A PROJECT REPORT

ON

"IMPROVEMENT OF MINI CNC"

Submitted to

UNIVERSITY OF MUMBAI

In Partial Fulfilment of the Requirement for the Award of

BACHELOR'S DEGREE IN
MECHANICAL ENGINEERING

BY

MUKADAM WASIF ASHRAF NASEEM	**16DME162**
QURESHI MOHD SIDDIQUE MOHD SAEED	**16DME166**
SIDDIQUI SAKIB SHAMSHUL HAQUE	**16DME181**
TUNGEKAR MOHD RAMEEZ MOHD MOAZAM	**16DME183**

UNDER THE GUIDANCE OF
PROF. ASLAM HIRANI

DEPARTMENT OF MECHANICAL ENGINEERING
Anjuman-I-Islam's Kalsekar Technical Campus
SCHOOL OF ENGINEERING & TECHNOLOGY
Plot No.2 & 3, Sector - 16,Near Thana Naka,
Khandagaon, New Panvel - 410206

2018-2019

AFFILIATED TO

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CERTIFICATE

This is certify that the project entitled

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submitted by

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SIDDIQUI SAKIB SHAMSHUL HAQUE	**16DME181**
TUNGEKAR MOHD RAMEEZ MOHD MOAZAM	**16DME183**

is a record of bonafide work carried out by them, in the partial fulfilment of the requirement for the award of Degree of Bachelor of Engineering (Mechanical Engineering) at ***Anjuman-I-Islam's Kalsekar Technical Campus, Navi Mumbai*** under the University of MUMBAI. This work is done during year 2018-2019, under our guidance.

Date: / /

(Prof. ASLAM HIRANI)
Project Supervisor

(Prof. RIZWAN SHAIKH)
Project Coordinator

(Prof. ZAKIR ANSARI)
HOD, Mechanical Department

DR. ABDUL RAZAK HONNUTAGI
Director

External Examiner

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MUKADAM WASIF ASHRAF NASEEM
QURESHI MOHD SIDDIQUE MOHD SAEED
SIDDIQUI SAKIB SHAMSHUL HAQUE
TUNGEKAR MOHD RAMEEZ MOHD MOAZAM

Project I Approval for Bachelor of Engineering

This project entitled ***ÏMPROVEMENT OF MINI CNC¨*** by ***MUKADAM WASIF ASHRAF NASEEM (16DME162), QURESHI MOHD SIDDIQUE MOHD SAEED (16DME166), SIDDIQUI SAKIB SHAMSHUL HAQUE (16DME181), TUNGEKAR MOHD RAMEEZ MOHD MOAZAM (16DME183)*** is approved for the degree of ***Bachelor of Engineering in Department of Mechanical Engineering.***

Examiners

1. .....
2. .....

Supervisors

1. .....
2. .....

Chairman

.....

Declaration

I declare that this written submission represents my ideas in my own words and where others ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Mukadam Wasif Ashraf Naseem
16DME162

Qureshi Mohd Siddique Mohd Saeed
16DME166

Siddiqui Sakib Shamshul Haque
16DME181

Tungekar Mohd Rameez Mohd Moazam
16DME183

ABSTRACT

CNC machining is a process used in the manufacturing sector that involves the use of computers to control machine tools.The mini cnc is presented by previous batch but due to vibrations and inaccuracy in the performance the engraving was affected so we had reduce the vibration in it and redesign the structure for better and smooth engraving using Universal Gcode Sender and inventable for generating the Gcode files.

Keywords: CNC, GCODE SENDER, INVENTABLE.

Contents

List of Figures

Chapter 1

Introduction

CNC Technology has proven to be of great use in the sector of contemporary CNC sytem along with higher computational and memory syorage capacity of modern computer, redefined the shop floor automation strategies. For the modern sector one of the biggest challenge today is how to make a CNC technology affordable, simpler and available to an extent that even an occasional user can think of owning such technology. Our proposed work was to achieve the objective of developing a low-cost effective CNC that can perform the basic operations. Based on our design and requirements, standard components required for developing the low-cost machine were selected. This resulted in developing CNC control by using Arduino microcontoller. The Z-axis motion was obtained by moving the spindle motor housing. The X-axis motion was obtained by moving the table and, the Y-axis movement was achieved by the sliding of spindle housing in Y direction. Thus completing the three basic Axes of the required

1.1 Purpose

Cost effective mini cnc machine to engrave on acrylic material with good carving and depth accuracy which will be controlled using arduino UNO.

1.2 Project Scope

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 CNC machine 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 for interfacing of the machines with the desktop. Thus the proposed machine aims at developing a miniature model of 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 .[2]

1.3 Project Objectives

1.3.1 Objectives

The proposed aim of this project is to develop a Mini CNC machine which can engraving on acrylic material without affecting its accuracy. A CNC engraver machine (Drawing surface area 20cm x 20cm) which will be able to engrave any geometry (or any image) on a solid surface.

Chapter 2

Literature Reviews

In this chapter the literature relevant to the present work has been presented. As the objective of the present work is to design a low cost CNC ENGRAVING M/C. Detailed study from basics has been carried out and an idea for building a modular structure was developed: Lin et.al [1] has studied effect of preloading of linear guides on dynamic characteristics of vertical column spindle system which is of importance for enhancing the structural performance of a vertical milling machine.

Xiangsheng et.al [3] analysed the influence of configuration parameters on dynamic characteristics on machine tools in working space, the configuration parameters have been suggested based on the orthogonal experiment method. Dynamic analysis of newly designed milling machine for producing turbine blades has been conducted by utilizing the model synthesis method.

Giacomo Bianchi[4] highlighted the use of damping in machine tools to suppress the vibration during dynamic analysis. Transferring energy dissipation mechanisms into numerical structural models. It is concluded that at multiple point which allows to investigate the complex interaction, in a machine tool, between structural dynamics, motion control and friction forces.

Abele at [5] presented the state of the art in machine tool main spindle units with focus on motorized spindle units for high speed and high performance cutting. Detailed information is provided about main components of spindle units regarding the historical development, recent challenges and future trends.

Namazi et.al [6] considered majority of the chatter vibrations in high-speed milling which originates due to flexible connections at the tool holder–spindle, and tool–tool holder interfaces.

Pritesh Runwal, Anil Shelke[7] This paper describes a low cost serial communication based mini CNC Plotter Machine based on open source software and hardware. Mini CNC Plotter Machine is an embedded system that works on the Principle on 'Computer Numeric Control (CNC)'. The system basically works with three stepper motors (two for X-axis and one for Y-axis) and micro-servo controller (for Z-axis). Where in Arduino Circuit plots the input given from the computer through 'INKSCAPE Software' on the sheet which is placed on the drawing board using micro-controller. The plotter has four axis control (2 X-axis and 1 Y & Z axis resp.) and a micro-servo controller for movement of pen. This system reduces human effort and also reduces the chances of error.

Chapter 3

Structure of the machine

3.1 Mechanical component

1. Y-axis C-shape structure
2. Spindle router
3. Milling tool
4. Bed
5. Circular guide ways
6. Clamping device

3.1.1 Y-axis C-shape structure

For Y-axis movement of the machine we had made a C-shape structure of aluminium material. which slides in y-axis direction of the CNC machine.

3.1.2 Spindle router

We used a DC spindle router for milling and drilling on a work piece for other various operations spindles are used in machine tools. For acrylic material engraving machine spindles should have high rpm and a special tool so that engaving will be smooth and material does not get heated and stick on the milling tool while machining. Low reaction from components for proper engraving.

The general requirements of spindles for CNC machine are:

1. High stiffness both static and dynamic.
2. Axial load carrying capacity.
3. Running accuracy.
4. Thermal stability.
5. High speeds of operations .

3.1.3 Milling tool

An end mill is a type of milling cutter, a cutting tool used in industrial milling applications. It is distinguished from the drill bit in its application, geometry, and manufacture. While a drill bit can only cut in the axial direction, a milling bit can generally cut in all directions, though some cannot cut axially.We had used a carbide milling tool which gives a smooth engraving on the acrylic material.

Figure 3.1: Milling tool

3.1.4 Bed

For X-axis direction we had made a bed type structure which slides on X-axis clamping mount over it. Workpiece is fixed on the clamps on the bed column . For moving the workpiece on X-axis and to carry the loads. We had made bed column from the mild steel so that it can carry load.The Bed size is designed as per the work area that is (165mmx160mm).

3.1.5 Circular guide ways

Guide ways are used in machine tool to, Control the direction of the table on which workpiece is held. To absorb all static and dynamic force. Size and shape of the work produced depends on accuracy of movements and geometry and kinematics accuracies of guide ways. Alignment of guide ways as to each other and to the axis of spindle is critical. Wear in guide ways reduces accuracy of movement .

3.1.6 Clamping device

We had used T-slot shape clamping device. T-slot are by far the most common way of positioning and holding down Work holding. They are simple, robust, and they work. To attach something to a T-slotted table, we had use T-slot nuts.we can easily fit the work piece on clam it is very rigid while machining.

The following points must be considered while designing guideways:

1. Rigidity.
2. Damping capabilities.
3. Velocity of slide.
4. Wear resistance.

3.2 Hardwares

1. Microcontroller.
2. Analog circuit.
3. Stepper motor.
4. CNC shield.
5. Motor driver.

3.2.1 Microcontroller

ARDUINO UNO:

Arduino uno is a micro controller based on AT mega 328P(datasheet) it has fourteen digit pins and reset button.It contains everything needed to support the microcontroller, simply by connecting it to a computer USB cable or power it with AC to DC (SMPS) or battery.

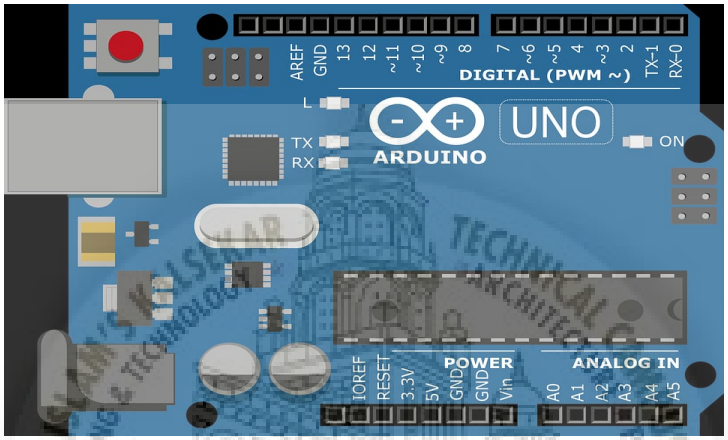

Figure 3.2: Arduino

3.2.2 Analog Circuit

Electrical design of CNC system

- Arduino uno.
- Nema 23 stepper motor.
- Stepper motor driver.
- CNC shield.
- Pc/laptop .

