CONTOLLING OF SERVOMOTORS ACCORDING TO PITCH AND YAW AND ROLL MOTIONS OF ACCELEROMETER

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***Abstract*— Gesture Controlled Robot is a robot that can be moved according to our hand movements. Accelerometer sensor is mounted on hand . The sensor mounted on your hand will judge the movement of hand in a particular direction. This project develops the hand movement monitoring system which feeds the data into the computer and gives the 3D visualization of accelerometer according to pitch, yaw and roll motions of accelerometer. In this project I used Adxl335 as the accelerometer and this project describes the controlling of servomotor(Futabas3003) according to motions of accelerometer and we can view the 3D visualization of accelerometer by interfacing Arduino (at mega 328p) with the processing software and MATLAB is used for graphical results of accelerometer motions.**

***Index Terms*—Adxl335 accelerometer, Servomotor(Futaba S3003),3D visualization, processing software**

INTRODUCTION

ACcelerometer[3] is a sensor which is used to measure the acceleration forces in two or three orthogonal axes . The 3 axis accelerometer is based on the principle of capacitive sensing. The fig.1 shows basic principle of accelerometer[3] sensor. The sensor is made of spring loaded, micro machined structure, mounted on silicon base. Force on the structure changes the position of seismic mass attached on the spring. This deflection is measured using fixed plate capacitor sensors.

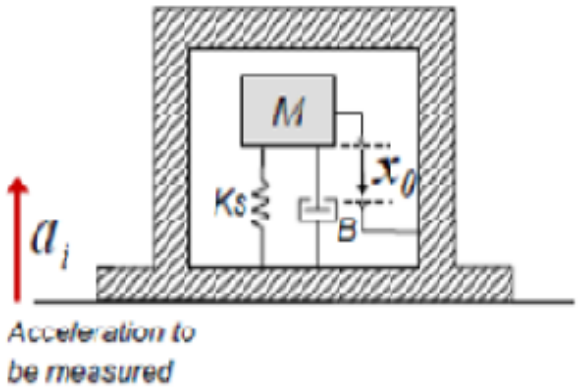

Fig. 1Accelerometer principle

Here the adxl335 accelerometer[3] mainly contains 5 pins those are x and y and z axis pins and one GND pin and one Vcc pin and fig2 shows the pin diagram of adxl335 accelerometer

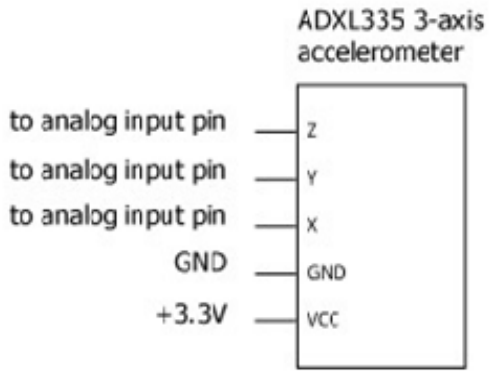

Fig. 2 Pin diagram of adxl335 accelerometer

I . Circuit diagram of connecting accelerometer to the arduino

The X-pin, Y-pin and Z-pin of the accelerometer Adxl335 is connected to Arduino board analog pins A0,A1,A2 respectivly and 5V supply is connected to 5V pin of accelerometer and reference(Vcc) pin is connected to ground pin of accelerometer

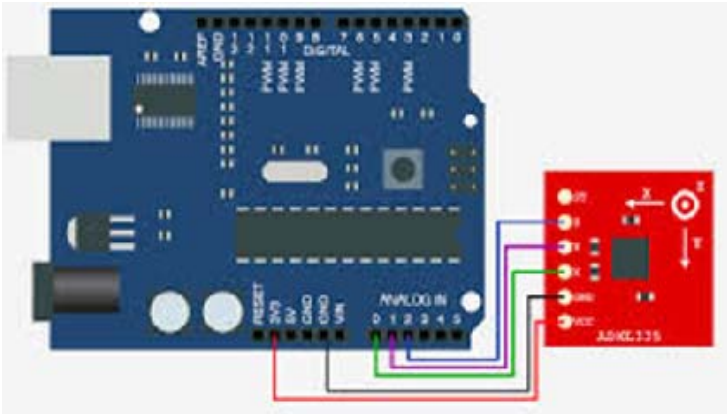

Fig. 3 circuit for connecting accelerometer to arduino

II .Circuit for connecting servomotor to the arduino

the servomotor[2] contains 3wires to connect to arduino[1] board and servomotor can be controlled through accelerometer and arduino board is used to send accelerometer[3] data to computer through serial communication . The red wire of servomotor indicates supply is connected to 5V pin of arduino board and black wire indicates that ground is connected to GND pin of arduino board and yellow wire indicates that signal is connected to one of the PWM pin

