Development of CNC Pen writer using Arduino Microcontroller

N. Ramu

Abstract— **In this paper explores the utilization of Arduino microcontroller over PLC controller for implementation ofCNC plottermachine.After learning through the various websites, this CNC plotter is fabricated using arduino microcontroller, two stepper motor ,one servomotor, interfacing relay cards and free open source software like linkscapeand processing software.The linkscapesoftware is used to generate the G code file for the given drawing and the processingsoftware is used for feeding generatedG CODE files are feed into the arduino controller which controls the outputdevices to reproduce the given drawing. This machinedraws the given sketch faster and more accurate than the humanbeing This machine can draw the images of letters, text, cartoons and shapes.**

Index Terms— **Arduino microcontroller, servomotor, stepper motor.**

I. INTRODUCTION

CNC Machines are Computerized Numerical Control Machines which are used to make mechanical parts according to the cad drawings by sending G code program using CAM software fed into their controller unit. Controller unit can be either computer or microcontroller. CNC machines are available in two, three, four and five axes have stepper and servo motors to feed movement of cutting tool and work piece .Complicated shape of 3d object are G codes are generated automatically using expensive cad software or writing manually. This plotter works on the same principle of CNC machine utilizing free open source software with low cost hardware components to draw the 2Ddrawings.Here one costless chiefly available
For the efficient operation of this machine, the following software's are used. Before fabrication of the unit, downloadthe following software's from the various websites and fabricate the whole set up to make the drawings.

1.Arduino IDE version 1.6.6 or later versions.
2.Processing IDE version 3.1.1 or later version.
3.Inkscape version 0.48.5. Download it from here.
4.Grbl controller (optional).

II. LITERATURE REVIEW

Udit Pandey , Swapnil Raj Sharma [1]work likewise fabrication unit, demonstrating the hardware required for the CNC plotter at low cost.in real time control of Z axis control using a stepper motor takes more time than servo motor to move the drawing pen up and down . Dinesh Awari , Manoj Bhamare, Akshay Ghanwat, Ketan Jadhav Jagdish Chahande,[2]describes a small scale three axis CNC milling

N. Ramu, Lecturer (Sr. Grade), Department of Mechanical Engineering AMK Technological Polytechnic college, Sembarambakkam, Chennai – 600 123, India

machine's component discuss and analyzed under very limited budjet. . Puja Girhe , Shubham Yenkar , Arpita Chirde [3] paper deals with the design of automatic mini CNC machine for PCB drawing and drilling operation.
Kajal J.Madekar,, Kranti R. Nanaware., Pooja, R. Phadtare., Vikas S. Mane., focus the Design and drill PCB based on low cost CNC system and the lower cost is achieved by incorporating features of PC with ATMEGA 328 controller in an arduino microcontroller.

III. METHODOLOGY

This plotter unit consists of three sections.
1. Software section (see introduction).
2. Electronic control system.
3. Fabrication set up for three axis movement/

To simplify the mechanism, two number of old CD Drive is dismantled and the fabricated structure is shown in figure. Here two 12VDC Bi polar stepper motors are used for X and Y axis horizontal movement.