3.2.3 Stepper Motor

Stepper motor used for high working ability of precision level such as the one are building for CNC machine, project, unlike DC motors, stepper motors are brushless, synchronous electric motors that can be rotated in both direction. Has capacity to

holding torque at zero speed. We have used Nema 23 stepper motor. It has step angle of 1.18 degree, 10.2kg/cm holding torque, phase current 2amp and 3.3 DC voltage.

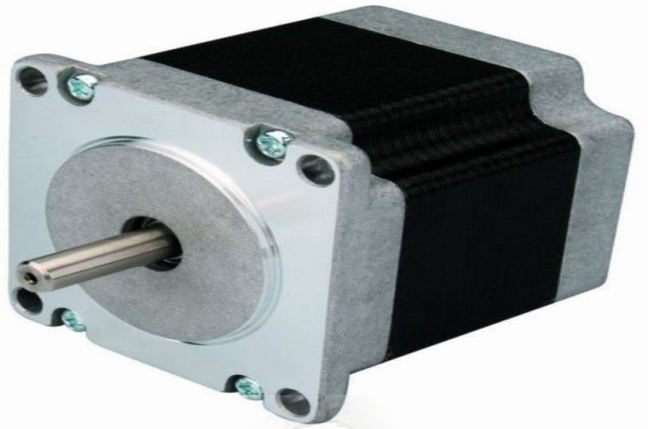

Figure 3.3: Stepper motor

3.2.4 CNC Shield

CNC shield inserted to arduino micro controller. Stop and connection of stepper driver easy. It is compatible with G code interpreter firmware called GRBL. It supports maximum of 4 stepper motor driver to run four stepper motor.it can support maximum of 36v and setting the micro stepping is easy with CNC shield.

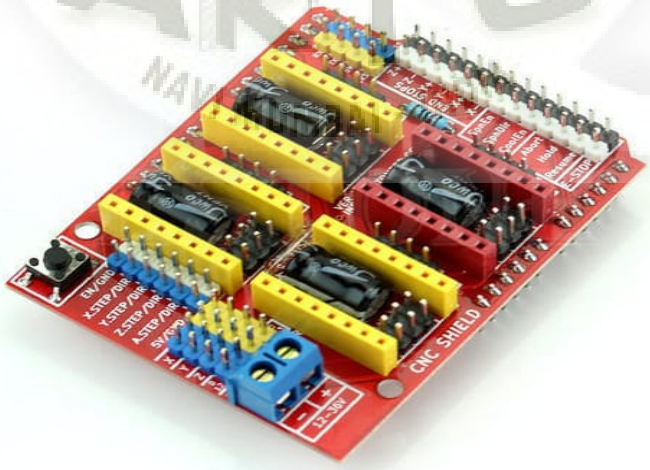

Figure 3.4: CNC shield

3.2.5 Motor Driver

The big easy driver is stepper motor driver board for bi-polar stepper motor uoto 2A phase. It is based on allegro A498 driver chip'which is next version of easy driver board.

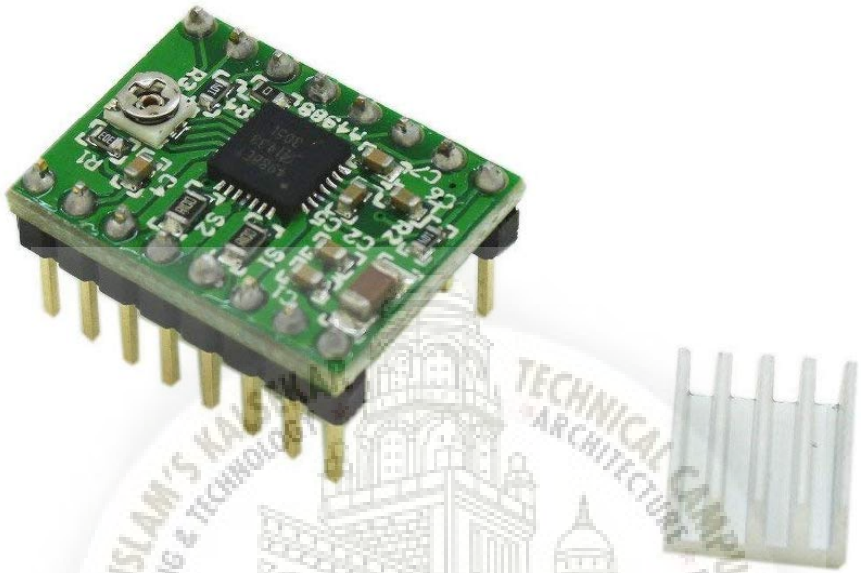

Figure 3.5: Driver

3.3 Softwares

3.3.1 Arduino ide

Arduino IDE comprises of two things - Arduino & amp; IDE. Let & # 39;s talk about these one by one. Arduino is a micro-controller development board series - Uno, Mega, Nano, Mini etc. are a few examples. Now, any micro-controller(here it is the Atmega 328 IC on the Arduino Uno or Atmega 1280 on arduino Mega) that needs to be programmed is basically fed with a hex code version of the code written in high level (English) language. So, arduino development boards are fed with the code via their Arduino IDE. Now, IDE (Integrated Development Environment) is basically a software that enables better and assisted code editing, compiling and debugging. The Arduino IDE runs on the Java Platform. You can co-relate this to Eclipse, which is another IDE for Java. So the language java has different IDEs that

ease the usage of the language for a particular purpose. However, Eclipse doesn&# 39;t support the functions and commands that work on arduino board. So, this Arduino IDE basically has inbuilt functions and commands that though work on Java platform, are customised to run on the arduino dev. board. Thus Arduino IDE serves for code editing, its compilation, debugging and then burning the code into the arduino dev. board.

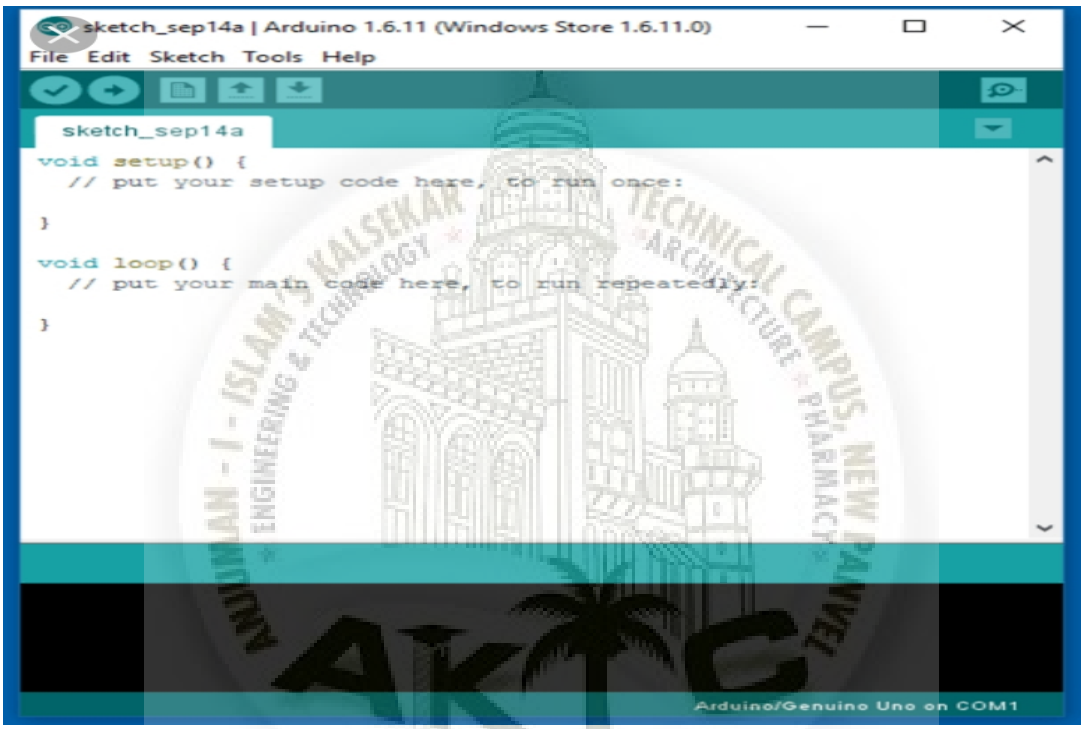

Figure 3.6: Arduino ide

On this software we uploaded a grbl programing so that the Arduino will control the motion of all the stepper motors which we will be using for x y and z axis.

3.3.2 GRBL

GRBL is an opensource framework for driving CNC (computer-numeric-control) machines with the Ardiuno type microcontroller. GitHub - gnea/grbl: An open source, embedded, high performance g-code-parser and CNC milling controller written in optimized C that will run on a straight Arduino “Grbl is a free, open source,

high performance software for controlling the motion of machines that move, that make things, or that make things move, and will run on a straight Arduino. If the maker movement was an industry, Grbl would be the industry standard."

To use it you need this family of controller and a project that needs to drive motion with CNC commands.

Additional items for GRBL

- arduino: To host GRBL software.
- stepper motor: to move machine.
- stepprt driver: bridge between stepper motor and arduino.
- supply: connect to stepper driver and provide power.
- Computer: to have USB connect between arduino and computer.
- Software: inkscape/ inventable easel.

3.3.3 Calibration Of Machine

In arduino we have to dumb a GRBL software which is used for co-ordination of machine in which there is a by default programming is set in X, Y and Z axis so we need to do a calibration of machine that we can get a actual co-ordination of all three axis.

A= current steps/mm for e.g 250/mm

B= expected length for e.g 20mm

C= final steps/mm

X=AxB/C = 250x20/15

X=334/mm

same goes for Y and Z axis calculation.