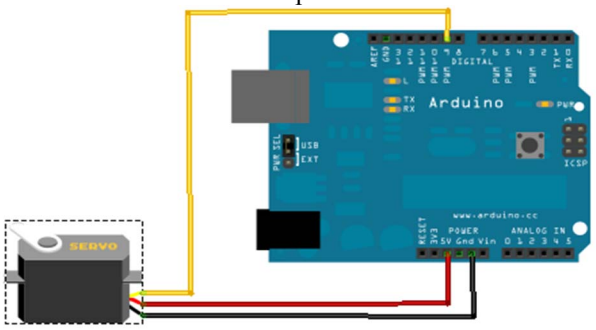

Fig .4 circuit for connecting servomotor to the arduino

III. 3D visualization of accelerometer using processing software

Here processing software is used to control the arduino[1] board through programme and by interfacing arduino[1] board to processing software .Here processing software Is used for 3D visualization of accelerometer[3] according to pitch and yaw and roll motions of accelerometer here pitch is rotation about X-axis and yaw is rotation about Z-axis and roll is rotation about Y-axis .

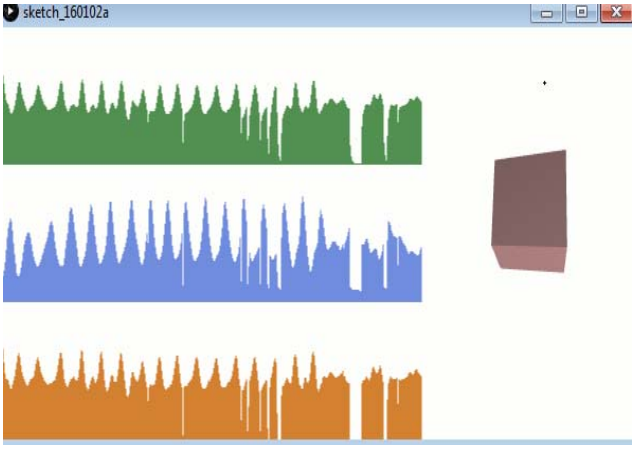

Fig .5 3D visualization of accelerometer using processing software

IV. Objectives and methodology

A. Objectives

i. connecting ADXL335 accelerometer[3] to arduino board through which we can get the analog values of accelerometer
ii. connecting two servomotors[2] to arduino[1] and bread board
iii. servomotor[2] 1 will be controlled for x and y directions of accelerometer and servo2 will be controlled for z direction of accelerometer.
iv. Processing software is used for 3D visualization of accelerometer

B. Methodology

The proposed methodology involved in this is is first arduino board reads the analog values of accelerometer[3] ADXL 335 according to pitch yaw and roll motions .And this motions will control the servomotors . servomotor 1[2] will be controlled for x and y directions of accelerometer and servo2 will be controlled for z direction of accelerometer[3] and Fig 6 shows the block diagram of proposed methodology

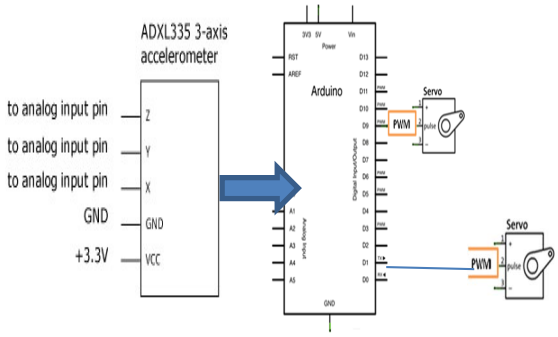

Fig .6 Block diagram for the proposed methodology

V .Flow chart for the proposed methodology

Here Fig 7 shows the flow chart for the methodology which is proposed and this will show directly motor1 and motor 2 will work between what x and y and z range values of adxl335 accelerometer[3] here motor1 will between 0 to 90 and 90 to 180 and where as motor2 will work between 0 to 180 directly according to pitch and yaw and roll motions of accelerometer

