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Accelerometer Gesture Controlled Robot using ARDUINO

Tarique Mojeebi*
Student
Deptt. of Electronics & Communication Engg.
Gandhi Institute of Engineering & Technology
Gunupur, Rayagada, Odisha, India

Sukanta Kumar Tulo
Assistant Professor
Deptt. of Applied Elec. & Instrumentation Engg.
Gandhi Institute of Engineering & Technology
Gunupur, Rayagada, Odisha, India

Abstract

A gesture controlled robot is a kind of robot which is controlled by the gesture, but not by the traditional button/remotes. The user have to wear a small transmitting device known as accelerometer in our case and this will records the movements of our hands and send the signal to the comparator IC which compares the input voltages for acceleration with a reference voltage and pass it to the encoder IC which is used to encode 4 bits data and this will be transmitted by a RF transmitter. At the receiving end there is a RF receiver which receives the encoded data and passes it to the decoder IC. The decoder decodes and converts the 4 bits serial data into parallel data and send to the microcontroller. The data is then processed by the microcontroller and shifted to the motor driver and hence motor driver rotates the motor as per the signal or movement of hand.

Keywords*: Gesture, Accelerometer, RF transceiver, DC gear motor, ARDUINO.*

****Author for correspondence*** tariqueahmad154@gmail.com

1. Introduction

Gesture recognisation is an important achievement in robotics science and language technology which aims to interpret human gesture via mathematical algorithm. Gesture can emanate from any bodily motion but commonly from the face or hand is taken. It is therefore a way for computer to start understanding human body language, thus building a strong bridge between machine and human than the primitive text user interfaces or graphical user interface (GUIs) which still limits the mouse, keyboards for inputs. Gesture recognisation makes us able to communicate with the machines naturally without any mechanical devices. Here we are using an accelerometer in conjunction with a microcontroller and RF links to make a gesture controlled robot.

2. System Overview

The system mainly focuses on the interaction of human with the machine. Previously the only way to communicate with robot was to program it which required an extensive hardwork. But with the development of robotics sciences, gesture based recognisation came into existence. Gesture originates from any bodily motion but most commonly face and hand is taken into consideration. This achievement into robotics reduces the gap between human & machine and hence minimizes the need for text interfaces and GUIs.

Accelerometer

Accelerometer is an electromechanical device that measures acceleration force. It is a kind of sensor which record acceleration and gives an analog data while moving in X, Y, Z direction or may be X and Y direction only depending on the type of the sensor.

RF Transceiver

Many existing technologies and transmission medium use only Radio Frequency because RF can travel through larger distance than InfraRed. The Radio Frequency (RF) module comprises of an RF transmitter and RF receiver. The RF transmitter/receiver match up operates at a frequency of 433MHz or 315MHz ASK RF modules. For long range application RF transmission is used. The RF receiver receives the control signals from RF transmitter and sends it to the microcontroller connected with it. The rate of transmission is about 1Kbps to 10 Kbps. The transmission sector has the encoder with it for encoding the control signals. The encoded signals will transfer to the receiver where the signals will be decoded to carry out the actions. HT12E-HT12D is commonly used encoder/decoder pair ICs.

DC Gear Motor

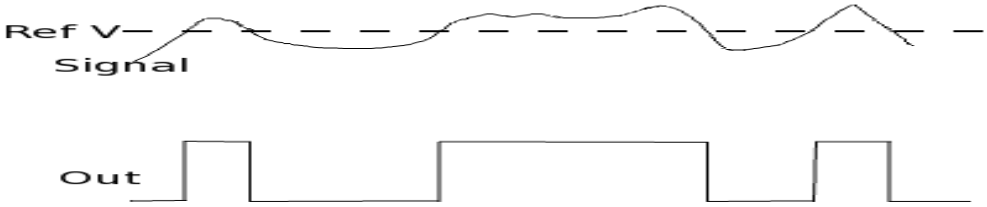
As the name suggest DC gear motors takes the direct electric current as source of energy. DC gear motors are attached to all the wheels of the robot. So whenever the gesture signals reached the DC motor it will formulate the wheel to move forward and backward. The rotation speed is deliberated in terms of Revolution per Minute (RPM). There are 4 wheels used in this robotic body, two wheels on the front side and another two wheels on the back side of the robot.

3. Proposed System

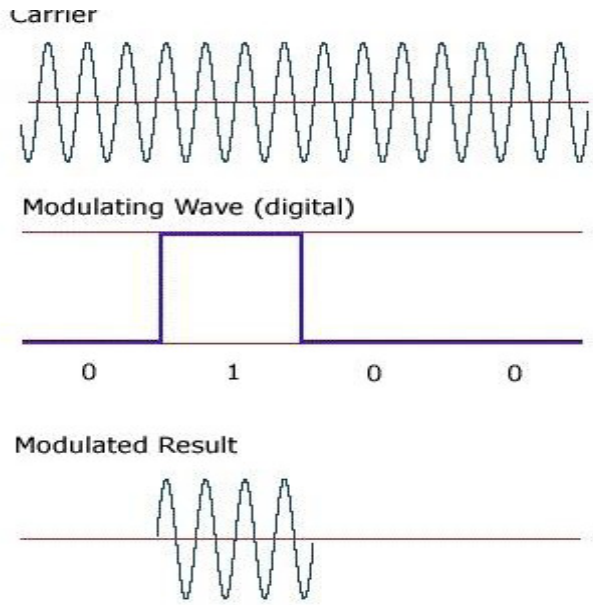
In the planned assignment four different gestures movement is proposed when we moves our hand forward, robot will goes forward, when we moves our hand back it goes backward and similarly moves on the right, left when we moves our hand to the right left respectively. This task is performed on the microcontroller. Whenever the hand palm with the accelerometer gestures the stored acceleration value, the signal generator in the microcontroller generates the control signal. The RF transmitter encodes the signal and transmits to the RF receiver. RF receiver decodes and performs the necessary actions.