3.3.4 Inkscape

Inkscape is professional quality vector graphics software which runs on Windows, Mac OS X and GNU/Linux. It is used by design professionals and hobbyists worldwide, for creating a wide variety of graphics such as illustrations, icons, logos, diagrams, maps and web graphics. Inkscape uses the W3C open standard SVG (Scalable Vector Graphics) as its native format, and is free and open- source software. Inkscape has sophisticated drawing tools with capabilities comparable to Adobe Illustrator, CorelDRAW and Xara Xtreme. It can import and export various file formats, including SVG, AI, EPS, PDF, PS and PNG. It has a comprehensive feature set, a simple interface, multi-lingual support and is designed to be extensible; users can customize Inkscape & #39;s functionality with add-ons. The Inkscape project has a growing international user community, and many learning materials exist to help get you started with your creations. Help and support is provided by the community, and there are lots of ways for you to get involved if you want to help improve the Inkscape project. Inkscape is a member of the Software Freedom Conservancy, a US 501(c)(3) non-profit organization. Contributions to Inkscape are tax deductible in the United States.

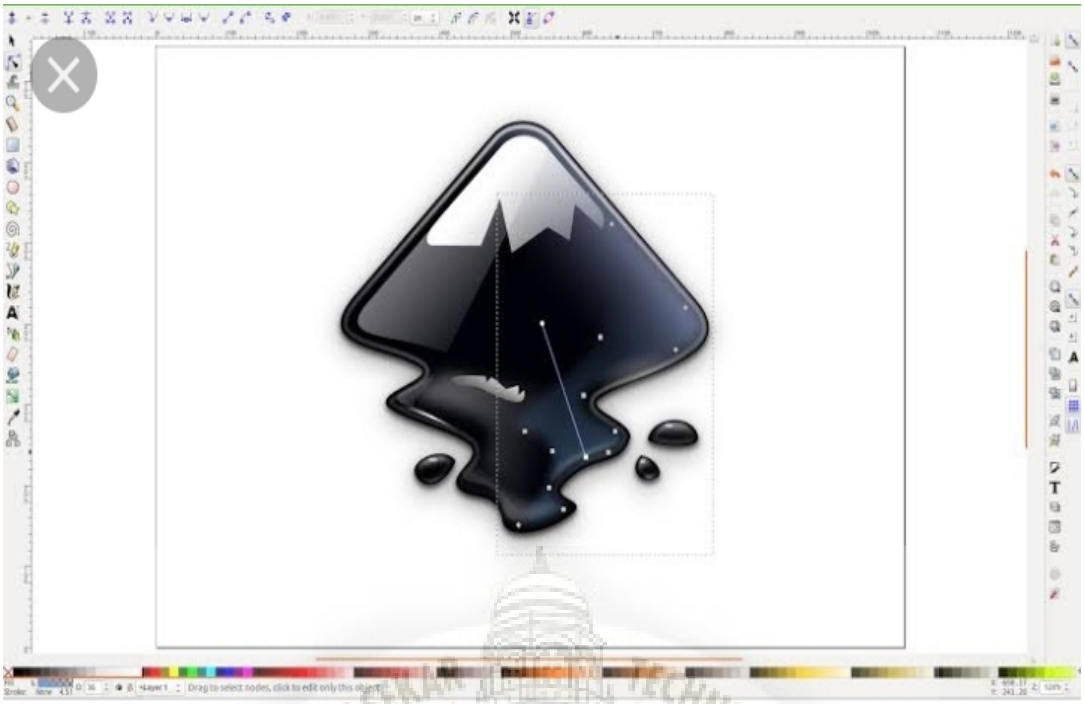

Figure 3.7: Inkscape

3.3.5 Inventable Easel

Easel is a software that allows us to design and manufacture products using a CNC milling machine.Easel is free software and it works in the browser at easel.com like other software it has file menu and edit menu but where easel is unique is that it also has a materials menu. And the design really starts with the materials so we can do aluminium, acrylics all sorts of different materials. In this section we will discuss how to use easel in an optimized way.

Step 1: Select material type

Enter the materials menu and select the material type. In our case we have selected the acrylic material. In the right side it also has option for entering the dimensions (Hight, width and thickness) of the material.

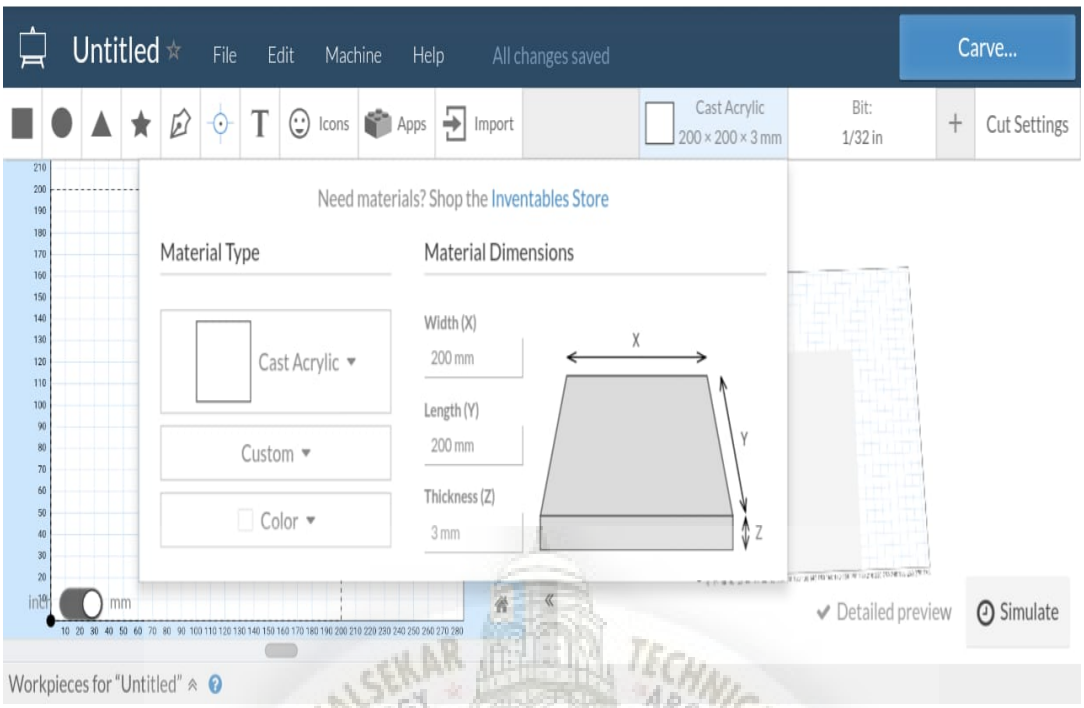

Figure 3.8: Step 01

Step 2: create design

On the left side of the main screen we can create design as per the required dimensions. Firstly, the type of font is selected from menu bar. Here we have selected the cinzel font for the text. Now enter depth of cut as per the requirement. The simulation of a design after machining is shown on the right side of the screen.

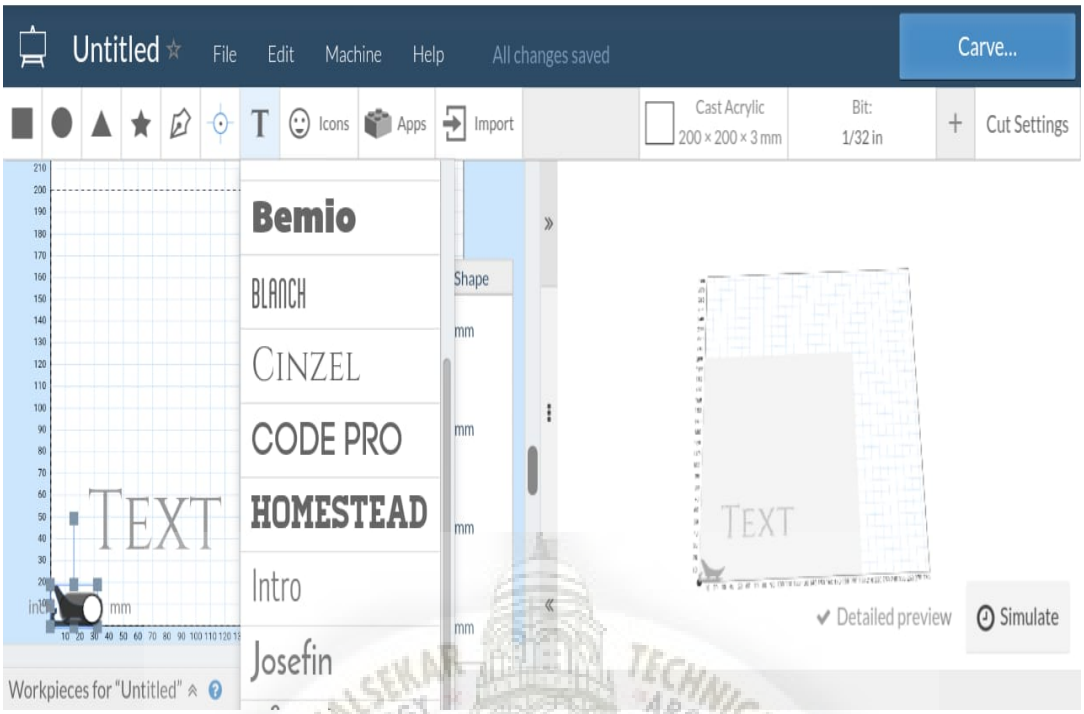

Figure 3.9: Step 02

Figure 3.10: Step 02.1

Step 3: bit/tool selection

Select “BIT” section from the menu bar, it shows different types of end mills and V-bits. It also has option for entering diameter of the tool.