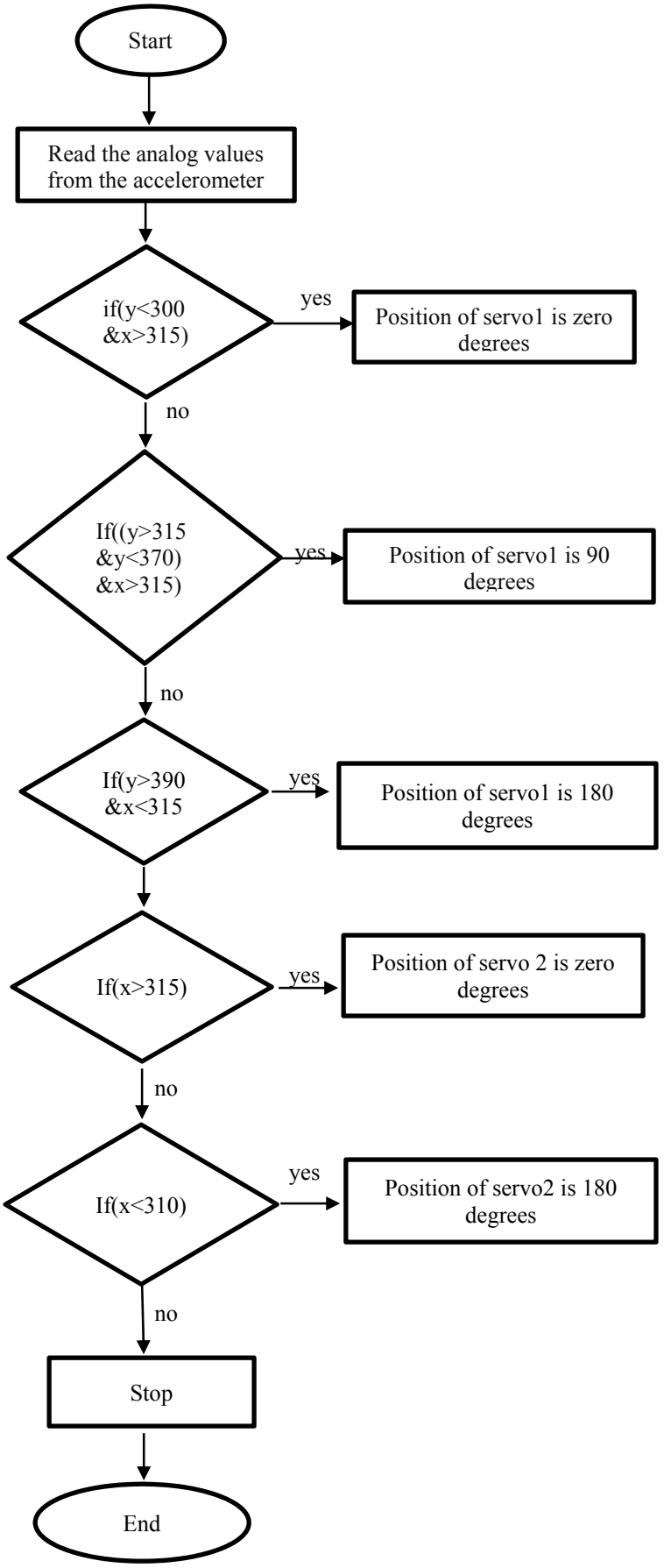

Fig. 7 Flow chart for the proposed methodology

VI. **Experimental work set up**

The experimental work setup consists of three major components those are arduino board[1] and ADXL 335 accelerometer[3] and two servomotors[2] and one base plate and hand cutter here one servomotor used for rotation of base plate and another one is used for hand cutter motion according to pitch yaw and roll motions of accelerometer

A. List of components used

1. arduino[1]board with atmega 328p microcontroller
2. s3003 servomotor(3kg)[2]
3. adxl335 3-axis accelerometer[3]
4. breadboard
5. connecting wires

