CNC Machine Based on Spindle Engraver using Arduino uno

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Abstract:. - **Due to rapid growth of technology the usage of CNC machine in industries are increased. The fabrication low cost CNC machine is used to reduced cost and complexity of machine. This project deals with the design of automatic mini CNC machine for engraving. The idea behind of our project is to design and engrave on low cost CNC system. The lower cost is achieved by incorporating features of PC with ATMEGA 328 controller in an arduino-uno. We have used the G-code for whole system operation G-code is nothing but a language in which people tell computerised machine tools "How to make something". The how is defined by instruction on where to move & fast move.**

Index terms: CNC machine, stepper motor, arduino uno, universal G-code converter, art cam.

I.   INTRODUCTION

CNC stands for computer numerical code which is used to controlled lathes machine, mills, routers & grinders etc. basically its looks normal PC control machine. CNC machine functions through numerical control and machine are programmed with CNC language called G-code. With the help of CNC technology we are used in manufacturing metal, plastic, wood etc. inspiring from CNC technology we are presenting the "CNC MACHINE BASED ON SPINDLE ENGRAVER BY USING ARDUINO-UNO". Idea behind this project is to make a small three axis CNC machine which engrave 3D on object. There are three stepper motor are used for X Y Z axis.

II.   SYSTEM DESCRIPTION

G-code: It's nothing but a language in which people tell computerised machine tools "how to make something". It means instruction on where to move, how to fast move & through what path to move.
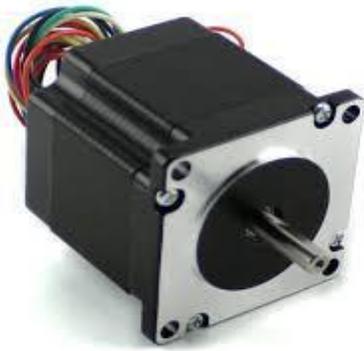
Table.1 G-code operation

| G-Code	Description
G00	Rapid Linear Interpolation
G01	Linear Interpolation
G02	Clockwise Circular Interpolation
G03	Counter Clockwise Circular Interpolation
G04	Dwell
G05	High Speed Machining Mode
G10	Offset Input By Program
G12	Clockwise Circle With Entrance And Exit Arcs
G13	Counter Clockwise Circle With Entrance And Exit Arcs
G17	X-Y Plane Selection
G18	Z-X Plane Selection
G19	Y-Z Plane Selection

Controller: microcontroller ATMega 328

Features -

Operating voltage 6-20 volt

Digital pins 14 (6 is used for PWM o/p)

Analog input pins 0-5

DC current 400mA

Flash memory 32 kb

SRAM 2 kb

.

Stepper Motor:

Table.1 stepper motor specifications

Size	NEMA 17
Drive system	Bipolar
Step angle	1.8^0 full
Phase/winding	4/2
Voltage	12volt
Current	400mA
Leads	18 in
RPM	15000

Stepper motor is a digital device, its more precisely a digital stepper motor. The stepper or stepper motor allows to select a certain degree of movement. Rather than making a whole spin it can divide spin into smaller operation. Also it has Gerbil support.
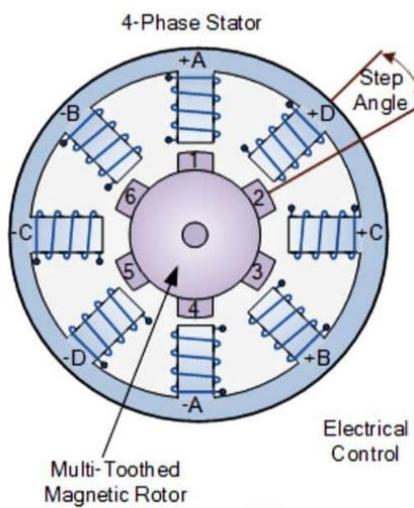

Spindle:

The **spindle** is an extremely important part of the engraving system. This is true for manual as well as computerized engravers. Spindles are precision manufactured mechanical components that operate at variable speeds during rotary engraving. They use internal precision bearings that provide the rotary capability and support the rotating cutter during engraving. All spindles use some form of bearings and require special care and handling. See the section on equipment maintenance for more details.

Centre to centre distance 68mm
Total length 95mm
Width 58mm

III.   PROPOSED METHODOLOGY

Block diagram:
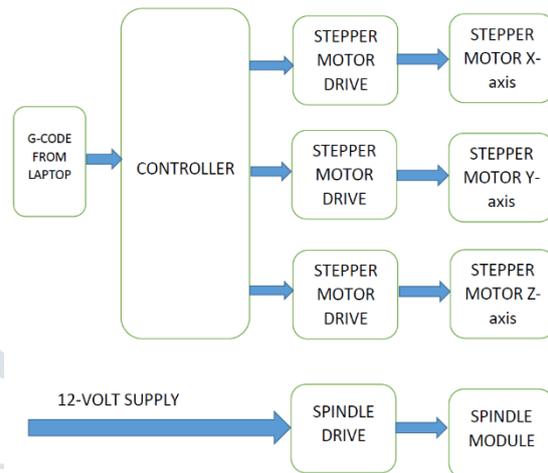
From block diagram, we describe the three dimension CNC router controlled based on stepper motor. Some of previous system are used for milling, drilling and designing. Also some system is suitable for designing metallic and non-metallic parts.

The drawback of these system was so costly, bulky and high weight of structure. For overcome such type of problem we proposed an idea of 3-D axis CNC machine with aluminium material and compact size.

In these system the instruction is given through software which is installed in laptop. The laptop is contain G-code to CNC router via microcontroller and arduino. Then signal is applied to stepper motor drives, according to command it changes its location and position and spindle starts engrave the image on given object. The spindle module is operated by spindle drive.

IV.   SIMULATIONS AND EXPERIMENTAL RESULTS
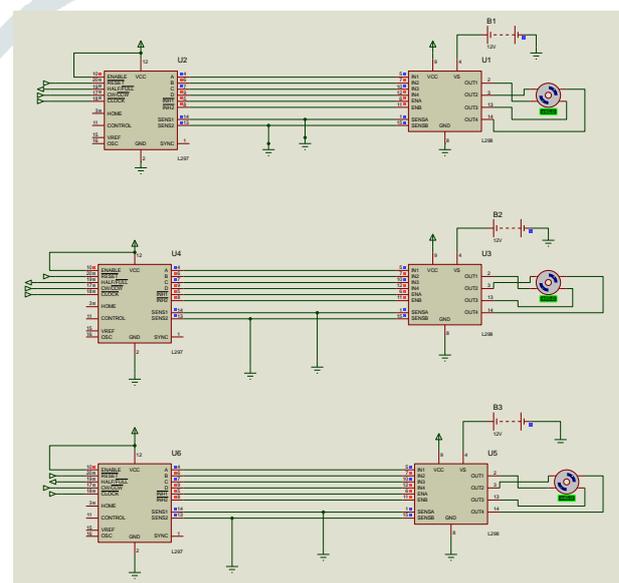
IV.   CONCLUSION

By using Arduino uno and G code it is possible to engrave any shape on any non-metallic surface with LASER.

V.   FUTURE SCOPE

By using Raspberry Pi we can minimize the cost. Also we can engrave on metal by using laser engraver

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