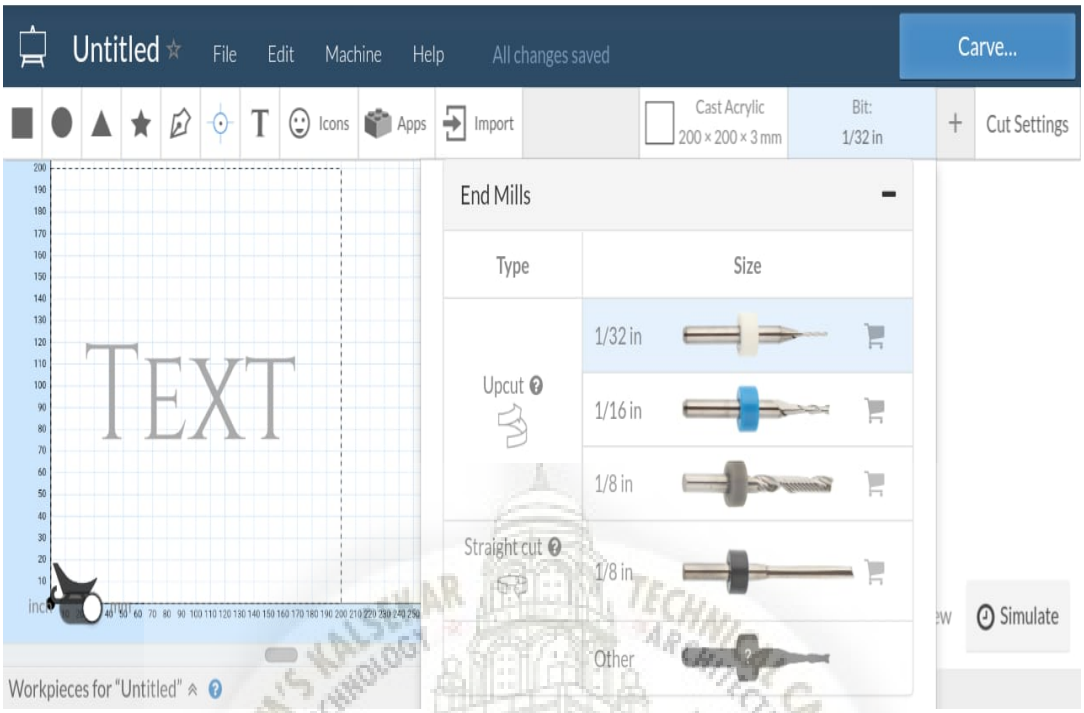

Figure 3.11: Step 03

Step 4: cut setting (cutting parameters)

On the top right corner of the main screen select “CUT SETTING” that shows recommended values of the feed rate, plunger rate and depth per pass for selected materials but it also has custom bar in which we can enter these values according to our need.

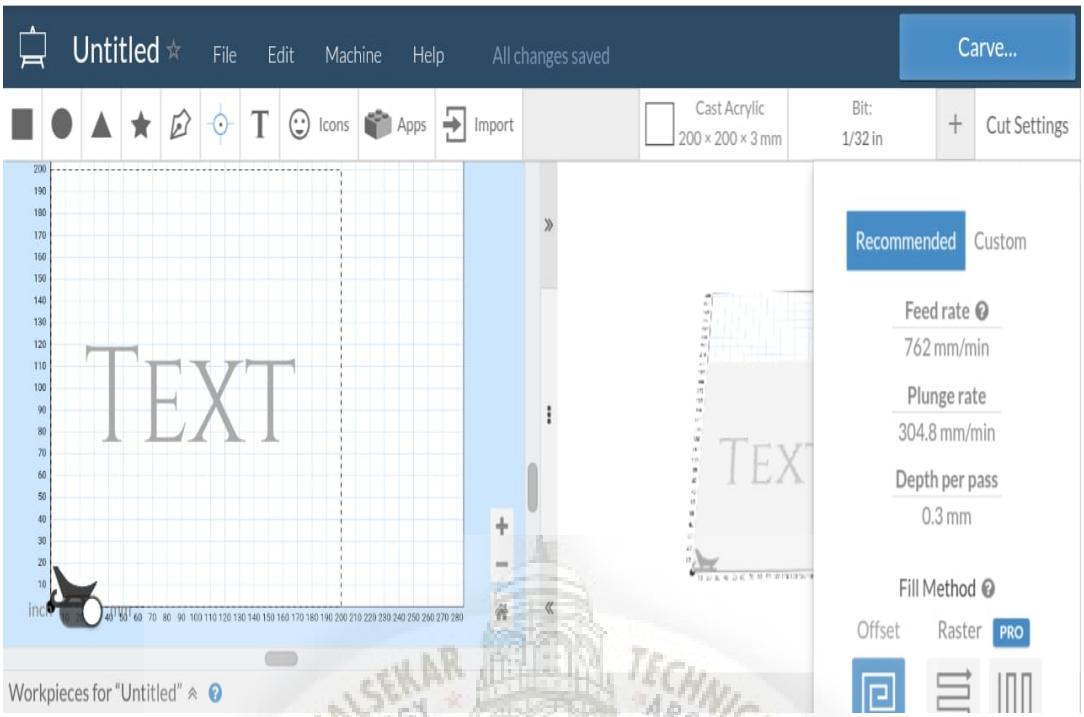

Figure 3.12: Step 04

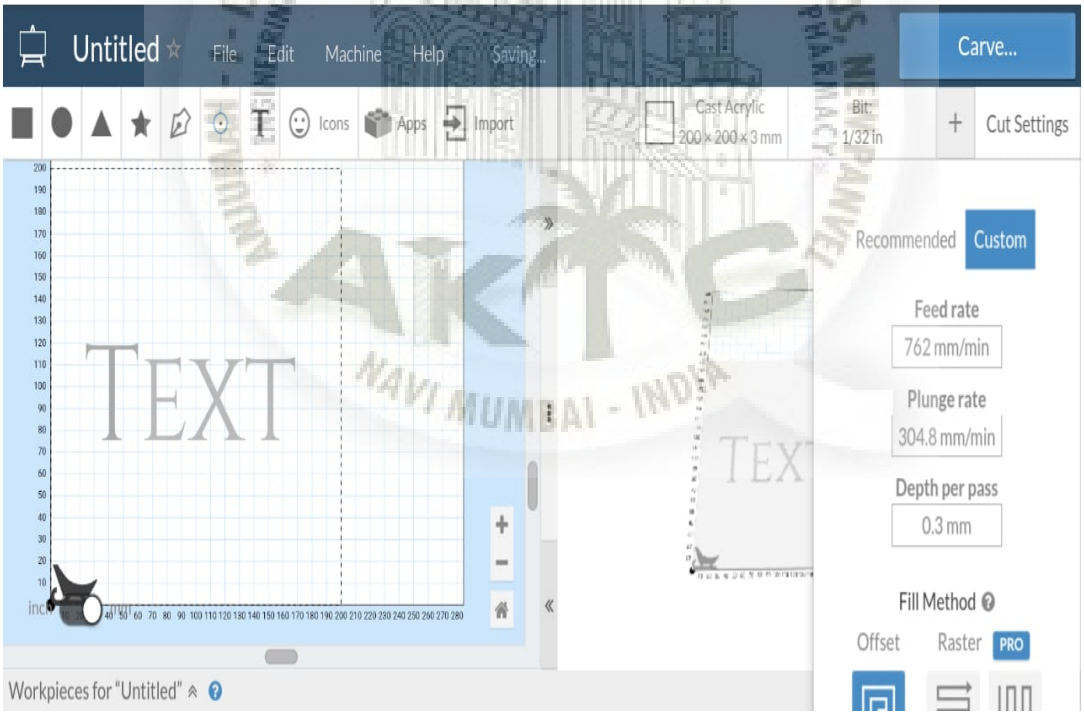

Figure 3.13: Step 04.1

Step 5: create G-code

Finally, we have done with the design and next step is to generate G-code for that design.

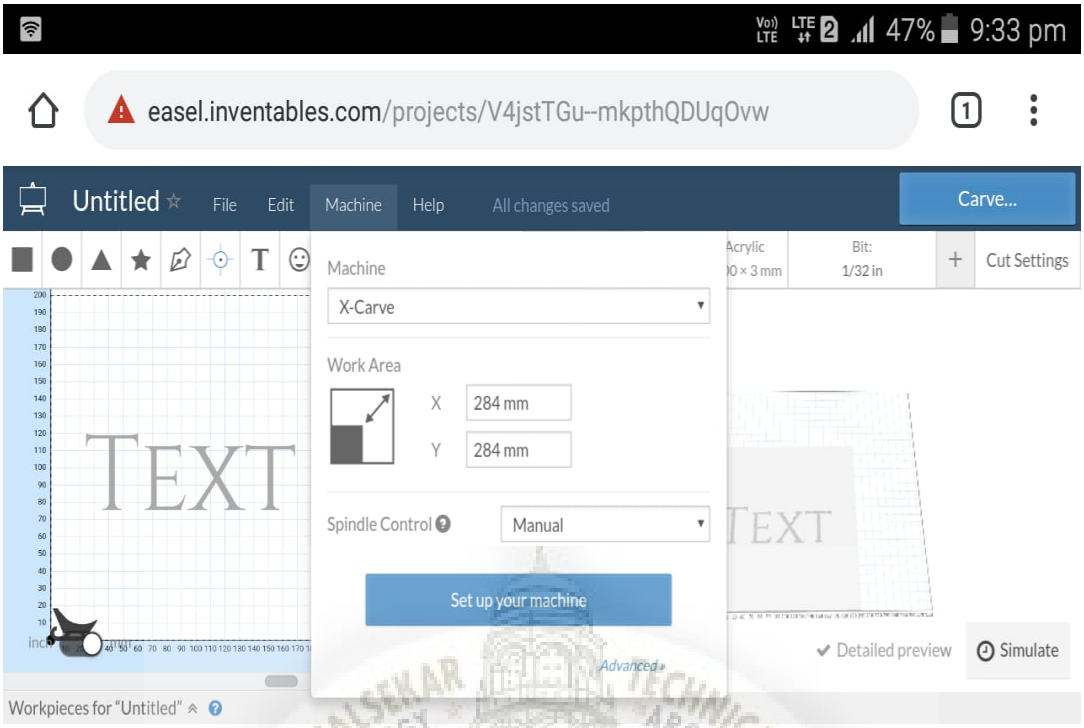

Figure 3.14: Step 05

Select “MACHINE” from the menu

Enter “advance” option

Enter safety height for the machining

We have taken 10mm as safety height

Enter “GENERATE G-CODE”

