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Simulation of Arduino Gesture Control Robot

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1. INTRODUCTION

Recently, strong efforts have been carried out to develop intelligent and natural interfaces between users and computer-based systems based on human gestures. Gestures provide an intuitive interface to both human and computer. Thus, such gesture-based interfaces can not only substitute the common interface devices, but can also be exploited to extend their functionality.

Robots are playing an important role in automation across all the sectors like construction, military, medical, manufacturing, etc. After making some basic robots like line follower robot, computer-controlled robot, etc.; we have developed this accelerometer-based gesture-controlled robot by using Arduino Uno. In this project we have used hand motion to drive the robot. For this purpose, we have used accelerometer which works on acceleration.

A gesture-controlled robot is controlled by using hand in place of any other method like buttons or joystick. Here one only needs to move hand to control the robot. A transmitting device is used in your hand which contains RF Transmitter and accelero- meter. This will transmit command to robot so that it can do the required task like moving forward, reverse, turning left, turning right and stop. All these tasks will be performed by using hand gesture.

Here the most important component is accelerometer. Accelerometer is a 3-axis acceleration measurement device with ±3g range. This device is made by using poly silicon surface sensor and signal conditioning circuit to measure acceleration. The output of this device is Analog in nature and proportional to the acceleration. This device measures the static acceleration of gravity when we tilt it and gives a result in form of motion or vibration.

According to the data sheet of adxl335 poly silicon surface-micro machined structure placed on top of silicon wafer. Poly silicon springs suspend the structure over the surface of the wafer and provide a resistance against acceleration forces. Deflection of the structure is measured using a differential capacitor which incorporates independent fixed plates and plates attached to the moving mass. The fixed plates are driven by 180° out-of-phase square waves. Acceleration deflects the moving mass and unbalances the differential capacitor resulting in a sensor output whose amplitude is proportional to acceleration. Phase-sensitive demodulation techniques are then used to determine the magnitude and direction of the acceleration.

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Review Stage

Our gesture-controlled robot works on the principle of accelerometer which records hand movements and sends that data to the comparator which assigns proper voltage levels to the recorded movements. That information is then transferred to an encoder which makes it ready for RF transmission. On the receiving end, the information is received wirelessly via RF, decoded and then passed onto the microcontroller which takes various decisions based on the received information. These decisions are passed to the motor driver ice which triggers the motors in different configurations to make the robot move in a specific direction.

Final Stage

HT12E and HT12D are CMOSICs with working voltage ranging from 2.4V to 12V. Encoder HT12E has eight address and another four address/data lines. The data set on these twelve lines (address and address/data lines) is serially transmitted when transmit-enable pin TE is taken low. The data output appears serially on DOUT pin. The data is transmitted four times in succession. It consists of differing lengths of positive-going pulses for '1' and '0,' the pulse- width for '0' being twice the pulse- widthfor'1.'The frequency of the repulses may lie between1.5and7kHz depending on the resistor value between OSC1 and OSC2PINS.

2. GESTURE CONTROLLED ROBOT

A Gesture Controlled robot is a kind of robot which can be controlled by hand gestures and not the old-fashioned way by using buttons. The user just needs to wear a small transmitting device on his hand which includes a sensor which is an accelerometer in our case. Movement of the hand in a specific direction will transmit a command to the robot which will then move in a specific direction. The transmitting device includes a Comparator IC for assigning proper levels to the input voltages from the accelerometer and an Encoder IC which is used to encode the four-bit data and then it will be transmitted by an RF Transmitter module.

3. APPLICATIONS

- Through the use of gesture recognition, remote control with the wave of a hand of various devices is possible.
- Gesturecontrollingisveryhelpfulforhandicappedandphysicallydisabledpeopleto achieve certain tasks, such as driving a vehicle.
- Gestures can be used to control interactions for entertainment purposes such as gaming to make the game player's experience more interactive or immersive.
- Traditional interfaces, keyboards and mice present a bottleneck in application that relyonheavyinteractionoftheuserwiththemachineduetotheunnaturalnessofthe interaction.
- From reading lots of related articles, we have learnt that recent efforts have attempted to eliminate this bottleneck by developing different ways of interacting with computers, for example: speech, hand writing.
- Through the use of gesture recognition, remote control with the wave of a hand of various devices is possible.

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- Gesture controlling is very helpful for handicapped and physically disabled people to achieve certain tasks, such as driving a vehicle.
- Gestures can be used to control interactions for entertainment purposes such as gaming to make the game player's experience more interactive or immersive.

4. ROLE OFROBOT

A gesture-controlled robot is controlled by using hand in place of any other method like buttons or joystick. Here one only needs to move hand to control the robot. A transmitting device is used in your hand which contains RF Transmitter and accelero-meter. This will transmit command to robots that it can do the required task like moving forward, reverse, turning left, turning right and stop. All these tasks will be performed by using hand gesture.

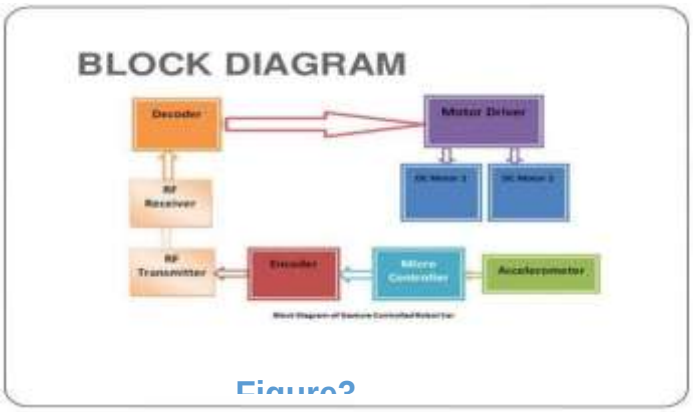
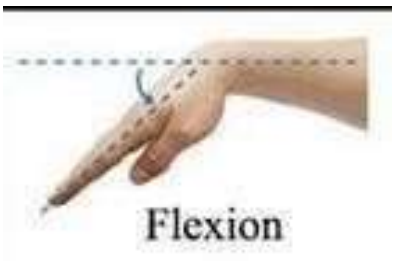
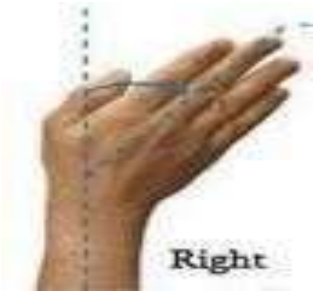


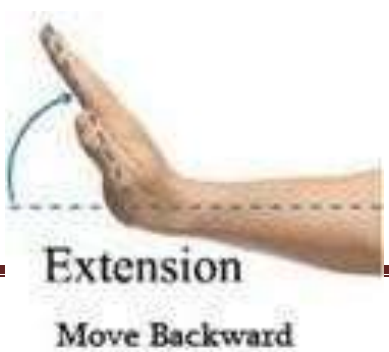
Figure2

SIMULATION

Different Hand gestures to make the robot move in specific directions are as follow:







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CONCLUSION

HT12E and HT12D are CMOSICs with working voltage ranging from 2.4V to 12V. Encoder HT12E has eight address and another four address/data lines. The data set on these twelve lines (address and address/data lines) is serially transmitted when transmit-enable pin TE is taken low. The data output appears serially on DOUT pin. The data is transmitted four times in succession. It consists of differing lengths of positive-going pulses for '1' and '0,' the pulse- width for '0' being twice the pulse- width for'1.'The frequency of these pulses may lie between 1.5 and 7 kHz depending on the resistor value between OSC1 and OSC2PINS.

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