4. Implementation

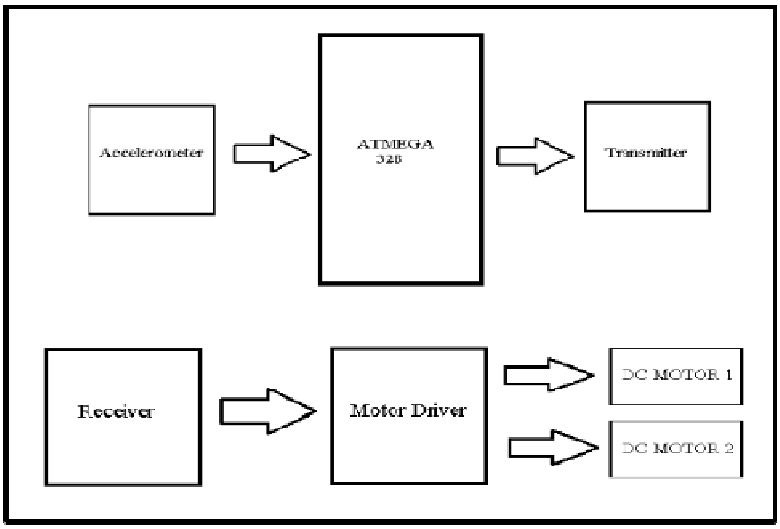
The accelerometer records the hand movements in the X and Y directions only and outputs constant analogue voltage levels. These voltages are fed to the comparator IC which compares it with the references voltages that we have set via variable resistors attached to the IC. The levels that we have set are 1.7V and 1.4V. Every voltage generated by the accelerometer is compared with these and an analogue 1 or 0 signal is given out by the comparator IC.



This analogue signal is the input to the encoder IC. The input to the encoder is parallel while the output is a serial coded waveform which is suitable for RF transmission. A push button is attached to pin 14 of this IC which is the Transmission Enable (TE) pin. The coded data will be passed onto the RF module only when the button is pressed. This button makes sure no data is transmitted unless we want to. The RF transmitter modulates the input signal using Amplitude Shift Keying (ASK) modulation. It is the form of modulation that represents digital data as variations in the amplitude of a carrier wave.



The RF modules works on the frequency of 315MHz. It means that the carrier frequency of the RF module is 315MHz. The RF module enables the user to control the robot wirelessly and with ease. This transmitted signal is received by the RF receiver, demodulated and then passed onto the decoder IC. The decoder IC decodes the coded waveform and the original data bits are recovered. The input is a serial coded modulated waveform while the output is parallel. The pin 17 of the decoder IC is the Valid Transmission (VT) pin. A led can be connected to this pin which will indicate the status of the transmission. In the case of a successful transmission, the led will blink. The parallel data from the encoder is fed to the port 1of the microcontroller. This data is in the form of bits. The microcontroller reads these bits and takes decisions on the basis of these bits. What the microcontroller does is, it compares the input bits with the coded bits which are burnt into the program memory of the microcontroller and outputs on the basis of these bits. Port 2 of the microcontroller is used as the output port. Output bits from this port are forwarded to the motor driver IC which drives the motors in a special configuration based on the hand movements.



5. Result and Conclusion

Through this manuscript we are in a position to control a robot wirelessly through gestures. We came to a conclusion that it is possible to make friendly interaction with the machines. This is an

easy way to interact with robots without any special training. By proper implementation, this concept will be a stepping stone in the robotic technology.

6. Future Scope

As we are using RF for wireless transmission, the range is quite limited; nearly 50-80m. This problem can be solved by utilizing a GSM module for wireless transmission. The GSM infrastructure is installed almost all over the world. GSM will not only provide wireless connectivity but also quite a large range. An on-board camera can be installed for monitoring the robot from faraway places. All we need is a wireless camera which will broadcast and a receiver module which will provide live streaming.

References

[1] JL Raheja et al. Real-Time Robotic Hand Control Using Hand Gestures.
[2] Bhosale Prasad S et al. Hand Gesture Controlled Robot.
[3] Powerpoint on Gesture Controlled Robot. Available at http://seminarprojects.com/s/hand-gesture-controlled-robot-ppt
[4] Motor driver. Available at http://www.robotplatform.com/howto/L293/motor_driver_1.html
[5] Gesture interface. Available at http://en.wikipedia.org/wiki/Gesture_interface
[6] What is a gear motor? Available at http://www.wisegeek.com/what-is-a-gear-motor.htm