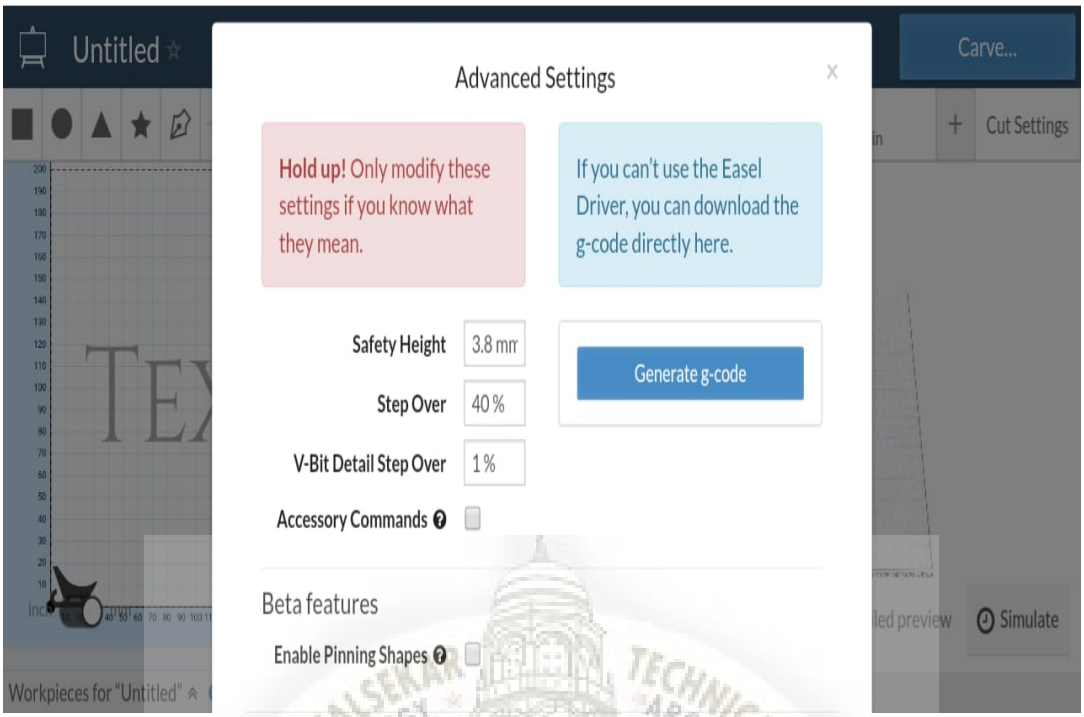

Figure 3.15: Step 05.1

3.4 Universal Gcode Sender

To send commands to your CNC/3-axis stepper motor driver board you need a g-code sender to send command and instruction.

. Download the Universal-G-Code-Sender.

Universal G-code Sender is a Java based GRBL compatible cross platform G-Code sender. Use this program to run a GRBL controlled CNC machine. Once downloaded, connect the UNO board USB to your computer and take note of the COM port it is connected to.

Run the start-windows.bat or the JAR file directly.

You will be presented with the following screen:

Gcode Sender(UGS).png

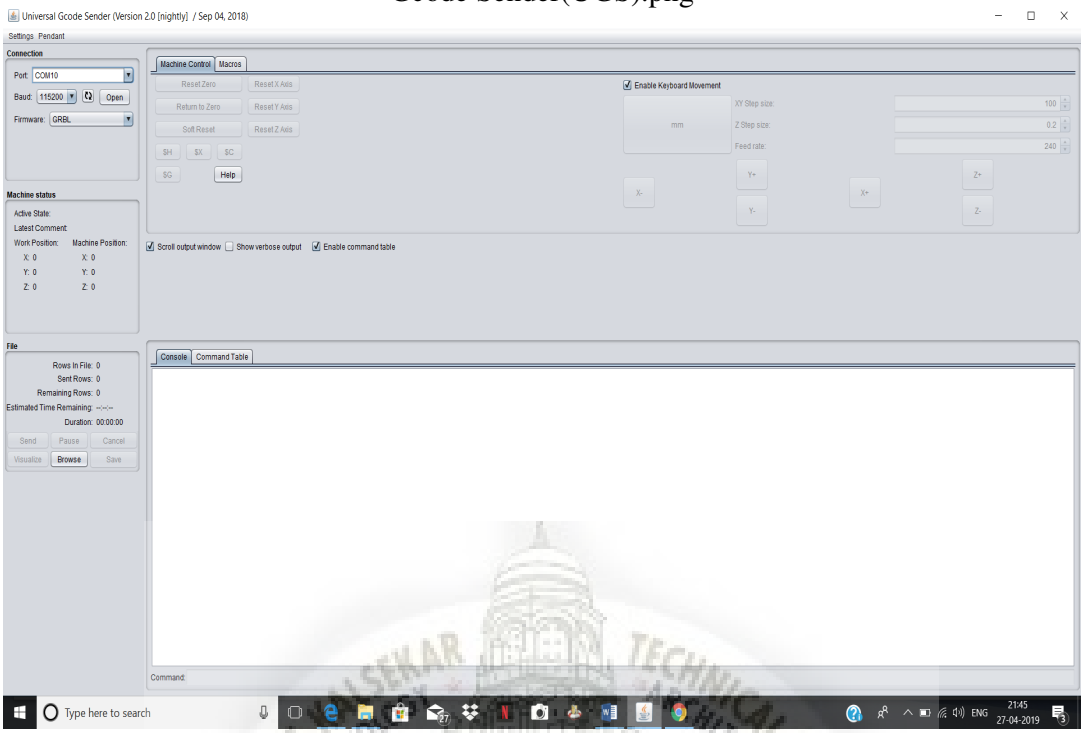

Figure 3.16: Universal Gcode Sender(UGS)

Click the "Machine Control" tab. Select the "Port" number which your Arduino board is attached to. Select 115200 as the Baud rate as this is the speed configured in "GRBL" firmware. Click "Open" button to start the communication for controlling this shield board.

Now, you are ready to control the XYZ stepper motor connected to shield board. Click X+ or X- for example, the stepper motor attached to X terminal will turn in forward or reverse direction. This will complete our initial setup for driving 3-axis stepper motor connected to this shield board with "GRBL" loaded to Arduino controller board using "Universal G-Code Sender" user interface

3.4.1 Gcode

Gcode is a industrial std. for machine control guidelines set. Gcode are ASCII content record, comprising of arrangement of charge code. Each order code is a rule a solitary in sequential order character took after by numeric parameter

Steps to run program-

• Connect marker or tool to the spindle.

• Power the machine.

• Connect with universal gcode sender.

• Setting the zero position with the help of X+X-/Y+Y- and Z+Z- until is touches work surface.

• Enter reset zero.

• Go to “file mode” tab.

• Select “browse”.

• Select file and open.

• Send the program.

• The machin will start moving accordingly

3.5 Proposed Design

The CAD model is prepared before fabricating the actual design. The design consist of various parts which is listed in part list table as shown.

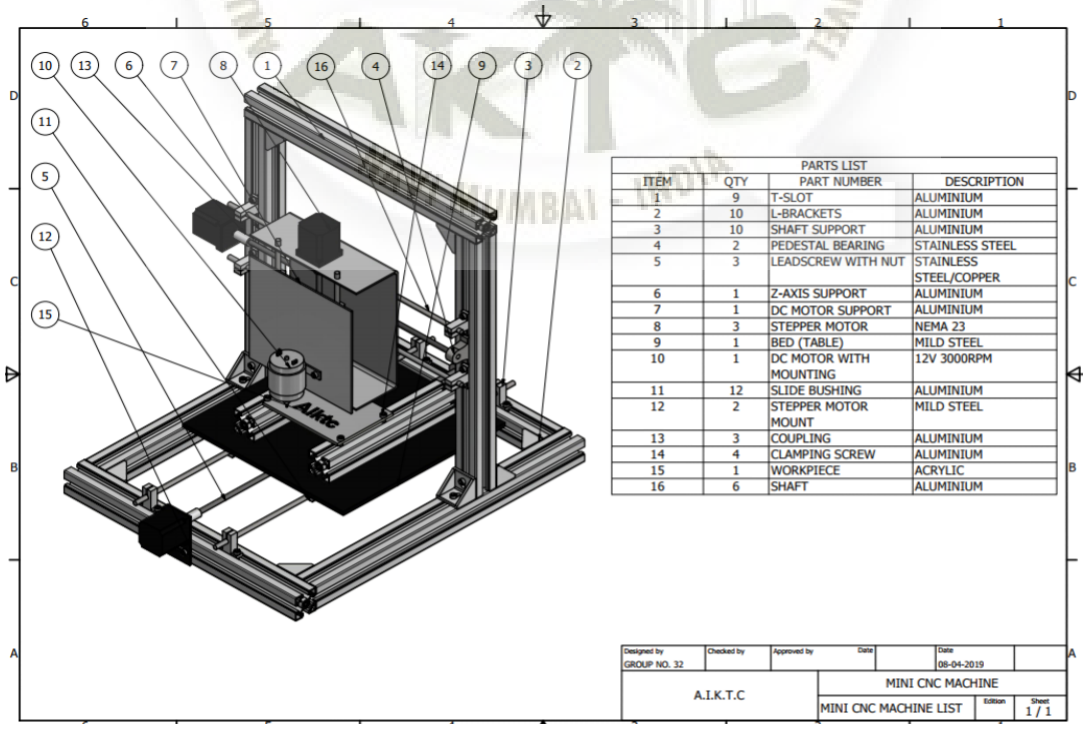

Figure 3.17: Structure Layout

3.5.1 Process

Geometry is designed using inkscape or inventable easel software then using extension in the inkscape the G-code file is generated. Arduino is connected to the computer using USB cable. The arduino is powered using SMPS. The CNC shield is connected to the arduino. The stepper motor driver is connected on to the CNC shield the drivers supplies pulses to the stepper motors then these motors rotates in a synchronized way. The entire work flow is shown in the flow chart.

