Rocker Bogie Suspension System

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Abstract- *In recent years, robotics is a demanding technology in the field of science, To rise the use of robots where conditions are not certain such as firefighting, rescue operations, robots can be made which follow the instruction of human hand and perform the task. In this way decisions are taken according to the working conditions by the operator and the task is performed by the robots. Thus, we can use these robots to perform those tasks that may be harmful for humans. This paper describes about the gesture control robot which can be controlled by your normal hand gesture. It consists of mainly two parts, one is transmitter part and another is receiver part. The transmitter will transmit the signal according to the position of accelerometer and your hand gesture and the receiver will receive the signal and make the robot move in respective direction. Here, the program is designed by using Arduino IDE.*

Keywords- Arduino UNO, ADXL, RF MODULE, DC MOTOR, ROBOT

I. INTRODUCTION

Robots are controlled using hand gesture because robots need a helping hand whether it may be any function, without human robots cannot be operated. The main purpose of using hand gestures is that it provides a more schematic way of controlling the robot and with this feature robot can be used as a wheelchair or as a spy robot or for vigilance. As human hand gestures are natural, with the help of wireless communication, it is easier to interact with the robot in a more-friendly way. The robot's movement depends on the gestures made by hand. The objective of this paper is to build a wireless, hand gesture controlled robot using an Arduino Uno, an accelerometer, and a RF transmitter and a RF receiver set. The Arduino Uno microcontroller reads the analog output values i.e., x-axis and y-axis values of the accelerometer and converts that analog value to respective digital value. The values are given a specific function by the use of the Arduino software. The digital values are processed by the Arduino Uno microcontroller and according to the tilt of the accelerometer sensor mounted on the hand, it sends the commands to the RF transmitter which sends the signal to the receiver and there these signals are processed by the receiver end which drives the motor to a particular direction in which we have set it to move. The robot moves forward, backward, right and left when we tilt our palm to forward, backward, right and left respectively and the robot stops when our palm is parallel to the ground.

II. PROPOSED WORK

The whole project is divided into two sections one is transmitter section and other is receiver section

A. Transmitter

The transmitter section consists of one Arduino Uno, one 3-axis ADXL sensor and one RF transmitter module.

B. Receiver

The receiver section consists of one RF receiver module, one motor driver IC, DC motors, wheels, battery.

C. Block Diagram Of Proposed System

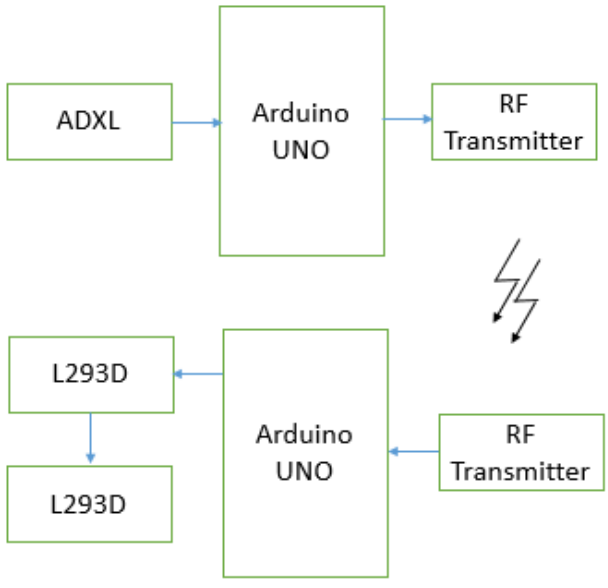

Figure1. block diagram of proposed system

III. TYPES OF COMPONENTS

- Arduino UNO:

Arduino/Genuine Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. Connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by boot loader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
LED_BUILTIN	13
Length	68.6 mm
Width	53.4 mm
Weight	25

Accelerometer

An Accelerometer is a kind of sensor which gives an analog data while moving in X,Y,Z direction or may be X,Y direction only depends on the type of the sensor. The ADXL335 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum fullscale range of ±3g. It can measure the static acceleration of gravity in tilt sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration.

This Accelerometer module is based on the popular ADXL335 three-axis analog accelerometer IC, which reads off the X, Y and Z acceleration as analog voltages. By measuring the amount of acceleration due to gravity, an accelerometer can figure out the angle it is tilted at with respect to the earth. By sensing the amount of dynamic acceleration, the accelerometer can find out how fast and in what direction the device is moving.

The basic connections required for operation are power and the communication lines. Accelerometers with an analog interface show accelerations through varying voltage levels. These values generally fluctuate between ground and the supply voltage level. An ADC on a microcontroller can then be used to read this value. ADXL335 is 3- axis accelerometer with on board voltage regulator IC and signal conditioned Analog voltage output. The module is made up of ADXL335 from Analog Devices. It measures acceleration with a minimum full-scale range of ±3 g. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration.

