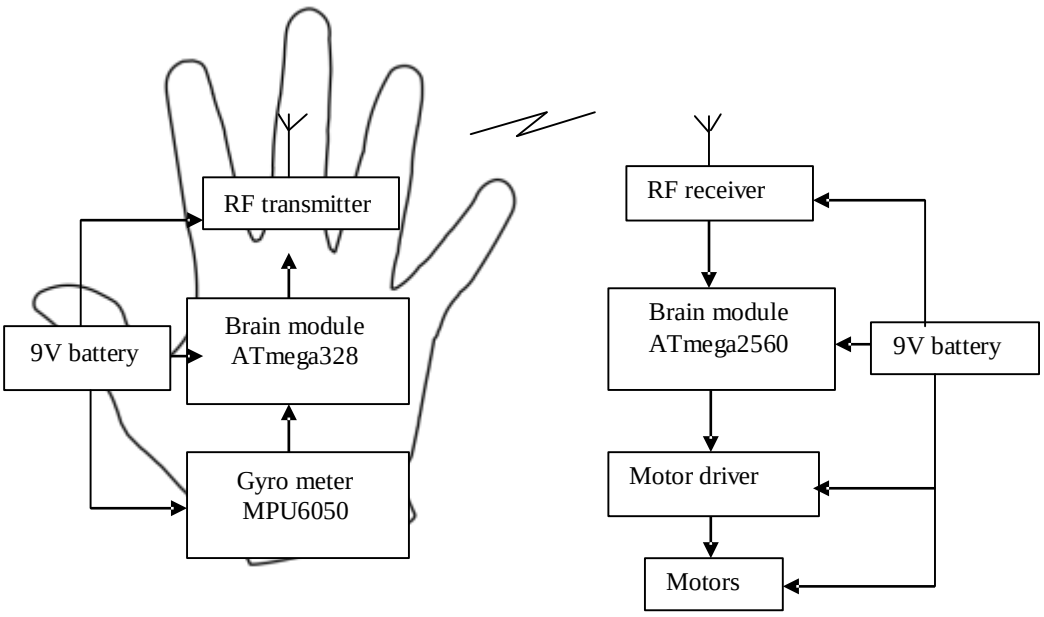
S.M.B.P.B. Samarathunga, and W.K.I.L. Wanniarachchi
Faculty of Science and Technology, Uva Wellassa University of Sri Lanka

Introduction

Gesture is a movement of part of the body, especially a hand or head. Gesture has many properties which shows significant different from speech. There for gestures are being used for the creation of expressive forms. Interaction between human and computer is based on human gestures. Gesture is behaved as an input for the computer and it might make computer more accessible for the physical impaired and make interaction like more natural.

In this project hand gestures are used to control a vehicle wirelessly. For that there are two modules are involved. One is the band and the other one is the vehicle. Band is consisting with gyro meter that gives the coordination according to the hand motion and RF module transmits the data that given by the gyro to the vehicle. The vehicle comprehends the signal sent by the gyro meter and it starts to move itself with respect to the signals that given by the hand gesture using gear motors.

Methodology



(a) Hand band unit (b) Vehicle robot

Figure 01: Block Diagram of wireless gesture control vehicle robot

As shown in figure 01. MPU6050 Gyro meter was used to sense the hand movements. The Gyro sensor integrated with 6-axis Motion Tracking device that combines a 3-axis Gyroscope, 3-axis

accelerometer, and a Digital Motion Processor. It is very accurate, as it contains 16-bits Analog to digital conversion hardware for each channel. Therefor it captures the x, y, and z channel at the same time. With its dedicated I Ĉ sensor bus, it directly accepts inputs from an external 3-axis compass to provide a complete 9-axis Motion Fusion output. To read the raw data, the sleep mode has to be disabled, and then the registers for the accelerometer and gyro can be read. But the sensor also contains a 1024 byte FIFO buffer. The sensor values can be programmed to be placed in the FIFO buffer. And the buffer can be read by the Microcontroller. The Arduino Duemilanove microcontroller (ATmega328) board was used for hand band unit as the brain module.

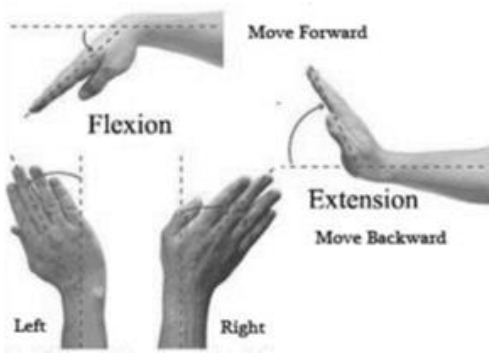


Figure 02: Predefined hand gestures

The data which were given by the gyro according to the predefined hand gesture as shown in Figure 02 were sent to the vehicle by transmitter. Two nRF24L01, single chip 2.4GHz transceivers were used for wireless communication between the hand band unit and the vehicle robot. The Arduino mega microcontroller board (brain module) was used at the receiver end. To control motor speeds, dual bidirectional motor driver based on L298 circuit was used. Signals which were sent by the transmitter according to the hand gesture were received by the receiver, and that data were taken by Arduino Mega board, and gear motors were controlled by the motor controller (H-bridge) in accordance with the commands that given by the microcontroller.

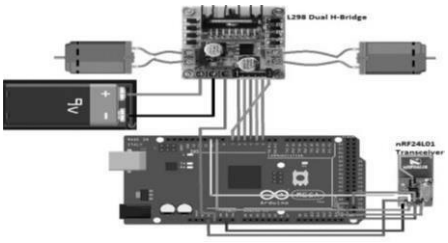


Figure 03: Connections of components in vehicle robot

Result and Discussion

In this project a vehicle was controlled by hand gestures. The rotation angle of the hand was given by the gyro meter, and with that data code was constructed to control gear motors in vehicle. As the wireless communicating agent nRF24L01 transceivers were used. Readings of the gyro meter were sent by RF transmitter and RF receiver which was placed on the vehicle received that data. While sending data through transceivers there was a little delay. Therefore a delay in micro second scale was shown by the vehicle with the hand gesture.

Speed of the vehicle can be controlled by the power source or a motor which was used. In this project only two axis (x and y) were used, so this can be improved by using three axes (x, y, and z). The developed robot not consists with a feedback mechanism. Therefore user would not know what he is working on. So is convenient if feedback system use. There are many areas that this concept can be used, such as when working in fields of medical science, hazardous waste disposal, construction, military approaches, etc.

References

Arduino. Products. Retrieved October 05, 2014, from the World Wide Web: http://arduino.cc/en/Main/Products

Blostein, D. Kwon, Y.B. (2002). Graphics Recognition Algorithms and Applications. 4th edition. Germany. Pringer Verlag Berlin Heidelberg.

Inven sense. MPU6050. Retrieved October 05, 2014, from the World Wide Web: http://invensense.com/mems/gyro/mpu6050.html

Kale, K.V., Manza, R.R. (2008). Advances in Computer Vision and Information Technology. I.K. International Pvt Ltd.

Nordic semiconductor. nRF24L01. Retrieved October 05, 2014, from the World Wide Web: http://www.nordicsemi.com/eng/Product/2.4GHz-RF/nRF24L01

Roth, F.H., Amor, D. (2003). Radical Simplicity: Transforming Computers into Me-centric Appliances. Prentice Hall Professional.