Flow Chart.png

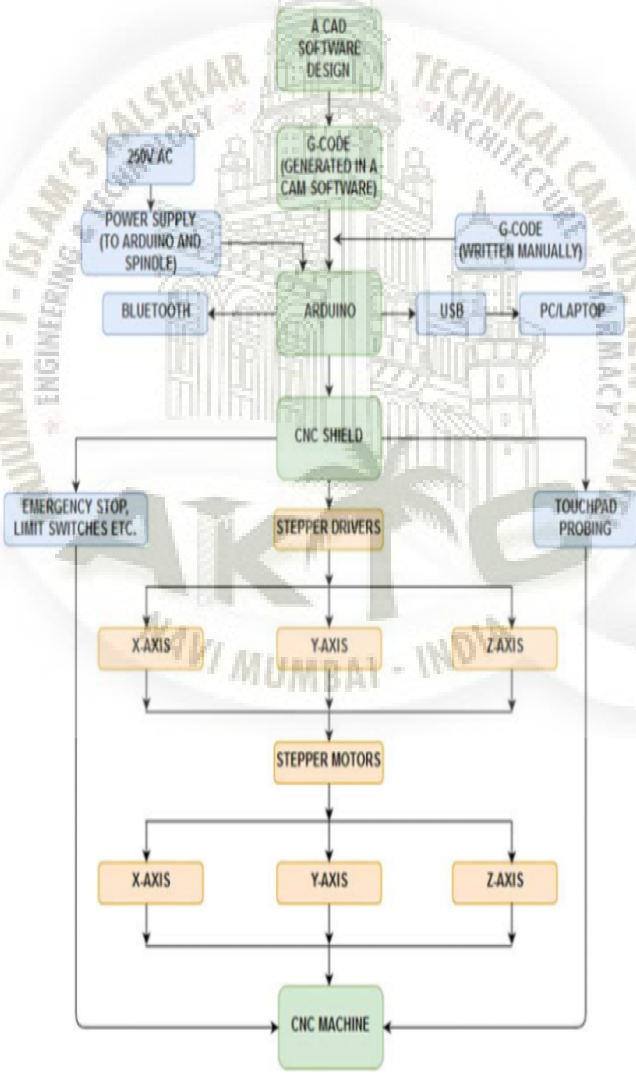

Figure 3.18: Process Flow Chart

Chapter 4

Fabrication

The assembly of the CNC machine was a rather challenging task. We are grateful to our guide who helped us and arranged work place required for the task guided us throughout the whole assembly.

4.1 Motor Housing

Motor housing is very basic design with plate that is supported on y axis box. There is a wooden block which moves up and down with the help of lead screw connected to the z axis stepper motor.:

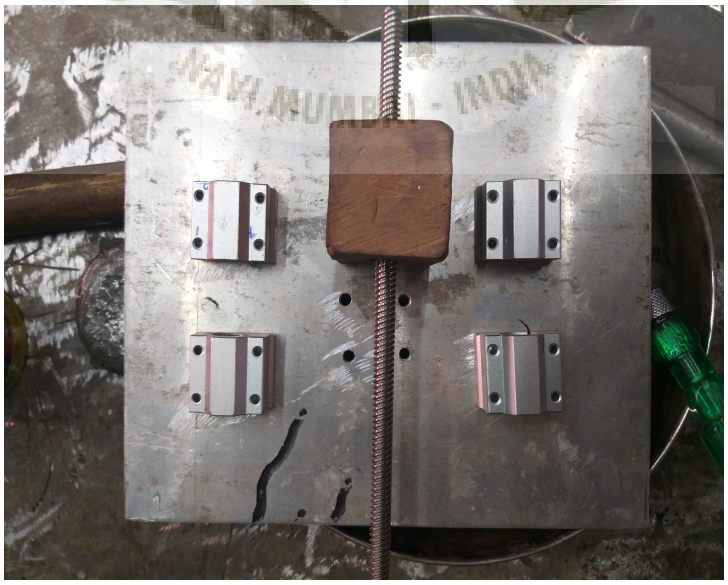

Figure 4.1: Z-axis plate

4.2 Y-axis slider

For y-axis movement of the machine we had made a C-shape structure of aluminium material. which slides in y-axis direction of the CNC machine.

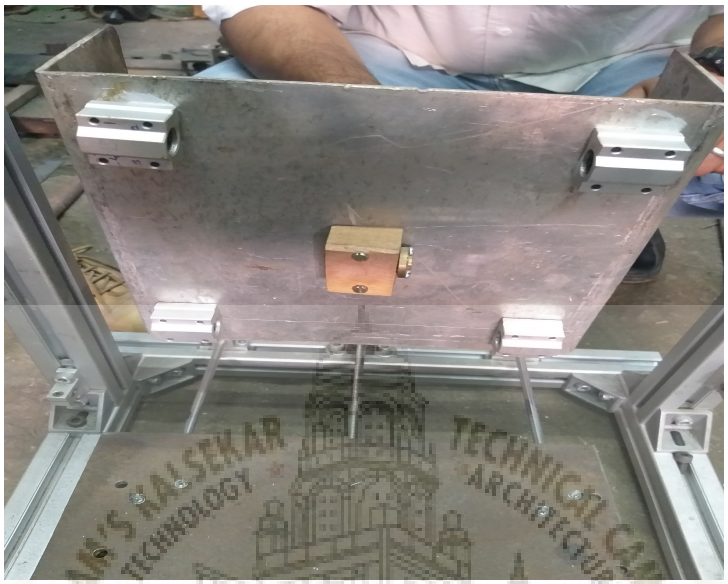

Figure 4.2: Y-axis slider

4.3 Bed And Clamping Device

For X-axis direction we had made a bed type structure which slides on X-axis clamping mount over it. Workpiece is fixed on the clamps on the bed column. It was bit complicated to hold the workpiece on to the bed so we decided to use part of the frame to clamp the workpiece.

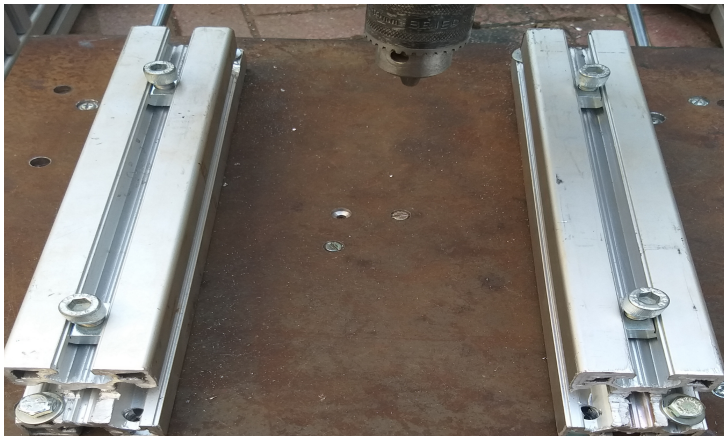

Figure 4.3: Bed Column

Chapter 5

Machine Setup

The machine works with the help of mechanical system , electronic system and program file creation.

5.1 Mechanical assembly

On the main structure of the machine we had mounted the bed which slides in X-axis with the help of lead screw which is connected to the stepper motor. The clamping device is mounted over the bed as shown. To allow spindle movement in Y-axis the C shape box is used which moves in Y-axis with the help of lead screw which is connected to the stepper motor. The spindle moves up and down with the help of plate on which spindle motor is connected. The different alignments are checked using vernier caliper and vernier depth gauge to ensure accurate movement of the components over the guide ways.

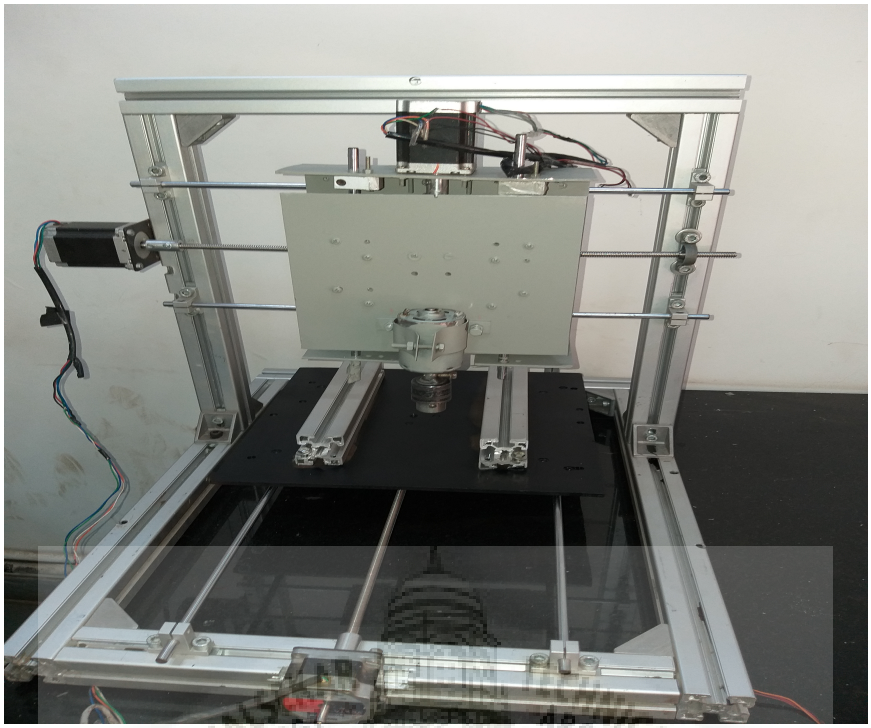

Figure 5.1: Mechanical Setup

5.2 Electronic system

Electronic system is a main function of our project this part includes GRBL, arduino, shield and driver assembly, GRBL take data from Gcode and interprets data and sends it to arduino. Then arduino passes these pulses to stepper driver and stepper driver amplifies these pulses, hence, motor runs.

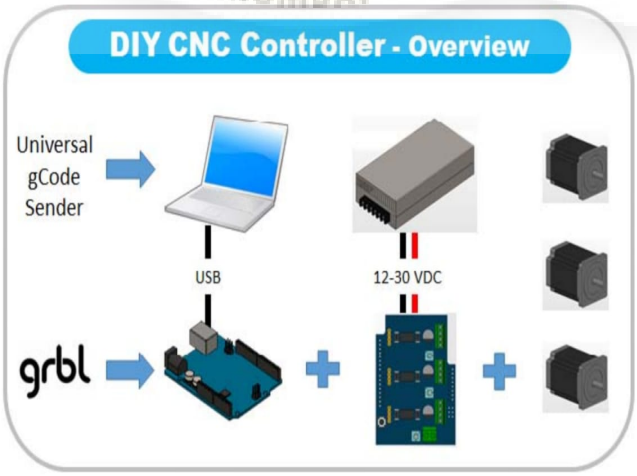

Figure 5.2: Electronic System

5.3 Arduino, CNC shield and driver assembly.

Here arduino uno is at the bottom also CNC shield is inserted above it. Finally stepper driver are inserted on shield.