We select the bandwidth of the accelerometer using the CX, CY, and CZ capacitors at the XOUT, YOUT, and ZOUT pins. Bandwidths can be selected to suit the application, with a range of 0.5 Hz to 1600 Hz for the X and Y axis, and a range of 0.5 Hz to 550 Hz for the Z axis. The required current typically falls in the micro (μ) or milli-amp range The ADXL335 is a triple axis accelerometer with extremely low noise and power consumption – only 320uA! The sensor has a full sensing range of +/-3g. There is an on-board voltage regulation, which enables to power the board with 3V to 6V DC. Board comes fully assembled and tested with external components installed. The included 0.1uF capacitors set the bandwidth of each axis to 50Hz.

Features:

- 3V-6V DC Supply Voltage
- Onboard LDO Voltage regulator
- Can be interface with 3V3 or 5V Microcontroller.
- Ultra Low Power: 40uA in measurement mode, 0.1uA in standby@ 2.5V
- Tap/Double Tap Detection
- Free-Fall Detection
- Analog output

ADXL335 Module Specification	
Interface :	3V3/5V Microcontroller
Voltage Requirement:	3 - 6V DC
Output format:	Analog output
Measuring range:	±3g
Measuring values(-3 to +3):	X (-274 to +325) Y (-275 to +330) Z (-275 to +310)

Pin description:

Pin No	Pin Name	I/O	Details
1.	VCC	Power IN	Positive Power supply,5V Regulated Power
2.	GND	Power GND	Ground
3.	X	O/P	X channel output
4.	Y	O/P	Y channel output
5.	Z	O/P	Z channel output
6.	ST	I/P	Self test

Hardware:

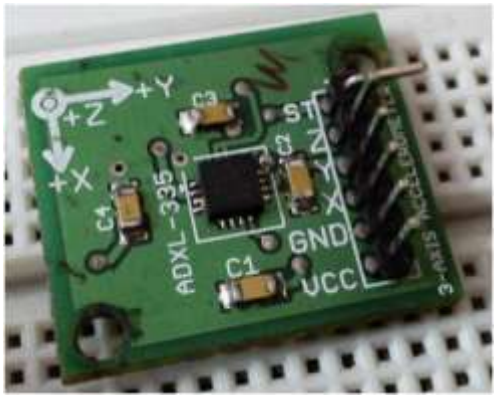

Figure 2:Arduino ADXL-335

- RF MODULE:

RF Module The TX is an ASK transmitter module .The result is excellent performance in a simple-to-use .The TX is designed specifically for remote-control , wireless mouse and car alarm system operating at 315/433.92 MHz. The RX is a miniature receiver module that receives On-off keyed modulation signal and demodulated to digital signal for the next decoder stage. The result is excellent performance in a simple-to-use ,with a low external component count. The RX is designed specifically for remote-control and wireless security receiver operating at 315/434Mhz.

Features Easy to use.• TX: Power supply and/or modulation input voltage : 2.2 to 5.5v.• Operating temperature: -40 to +80C.• RX: Power supply and/or modulation input voltage :.5v.• Operating temperature: -20 to +80C.

Motor Driver :

Motor Driver works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to flow in either direction. As voltage need to change its direction for being able to rotate the motor in clockwise or anti-clockwise direction. Therefore H-bridge IC is ideal for driving a DC motor. In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due to its size it is very much used in robotic application for controlling DC motors.

- DC Motor

DC motor is used for the conversion of direct current into mechanical motion. The mechanical motion could be rotary or linear. The operation of DC motor is based on the principle that when a current carrying conductor is placed in a magnetic field, the conductor experiences a mechanical force. The speed of a DC motor can be controlled by changing the voltage applied to the armature or by changing the field current. DC motors can be used for the movement of the robotic

- Battery

A battery is a device consisting of one or more electrochemical cells. A battery is device that directly converts chemical energy to the electrical energy. The purpose of battery is to supply 12 volts to operate DC motors.

- CAD model

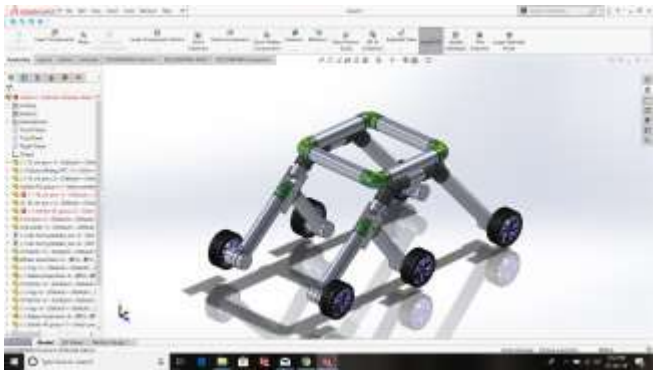

Figure 3: CAD model

IV. CONCLUSION

In this paper, we introduced a hand-gesture-based interface for navigating a robot. A user can control a robot directly by using his or her hand motions. In the future, I will directly use 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 effectively way.

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