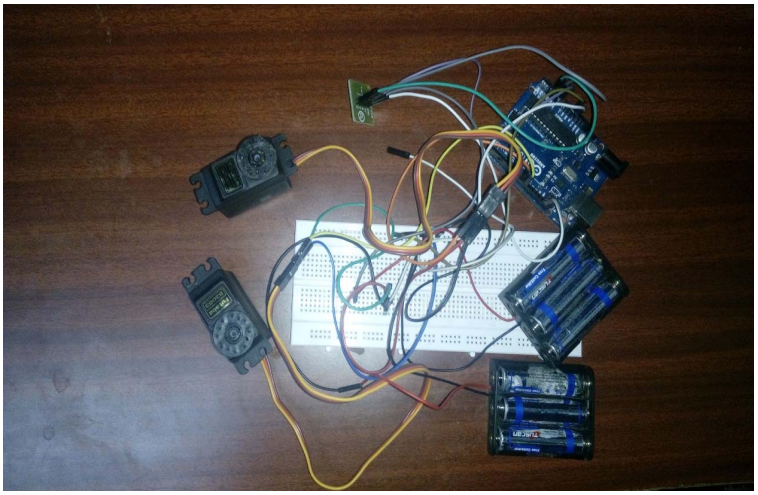

Fig .8 Hardware work setup

This paper mainly contains two hardwares as shown in the Fig.8 Those are arduino and adxl335 accelerometer[3] here the arduino[1] mainly contains 14 digital input and output pins and 6 analog pins it is simply connected to computer through the USB cable to get started with arduino. And where as adxl335 accelerometer contains 5pins

SNO	PIN NAME	I/O	DETAILS
1	Vcc	POWER IN	5V SUPPLY
2	GND	POWER GND	GND
3	X	O/P	X CHANNEL O/P
4	Y	O/P	Y CHANNEL O/P
5	Z	O/P	Z CHANNEL O/P

Fig 9 Pins description for adxl335 accelerometer

VII. **Accelerometer analog values read by using MATLAB**

Here MATLAB is used to read the analog values from accelerometer[3] ADXL 335 and we can see the analog values by graphical representation here following is the graphical results of adxl335 accelerometer. we can generate the graph by taking TIME (seconds) as X-axis and digital value as Y-axis we can read the accelerometer values according to pitch yaw and roll motions of accelerometer .

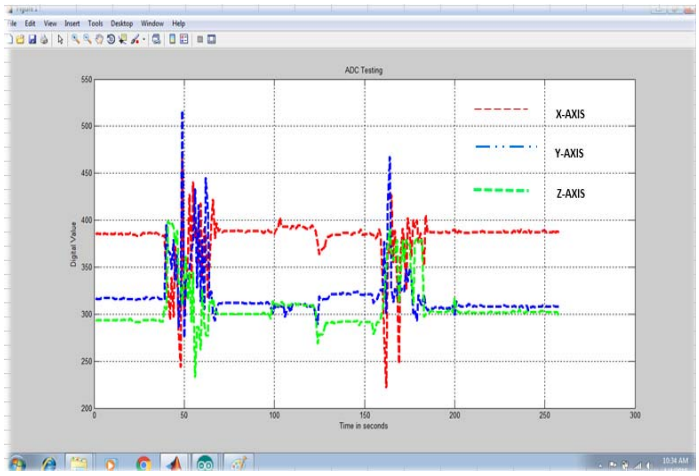

Fig. 10 ADC testing of accelerometer using MATLAB

VIII. **Accelerometer readings by using arduino**

Here arduino software is used to generate accelerometer values according to pitch yaw and roll motions of accelerometer[3] ADXL 335 and following is the accelerometer readings here arduino board will send the data through COM port 3

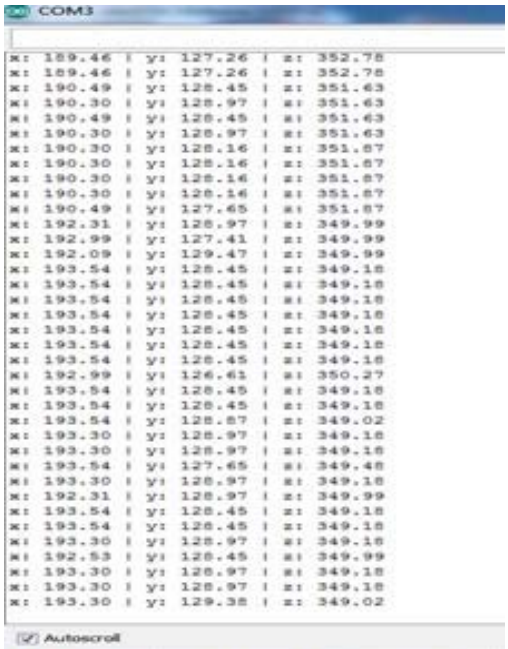

Fig. 11 Accelerometer readings by using arduino

IX. **Conclusion and results**

The objective of project is controlling of servomotors[2] according to position of accelerometer and here servomotor1 will be controlled according to pitch and yaw motions of accelerometer and servomotor2 will be controlled according to roll motion of accelerometer and Fig . 10 shows the graphical result of accelerometer and here we can observe the motion of accelerometer graphically

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I am submitting the paper on "controlling of servomotors according to pitch and yaw and roll motions of accelerometer"

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