CNC Shield V3.0 can be used as drive expansion board for engraving machine, 3D printer and other devices. There're 4 slots in the board for stepper motor drive modules, can drive 4 stepper motors, and each step stepper motor only need two IO port, that is to say, 6 IO ports can quite well to manage three stepper motor, it's very convenient to use. After insert Arduino CNC Shield V3.0 into Arduino UNO, and installed GRBL firmware then you can quickly DIY a CNC engraving machine.

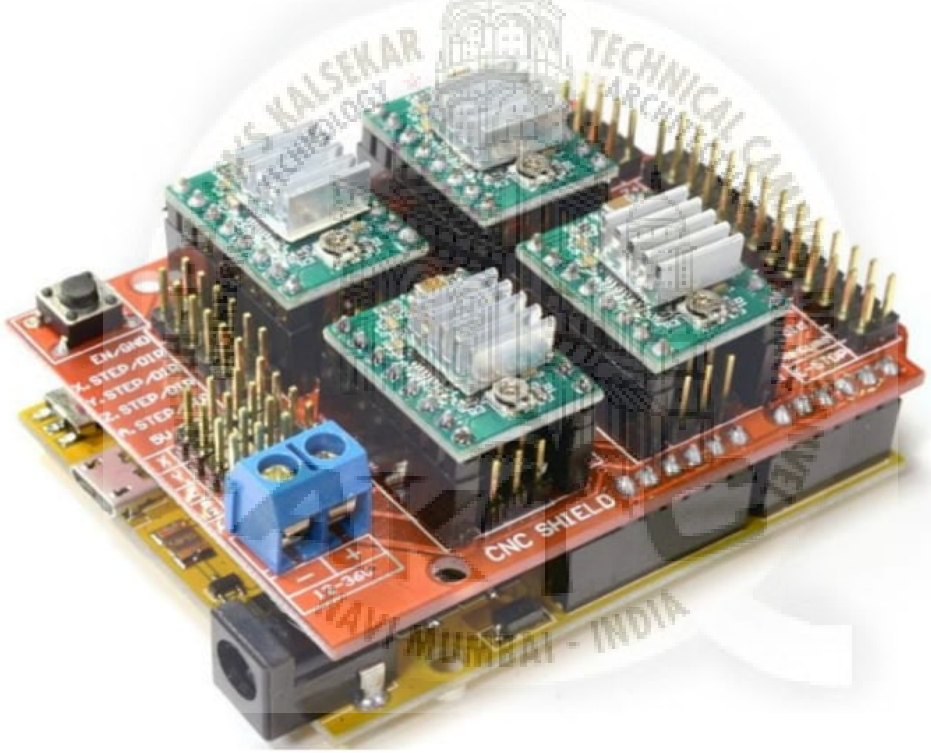

Figure 5.3: CNC shield

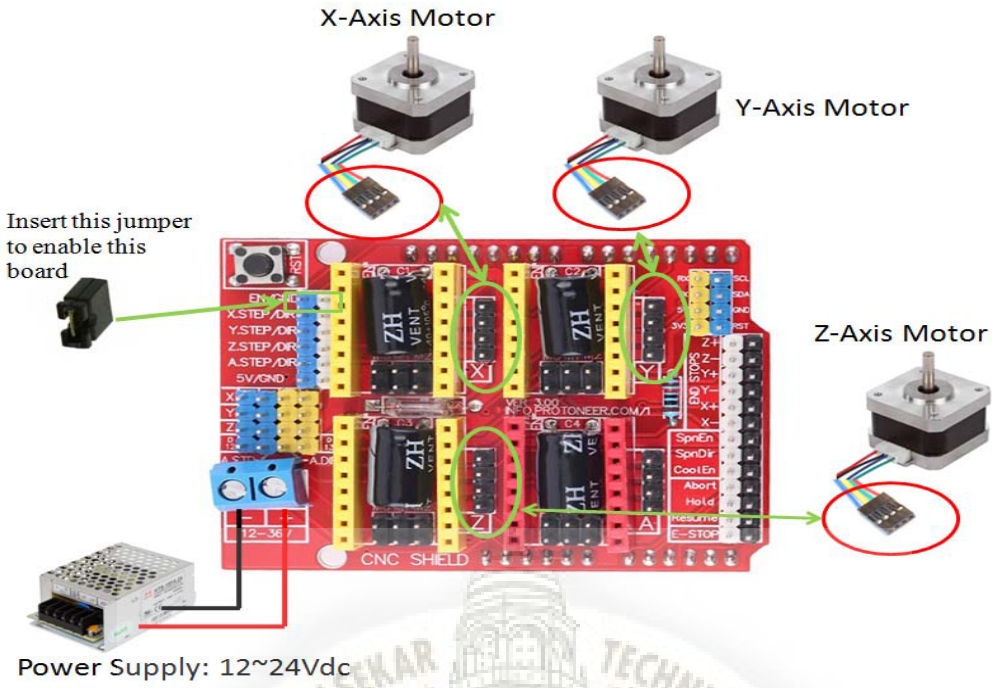

Figure 5.4: circuit diagram

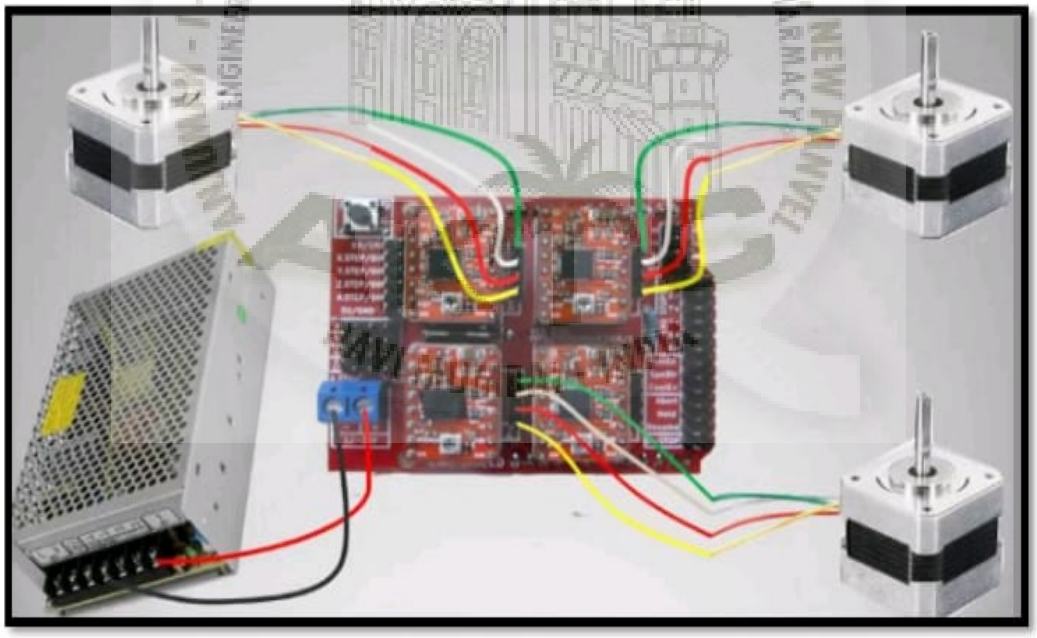

Figure 5.5: Driver Assembly

Chapter 6

Cost of the Project

Element	Servo Motor	SMPS	Hardware	Cutting tool	Chuck And Connector	Acrylic sheet
Description	DC motor 12V,3000rpm 15Kgfcm torque	24V 10A with 3 output ports	Arduino uno + CNC shield + Stepper motor driver A4988	End mills	It can hold upto 6mm end mill cutters	Transparent and white acrylic sheet
Cost And Address	1800 INR Thane	1000 INR Laminton road	400+200+ 150 INR Hi-Tech electronic Laminton road	350 INR	200+400 INR Shor bazzar	500+200 INR

Sr. No.	Product name	Cost (INR)	Quantity	Total cost(INR)
1	Servo motor	1800	1	1800
2	SMPS	1000	1	1000
3	Hardware	1650	1	1650
4	Chuck and connector	600	1	600
5	MS Bed	500	1	500
6	Aluminium box	2500	1	3000
7	Cutting tool	100	3	300
8	Acrylic sheet	700	1	700
9	Breakdown and maintenance	750	1	750
10	Black book	435	7	3045
11	Traveling			2150
		TOTAL COST		15495

Chapter 7

Programing

7.1 Programe of AIKTC

Gcode file:-

GCODE FILE:-

G21 G90

G1 Z20.000 F228.6

G0 X41.677 Y6.098

G1 Z-0.500 F150.0

G1 X38.374 Y6.539 F150.0

G1 X36.908 Y6.868 F150.0

G1 X35.564 Y7.268 F150.0

G1 X34.345 Y7.740 F150.0

G1 X33.250 Y8.283 F150.0

G1 X32.277 Y8.899 F150.0

G1 X31.428 Y9.586 F150.0

G1 X30.152 Y11.011 F150.0

G1 X29.239 Y12.599 F150.0

G1 X28.919 Y13.456 F150.0

G1 X28.552 Y15.291 F150.0

G1 X28.504 Y16.271 F150.0

G1 X28.603 Y17.380 F150.0

G1 X28.833 Y18.433 F150.0

G1 X29.196 Y19.431 F150.0

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G1 X30.318 Y21.264 F150.0

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G1 X32.991 Y23.602 F150.0

G1 X34.124 Y24.255 F150.0

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G1 X38.046 Y25.696 F150.0

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G1 X50.940 Y25.716 F150.0

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G1 X61.567 Y13.810 F150.0

G1 X61.716 Y14.956 F150.0

G1 X61.764 Y16.136 F150.0

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G1 X58.336 Y41.573 F150.0

G1 X57.348 Y41.269 F150.0

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G1 X61.964 Y40.875 F150.0

G21 G90

G1 Z20.000 F150.0

G0 X0.000 Y0.000

G4 P0.1

Chapter 8

Conclusion

The machine was fabricated successfully as during testing it performed well and most of commonly available software were supported. all the misalignment of a machine were eliminated. The machining parameters were optimized using optimum feed rate of 150mm/min and 0.2mm depth per cut. A confirmatory test was conducted to analyze the engraved part

Chapter 9

Future Scope

CNC machines are extremely versatile these days for for having capacity of wide range of function including cutting, drilling, routing and milling.

