A Review on Pen plotter

Haripriya Joshi[1], KunalKhole[2], Narendra Kulkarni[3]

1,2,3(Department of Mechanical Engineering ,JaswantaShikshanPrasarak Mandal, Pune,Maharastra,India)

Abstract: Today the Growth of Technology and utilization of CNC machine are Rapid increased. The idea on fabrication of low cost CNC machine came forward to reduce the cost and complexity in CNC plotter machine with using Arduino and its shield, which is capable of 3-axis simultaneous interpolated operation to draw 2-d design and write in the multiple input languages. The input may vary in form of standard input through means of usb or such or speech input. This paper also discusses the development of a low cost CNC which has decreased cost and complexity. In this machine G codes are used to command or instructions.

Keywords:CNC Shield, Arduino Board, Arduino Drivers, G Codes, speech input machines.

I. INTRODUCTION

Mini CNC plotter machine is described as it is based on Arduino controller and CNC shield. CNC is computer numerical control machine. G codes are preparatory Function. G codes are pre-define Function Associated with the movement on machine axes. In CNC Plotter Machine only G codes are used. G codes are giving the Direction to move the pen in X, Y, Z directions. Pen can be changed by other writing materials like pencil, sketch pens,etc. The aim of over is to make a mini pen plotter machine which is capable to draw difficult design and write on paper or writable surface. To function with a great accuracy we have used 2 stepper motors with timing belts and pulley in Cartesion coordinate X and Y, directions and a servo motor for z axis. The main aim is to fabricate a MINI CNC plotter Machine to draw an object with using G codes. We also work on to reduced cost of the project and increase Reliability and Flexibility. We have reduced the cost, in the setup of mini CNC plotter machine.

II. Methodology

We have supplied the current to Arduino with external power supply. A cable to transfer Data from Computer to Arduino Board or a microphone for speech input. Here we have used 2 Stepper motors for precise movement in X and Y axis respectively and 1 servo motor for lifting up the pen in Z direction. Drivers to supply the G codes in Sequence to the stepper motors and servo motor. CNC shield will be mounted on Arduino. CNC shield will be distribute the Current in the command of Arduino. CNC shield will be convert the command of G codes in digital pulse by Stepper motor. In X direction Stepper motor will be move left and Right ,Y direction stepper motor will be move in front and back direction, Z direction Stepper motor will be move in Up and down. We can make many difficult design via using this machine. The accuracy of this machines results is very high. So we can used in industry to reduce the cost of design printing and maintain accuracy level. Drafting and Scaling of CNC Plotter machine is very precious.

III. Block Diagram

Mini CNC Plotter Machine is worked on input as a G codes of Design and Converting it via use of software further transferring to Arduino, CNC Shield, Stepper motors, Servor Motor. We have work on to maintain lowest possible cost throughout our project. We have design a simple construction of our project. This is easier way to use stepper motor with pulleys and belts, CNC shield, Stepper drivers, Arduino Board, etc. The Setup of machine is flexible that's why it will be easily transported and Maintenance time is short. The basic diagram of CNC Plotter machine is shown in figure.
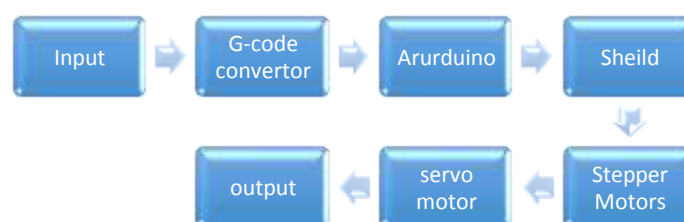

Fig: Block diagram of pen plotter

IV. Arduino Uno

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, send message - and turn it into an output - activating a motor, turning on an LED, publishing something online. We can tell board what to do by sending a set of instructions to the microcontroller on the board. Arduino UNO is a microcontroller board, it contains everything needed to support the plotter. Hereit controls the position of motors with help of a program. It is open source platform based on easy to use hardware and software. It has digital and analog input/output pins which can interface into various expansion board and other circuits and microcontroller with complementary components that helps in programming and incorporation into other circuits. It works on 5 volts current.

Fig:Board

VI. Shield

Shields are boards that can be plugged on top of the Arduino PCB extending its capabilities. The Arduino shield made it easy extending its capabilities of the board also making it more flexible to use. It is use open source firmware to control two stepper motors and one servo. Current supplied to CNC shield is 12 volt by external source. CNC shield Controls the Current distribution on each motor.

Fig:shield

VII. Motors

Stepper can convert digital pulse in to movement of pen with respect to axis X and Y direction. A stepper motor is a brushless motor that divide a full rotation into a number of equal steps, the stepper motor is known by its property to convert a number of impulses into a defined increment in the shaft position. Each pulses move the shaft through a fixed angle. We have used 2 stepper motors with pulley and belts. Motor output will be in the form of movement of belt with respect to X and Y Axis.

Fig:Stepper Motor

VIII. Conclusion

In this paper we have used concept of low cost mini CNC plotter machine, which is user friendly and easy to operate. By using this we can make Difficult and Complex Design on paper or any writable material. This is small machine which is easily Transportable and Assembled everywhere as per Requirement.It will be free to make big size of design on paper. We have used G codes to giving commands. G-codes are language to give the command to the machine to move right, left or up and down.

References

[1] CNC Programming, Michael Mattson, Delmar Cengage   Learning, 2010.

[2] Managing Computer Numerical Control Operations, Mike Lynch, Society of Manufacturing Engineers, 1995

[3] Study on computer numerical control (CNC) machines (PDF Download Available). Available from: https://www.researchgate.net/publication/303370721_Study_on_computer_numerical_control_CNC_machines

[4] Improvements of Educational Process of Automation and Optimization Using 2D Plotter,JurajOravec, Martin Kalu´z, Peter Bakar´aˇc, Monika Bakoˇsov´

[5] Design and Development of CNC Robotic Machine Integrate-able with Nd-Yag Laser Device NurHidayantiBintiAmbrizala, AwaisFarooqib, Osama I. Alsultanc, Nukman Bin Yusoffd.

[6] The investigations of dynamic characteristics of a stepper motor ŁukaszWarguła, Piotr Krawiec, Jarosław M. Adamiec, Konrad J. Waluś

[7] Raspberry Pi and Arduino boards in control education ,JaroslavSobota∗ Roman Piˇsl∗∗ Pavel Balda∗∗Miloˇs Schlegel Sensorless load angle control for two phase hybrid stepper motor,