

SOFTWARE CONTROLLED 2-AXIS FOAM CUTTING MACHINE

Aakash Athale¹, Ninad Patil², Vinay Kumar³

^{1,2}Student, Department of mechanical engineering, MVSIT Sonipat

³Project guide, Department of mechanical engineering, MVSIT Sonipat

MAHAVIR SWAMI INSTITUTE OF TECHNOLOGY, SONIPAT HARYANA-131030

ABSTRACT: In this research paper we will study about a software controlled 2-axis foam cutting machine. The machine is manufactured as per construction design. Machine is controlled via a computer software called universal G-code sender (UGS) which used to connect and control the machine. Also, software called Inkscape is used for designing and construction of the product designed to be obtained on the machine. It draws the design in coordinate system and feed the commands in G-codes instructions. In this research paper we will study about the construction and controlling of machine, also we will learn about the usage of both the software and their commanding.

KEYWORDS: Universal G-code sender, Inkscape, G-codes, coordinate system.

I. INTRODUCTION

The 2-axis foam cutter is a device that is used to cut Styrofoam into a desired shape which is designed on the controlling device. Machine tool is a nichrome heater wire. The controlling unit is a desktop with universal G-code sender (UGS) which is used to control the machine. This machine can be used to design the Styrofoam cutting in which automatic cutting can be done without the interference of hand during cutting. Inkscape is software that is used to convert the outline design into a coordinate plot design using G-codes set of instruction.

CONSTRUCTION

Drawing of the model to get an idea of materials required and positioning of the material used. The basic structure was prepared by traditional method using drafter and scale. Then pasted and cut accordingly as the designed.

Materials & Tools

This project was made with things I had lying around. I used a Step-Down transformer to avoid overheating the nichrome wire. A setup is also installed for Arduino Uno and stepper motor driver for movement of workpiece.

Material required are listed below

Birch plywood (560 mm x 720mm).

Screws (roughly 22x4 mm)

1 Eye bolts M6 or 1/4 inch

2 Carriage bolts M6x40 mm or 1/4 inch

M6 nuts and washers or 1/4 inch

2 knobs M6 or 1/4 inch

Nichrome wire (I used 0.5 mm, 30 cm)

Bronze bushing (optional 6 mm ID) or 1/4 inch

Large washer M12

Wire
Sliding pair
Belt drive
Carriage for workpiece (260mm x 260mm)
Step Down Transformer (230 to 12 volts)
Nema-17 stepper motor
Wheat-stone bridge
Arduino Uno and its module
Codes for Arduino Uno
220VAC -24VDC power supply
Desktop with Inkscape and universal-code sender installed
ON/OFF SWITCH
Essential tool for cutting and fitting of machine

II. PROCEDURE OF INSTALLING

Assembly of machine: -

At first will mark the points of installation for where the drilling is to be done. After the drilling holes using drill machine clean and rim the holes for the attachment of slider pair and stepper motor with the baseboard. Now fix the heater wire stand and its power circuit which include wheat-stone bridge connected to hot wire and a stepdown transformer of 230VAC to 24VDC.

Installation of Arduino Uno: -

Arduino Uno is installed on the corner of board so that its usability and distance from other instruments will be maintained. Arduino Uno is programmed with 2-axis control program via desktop using Arduino IDE software. Output of Arduino Uno is given to stepper motors via connection cables.