- Versatile uses

  Not very long ago CNC machine were used only in the manufacturing industry of large scale project. However now scenario change and even small to medium size business and small hobby shop are using CNC machine

- Increment of usage

  CNC machine are becoming more and more powerful technology advances and software development. Moreover they are also becoming easier to operate and handle to new user with there advances

- 3D printer

  It is preferable to build CNC machines with DC or AC servomotors and encoder feedback using PC based motion controllers. It is planned to implement the multi axis about 4 to 6 axis CNC routers. The implementations of 3D printing(Rapid prototyping) yechnology to the same hardware abstract is ongoing plan for printing 3D models

References

[1] *"Metrological Control of Selected Surface Types of A Mechanical Part By Using on-Machine Measurement System"Michal OMAMIK, Ivan BARANEK [2011]*

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[3] "Low Cost Computer Numeric Controller Using Open Source Software and Hardware". Muhammad Yaqoob Javed, Sayyed Tahir Hussain Rizvi , M. Amer Saeed, Kamran Abid, Osama Bin Naeem, Adeel Ahmad, Kamal Shahid[2015]

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[5] "Design and analusis of small scale cost effective cnc milling machine". WEI QIN [2013]

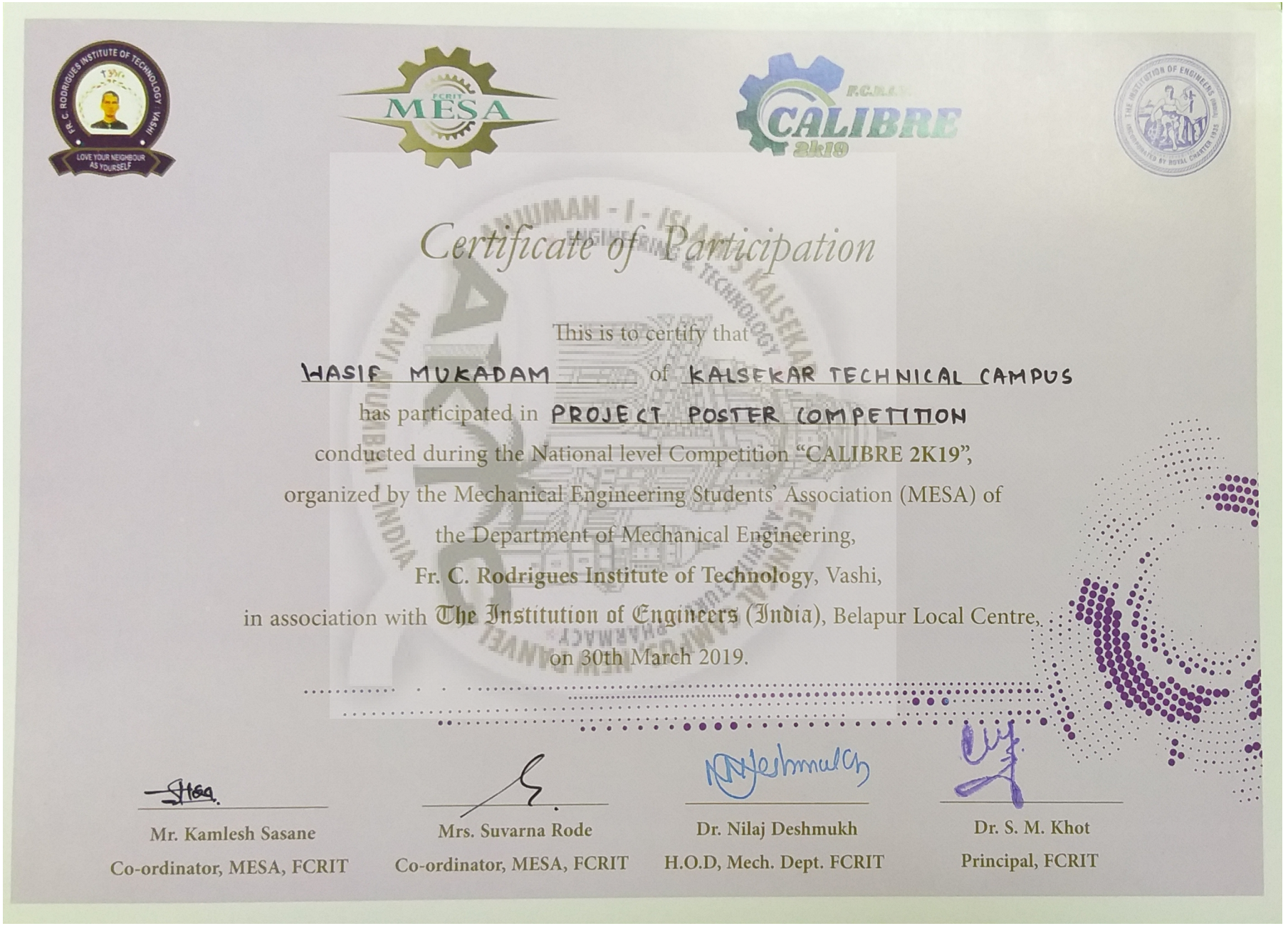
Achievements

1. **PUBLICATIONS**

   (a) *Design of Mini CNC using Arduino UNO*; MUKADAM WASIF , QURESHI MOHD SIDDIQUE , SIDDIQUI SAKIB , TUNGEKAR MOHD RAMEEZ , International Research Journal of Engineering and Technology(IRJET), April 2019 of published (https://www.irjet.net)

2. **PROJECT COMPETITION**

   (a) *DESIGN OF MINI CNC*;
   WASIF MUKADAM
   MOHD SIDDIQUE QURESHI
   SAKIB SIDDIQUI
   MOHD RAMEEZ TUNGEKAR
   CALIBRE 2k19 , 30th march 2019 (Fr.C.Rodrigues Institute of Technology, Vashi)



Certificate of Participation

This is to certify that

WASIF MUKADAM of KALSEKAR TECHNICAL CAMPUS

has participated in PROJECT POSTER COMPETITION

conducted during the National level Competition "CALIBRE 2K19",

organized by the Mechanical Engineering Students' Association (MESA) of

the Department of Mechanical Engineering,

Fr. C. Rodrigues Institute of Technology, Vashi,

in association with The Institution of Engineers (India), Belapur Local Centre,

on 30th March 2019.

Mr. Kamlesh Sasane	Mrs. Suvarna Rode	Dr. Nilaj Deshmukh	Dr. S. M. Khot
Co-ordinator, MESA, FCRIT	Co-ordinator, MESA, FCRIT	H.O.D, Mech. Dept. FCRIT	Principal, FCRIT

Certificate of Participation

This is to certify that

QURESHI MOHD SIDDIQUE of KAISEKAR TECHNICAL CAMPUS

has participated in PROJECT POSTER COMPETITION

conducted during the National level Competition "CALIBRE 2K19",

organized by the Mechanical Engineering Students' Association (MESA) of

the Department of Mechanical Engineering,

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Mr. Kamlesh Sasane	Mrs. Suvarna Rode	Dr. Nilaj Deshmukh	Dr. S. M. Khot
Co-ordinator, MESA, FCRIT	Co-ordinator, MESA, FCRIT	H.O.D, Mech. Dept. FCRIT	Principal, FCRIT

Certificate of Participation

This is to certify that

SIDDIQUI SAKIB of KALSEKAR TECHNICAL CAMPUS

has participated in PROJECT POSTER COMPETITION

conducted during the National level Competition "CALIBRE 2K19",

organized by the Mechanical Engineering Students' Association (MESA) of

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on 30th March 2019.

Mr. Kamlesh Sasane	Mrs. Suvarna Rode	Dr. Nilaj Deshmukh	Dr. S. M. Khot
Co-ordinator, MESA, FCRIT	Co-ordinator, MESA, FCRIT	H.O.D, Mech. Dept. FCRIT	Principal, FCRIT

Certificate of Participation

This is to certify that

TUNGEKAR MOHD RAMEEZ of KALSEKAR TECHNICAL CAMPUS

has participated in PROJECT POSTER COMPETITION

conducted during the National level Competition "CALIBRE 2K19",

organized by the Mechanical Engineering Students' Association (MESA) of

the Department of Mechanical Engineering,

Fr. C. Rodrigues Institute of Technology, Vashi,

in association with The Institution of Engineers (India), Belapur Local Centre,

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CALIBRE 2K19
MESA
Certificate of Participation
This is to certify that QURESHI MOHD SIDDIQUE of KALSEKAR TECHNICAL CAMPUS
has participated in PROJECT POSTER COMPETITION
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organized by the Mechanical Engineering Students' Association (MESA) of
the Department of Mechanical Engineering,
Fr. C. Rodrigues Institute of Technology, Vashi,
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on 30th March 2019.
Mr. Kamlesh Sasane Co-ordinator, MESA, FCRIT
Mrs. Suvarna Rode Co-ordinator, MESA, FCRIT
Dr. Nilaj Deshmukh H.O.D, Mech. Dept. FCRIT
Dr. S. M. Khot Principal, FCRIT


CALIBRE 2K19
MESA
Certificate of Participation
This is to certify that WASIF MUKADAM of KALSEKAR TECHNICAL CAMPUS
has participated in PROJECT POSTER COMPETITION
conducted during the National level Competition "CALIBRE 2K19",
organized by the Mechanical Engineering Students' Association (MESA) of
the Department of Mechanical Engineering,
Fr. C. Rodrigues Institute of Technology, Vashi,
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Mrs. Suvarna Rode Co-ordinator, MESA, FCRIT
Dr. Nilaj Deshmukh H.O.D, Mech. Dept. FCRIT
Dr. S. M. Khot Principal, FCRIT


CALIBRE 2K19
MESA
Certificate of Participation
This is to certify that SIDDIQUI SAKIB of KALSEKAR TECHNICAL CAMPUS
has participated in PROJECT POSTER COMPETITION
conducted during the National level Competition "CALIBRE 2K19",
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