Old CD drive

SMPS power supply

A ordinary ball point pen is used for the drawing purpose and this pen is connected to 12vdc servo motor for Z axis vertical up and movement. A separate 12vdc /10 amps SMPS power supply is for whole assembly set up. To drive the two stepper motors l293D motor driver shield is connected between the arduino and stepper motors. The L293D driver shield is shown below.
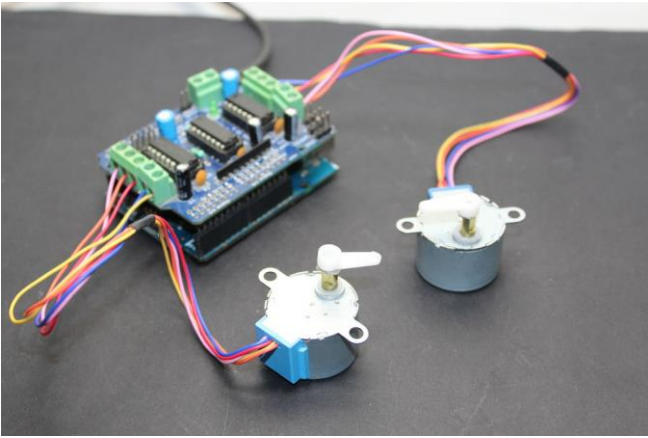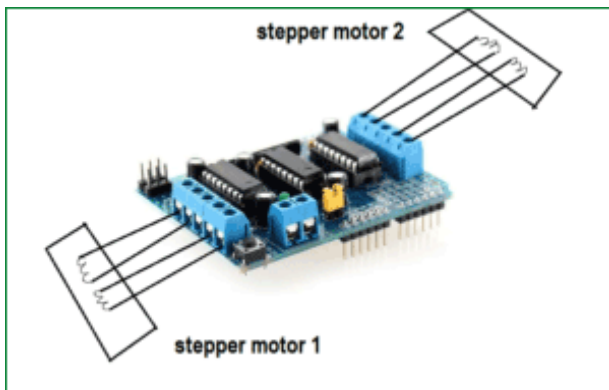
Image of Stepper motors and its L293 D driver shield with arduino

Servo motor with arduino controller

stepper motor wiring circuit diagram

IV. EXPERIMENTAL WORK

This machine is fabricated by dismantling two number of old CD drives and mounted both the drive units in horizontally for X and Y axis movement of worktable. The oneend of the cotton wire is connected to a refill of ball point pen under spring control and the other end is connected to the lever of servo motor shaft. When the servo motor rotated to 90 degree the refill moves up and down , The total cost of this plotter unit is less than 3000 rupees. The sample sketch to be drawn is taken from the web and imported into the linkscape software . G code files are taken from the linkscape software feed into the processing software.The software that will enable us send G-Codes into the Arduino is called Processing.

After opening Processing IDE software platform, click run. A window appears with all the instructions. Press p on the keyboard. The system will ask you to choose a port. So select the port on which your Arduino board is connected. Now press g and browse to the folder where you saved your G-CODE. Select the right G-CODE and press enter. Now the devicestarting to plot on the paper.

To terminate the process, just press x and the device will stop whatever it was doing.

V. CONCLUSION

After installing all the necessary software's, the machine runs smoothly and draws the sketches more accurately on the paper.The same set up can be modified into laser engraving machine by simply placing the laser unit with driver board or automaticCNC drilling machine for drilling PCB board by simply placing the drilling machine unit with driver board by replacing servo motor and pen.

REFERENCES

[1] UditPandey ,Swapnil Raj Sharma, "Model and Fabrication of CNC Plotter Machine," International Journal of Advanced Research in Computer and.Communication Engineering. Vol. 6, Issue 6, June 2017

[2] Dinesh Awari ,ManojBhamare, AkshayGhanwat, Ketan Jadhav Jagdish Chahande, "Methodology for Selecting Components for Fabricating CNC Milling Machine for Small Scale Industry" International Journal for Scientific Research & Development| Vol. 4, Issue 11, 2017

[3] Puja Girhe , Shubham Yenkar , Arpita Chirde ,"Arduino Based Cost Effective CNC Plotter Machine" International Journal of Emerging Technologies in Engineering Research (IJETER) Volume 6, Issue 2, February (2018).

[4] Kajal J. Madekar1, Kranti R.Nanaware2, Pooja R. Phadtare3,Vikash S. Mane4, "Automatic mini CNC machine for PCB drawing and drilling,' International Research Journal of Engineering and Technology (IRJET), Volume: 03; Issue: 02; Page No. 1106-1110; 2016.

[5] N. Balasubramanyam and Prof. Smt. G. Prasanthi "Design and Fabrication of an Automatioc PC- Based Drilling Machine", HCTL Open International journal of Technology Innovation and Research, Volume: 07, 2014.