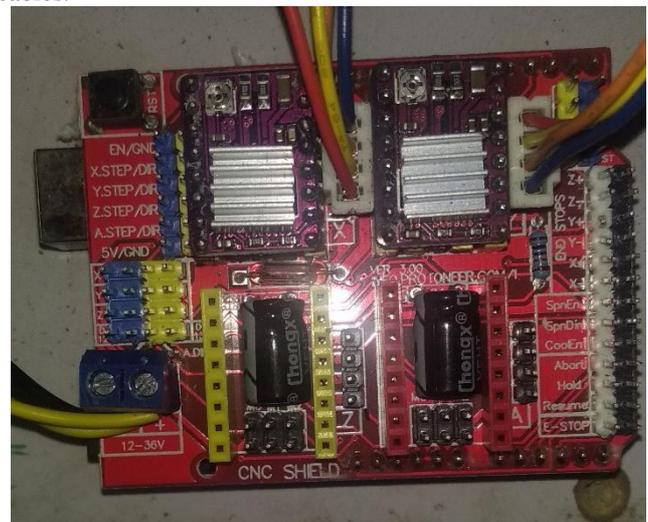


Figure 1. Arduino Uno



Figure 2. Nichrome wire on heater stand

Installation of nichrome wire on heater wire stand: -

Nichrome wire is used as tool in this machine. Wire will be installed between the base board and heater stand with the help of bolts. Here we have to be careful so the it should not touch the stand, otherwise it leaks the 24VDC in the stand which could make a fatal mistake and could lead to a mis happening. A bronze bushing should be installed in the board to avoid the contact of nichrome wire with the base board. The nichrome wire should be so tight enough that there should not be any slang in wire, but also check that tension should not be greater that stretch the wire

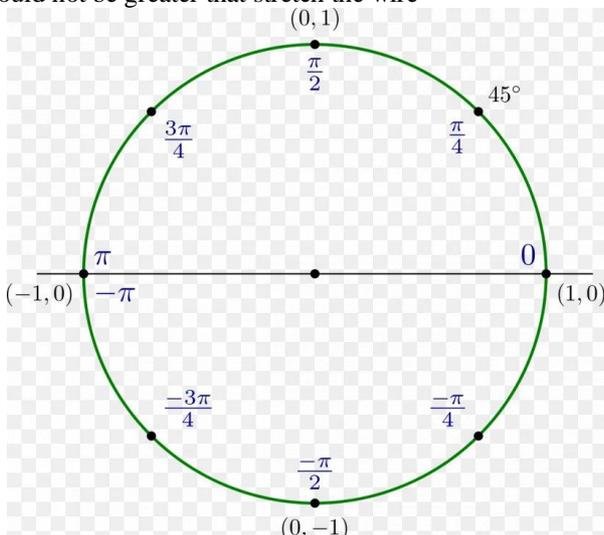


Figure 3. circle in bitmap form

Design of cutting and making of bitmap image of desired design: -

The selected design will be converted into a bitmap image which contain the design in coordinate system representation is done with the help of software called Inkscape.

Establishment of connection between desktop or controller to the machine: -

Universal G-code sender (UGS) is a software which allow us to establish connection in controller and machine. Also, we can control the machine via controller because of UGS software.

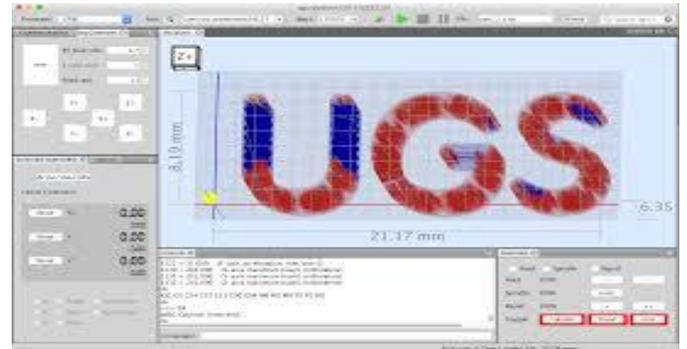


Figure 4. UGS Software

III. RESULT

THE RESULT OF THE RESEACH WAS OBTAINED THAT THE DESIRED SHAPE IS CUTTED VIA SOFTWARE CONRTOLLER

IV. CONCLUSION

ABOVE RESEARCH HELPS US IN A WAY THAT WE CAN CONTROL THE 2-AXIS FOAM CUTTER MACHIN VIA DESKTOP/CONTROLLER AND OBTAIN A DESIRED SHAPE OF CUTTING ON STYRO FOAM.

REFERENCES

- [1] WIKIPEDIA
<https://www.wikipedia.org>
- [2] GOOGLE IMAGES OF PICTURES
<https://www.google.com/imghp?hl=en>