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Design of Mini CNC using Arduino uno

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Abstract – *In manufacturing sector the CNC technology is most widely used machine. The CNC that involves interfacing of computer for controlling the machining process. The CNC stands for computer numerical control . This paper gives idea about the CNC engraving machine using Arduino uno. The purpose of this mini cnc is to engrave on Acrylic materials with an accuracy and that to be within a low cost. The device is capable of functioning with the computer for defining the cutting geometry. The software is used for controlling the motion of the machine is universal gcode sender (UGS) and defining the geometry of a particular engraving on material the software to be used is inkscape.*

***Key Words*: Mini cnc, Arduino uno, Acrylic Material, UGS ,Inkscape**

1.INTRODUCTION

Cnc is a computer numeric control machine with the help of which high precision jobs can be done. A 2D design is created with the help of CAD/CAM, Now that design is converted into gcode file. The gcode is a language which CNC machine understands and performes accordingly on any workpiece. The CNC machines employ various mechatronics elements that have developed over the years. However ,the quality and reliability of these machines depends upon his machine structure and the cutting parameters. For designing the cnc machine the various aspects to be considered, for example Machine structure, Guideways, Feed drivers, controls, software and operator interface.

Today a number of different CNC control options have become commercially available including low cost software that can turn a common pc into a multi axis motion controller.

Nowadays, products can be produced by modern technology, which uses computer software, hardware and firm ware in industries. It is needed to use CNC mill machine to get more accurate dimensions and irregular shape. End milling is the most important milling operation, widely used in most of the manufacturing industries due to its capability of producing complex geometric surfaces with reasonable accuracy and surface finish. However, with the inventions of CNC milling machine, the flexibility has been adopted along with versatility in end milling process. In order to build up a bridge between quality and productivity and to achieve the same in an economic way, the present study highlights optimization of CNC end milling process parameters to provide good surface finish and high material removal rate (MRR).

Many CNC tools have no inherent sense of the absolute position of the table or tools when turned on. They must be manually "homed" or "zeroed" to have any reference to work from, and these limits are just for figuring out the location of the part to work with it, and aren't really any sort of hard motion limit on the mechanism. It is often possible to drive the machine outside the physical bounds of its drive mechanism, resulting in a collision with itself or damage to the drive mechanism. Many machines implement control parameters limiting axis motion past a certain limit in addition to physical limit switches. However, these parameters can often be changed by the operator.

1.1 Problem Defination

The proposed machine aims at developing a small scale industrial CNC machine that will aim to reduce the cost of machining of acrylic. Also the aim is to reduce the overall cost of manufacturing of Mini CNC machine and also provide accurate engraving on a acrylic material so that it can be used for empowering small scale industries. Also the overall all cost of the machine can be reduced by using Arduino uno for interfacing of the machines with the desktop. Thus the proposed machine aims at developing a miniature model of Mini CNC m/c that can reduce the overall all cost of

machining of acrylic and various other material and develop small scale m/c that in near future help development of small scale industries or can be used for educational purpose.

1.2 SIGNIFICANCE OF THE PROBLEM

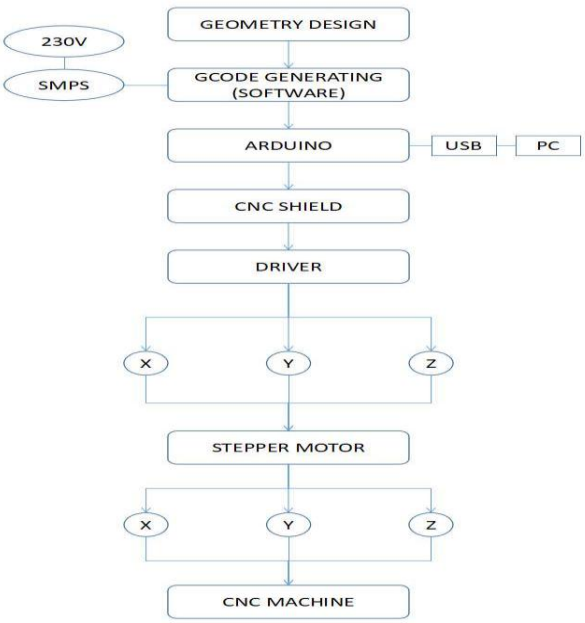
Larger and more efficient machining centers are typically used for production manufacturing. A desktop machine would likely be used for prototyping, education, or making one-off parts. Independent of the usage, lowering the cost of advanced manufacturing technologies and making those technologies available to a wider audience is significant to promoting economic growth.

2. METHODOLOGY

Methodology is a guideline for a developer to plan the structure and control development process. Design and development of this CNC 3-axis machine using Arduino Uno consisted of several parts such as mechanical parts, electrical parts and programming.

NEMA 23 stepper motor and Servo motor was used. While Arduino UNO was the controller for the machine. The designing of the machine included the frame work and motors along with the wiring connection and the software to generate the program. Universal GCODE sender was used for the computer control, which would process the Gcodes and send signals to Arduino. Arduino then would feed the signals to the various motors so that they would move based on the user data input.

The structure and frame put in a appropriate condition and put in right alignment so it can engrave without affecting its accuracy .The various parts are purchased from a suppliers and made in lathe machine.



2.1 SOFTWARE

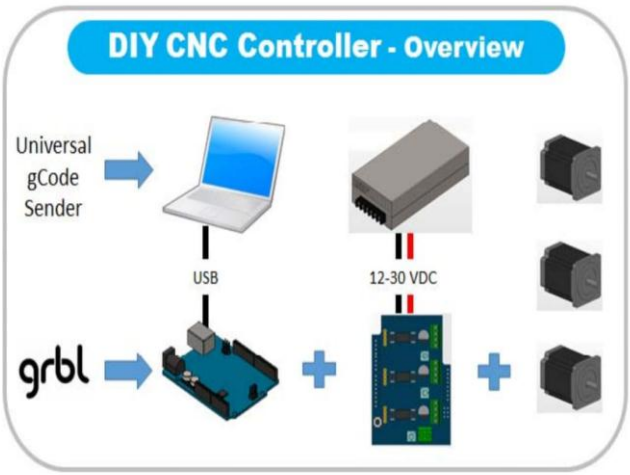
1)Arduino Ide

A program for Arduino may be written in any programming language with compilers that produce binary machine code for the target processor. Atmel provides a development environment for their microcontrollers, AVR Studio and the newer Atmel Studio. The Arduino project provides the Arduino integrated development environment (IDE), which is a cross plate form application written in the programming language java. It originated from the IDE for the languages processing and wiring . It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching and syntax highlighting, and provides simple one-click mechanisms to compile and upload programs to an Arduino board. In Arduino board we are going the grbl coding for make to run the gcode files in Univesal gcode sender.

2)Inkscape

we use this software for make gcode file extention from this we can define the geometry which work has to be carried out on wokpiece. The work area is define in this software and various shape and image can be created and converted it into gcode files.

Schetamatic diagram



3. CONCLUSIONS

Designed cost effective mini cnc machine which can engrave on acrylic materials as per desired geometry.

Using small machine tools to fabricate small scale parts can be provide flexibility and efficiently manufacturing approach. The machine built successfully as while testing it performed welled.

Most of the software were supported and the machine engraved a 2d design on workpiece. The best machining parameter were 150mm/min and 0.2 mm per cut. A test were conducted to validate as per the calculated result .

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