

WOODEN CARVING MACHINE USING BLUETOOTH TECHNOLOGY

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Abstract— This paper deals with the design of a three axis and operates in wood carving machine. The invention of the X-Y-Z plotter is to record or plot three dimensional data on a cartesian co-ordinate system. The study emphasizes the fabrication of X-Y-Z plotter by using mechanism from printers and microcontroller system (Arduino) to connect the movement of X-Y-Z axis. The wooden carving machine using Bluetooth can draw with the application of X-Y-Z plot and further made with Laser cutting machine. The X-Y-Z plot provides flexibility to draw the design according to available size or space.

Keywords: Computer Numerical Control(CNC), Arduino Uno, Arduino compactable.

I. INTRODUCTION

Wood carving involves various techniques of removing wood from a raw material and finishing it into a carved object. This involves various traditional carving tools such as a chisel, gouge, knife, and Hammers. Wood carving system is used to engrave the wooden particles. It is difficult to carve complex profile manually, so woodcarving system is introduced. Wood carving system is designed at low cost so that all the carpenters can afford it. CNC's had made revolutionary changes within the manufacturing sector in before days achieving productivity up to the desired level was not possibilities due to lots of drawbacks like complication of shapes and sizes, lack of skilled labours, lots of wastages and scraps due to unexpected mistakes and low quality levels and accuracy. By using CNC this all draw backs can be overcome and this was our small contribution to show the performance of CNC. It uses three axis to create geometry. The supporting column guides the tool in a linear direction. The system is operated by using stepper motors integrated with a Arduino. It differs from the traditional wood carving system as it uses string to drive the tool. The required drawing or pattern is drawn with by using Text to G-Code App. G codes are generated according to the pattern by using this app. Arduino UNO is an open-source physical computing platform predicated on a simple input/output board and a development environment that implements the Processing/Wiring language. The board based on ATmega328 microcontroller. It contains 13 input/output pins, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button (Arduino). Thus, it is needed for the

project to control the movement of the 3D printer axis and the extruder through stepper motors. To power the system a 12V 10A power supply is used since the recommended input voltages between 7-12V. The board may be unstable with low input voltage and could be damaged with high input (Arduino). Therefore, using the precise power supply and accurate connections are required to guarantee preferable outcomes.

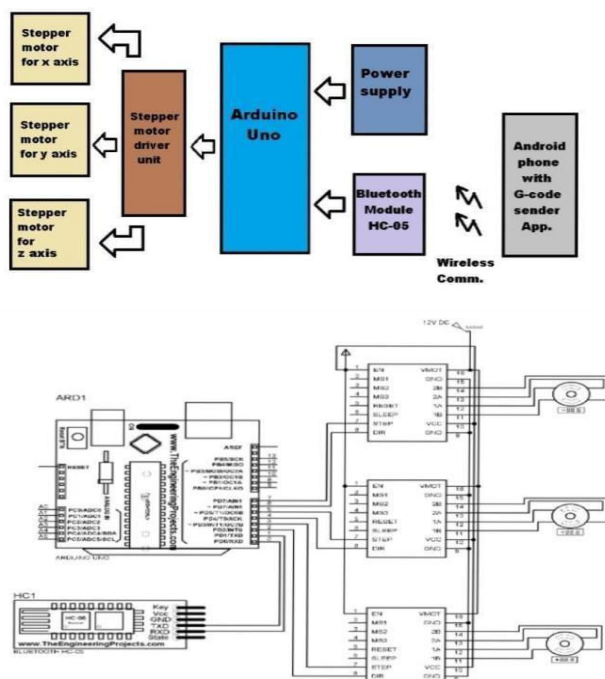
II. LITERATURE REVIEW

In 2017 R. Ginting, S. Hadiyoso and S. Aulia presented paper on "Implementation 3-Axis CNC Router for Small Scale Industry". This paper discusses the design and realization of complex 3-axis CNC machines based on microcontroller which combined with spindle drill. This machine can be used for Cutting, Engraving and Marking on wood, acrylic and PCB objects. Design picture that have been made on the PC sent to the microcontroller using serial communication then CNC perform execution on object according to point coordinates. Drill spindles will create patterns on objects automatically according to the design drawings. After testing, the CNC machine can be used for cutting, engraving and marking on wood, acrylic and PCB to 2D or 3D objects with 98.5% of carving accuracy and 100% of depth accuracy. This machine works on a object with maximum size of 20 x 20 cm. They conclude in this paper The CNC router machine was successfully built using ATmega328p and IC4988 microcontrollers combined with stepper motors, with 20x20cm cross-sectional area and using 500 Watt Spindle Air Cooled drill type. The CNC machine can be used for cutting, engraving and marking on wood to form 2D or 3D objects with 98.5% carving accuracy and 100% depth accuracy. The process of synchronizing the 3 stepper motors was controlled using GRBL library and Universal Gcode Sender Software.

In 2017 Dinesh Awari¹ Manoj Bhamare² Akshay Ghanwat³ Ketan Jadhav⁴ Jagdish Chahande⁵ presented a paper on "Methodology for Selecting Components for Fabricating CNC Milling Machine for Small Scale Industry". In this Paper they discussed increase in the rapid growth of Technology significantly increased the usage and utilization of CNC systems in industries but at considerable expensive. The idea on fabrication of CNC Milling Machine came forward to reduce the cost and complexity in CNC systems. This paper discusses the development of a low cost CNC milling machine components which is capable of 3-axis simultaneous interpolated operation. The lower cost is achieved by incorporating the features of a standard PC interface with microcontroller based CNC system in an Arduino based embedded system.

III. BASIC SCHEMATIC

The primary idea of this system is to completely automate means we use Bluetooth technology. In this project we use three main Play store application. First is the G-Code2GRBL and second is the text to G-code and third is the Inkscape. We use Code2GRBL this app because Bluetooth connection is very important in our project. We connect Bluetooth module with mobile Bluetooth by using code2GRBL app. Our Bluetooth module name is HC-05. Second app is Text To Gcode this app convert any text or letters in G-code format so we use this app and third app is Inkscape this for Any picture to G-code format. We required G-Code so this app will use. This App can generate G-code and send this G-code by using Bluetooth to the Arduino. Arduino will give the command to stepper motor. X plotter, Y plotter and Z plotter is connected to Stepper motor. When stepper motor is receive command from Arduino then the X, Y plotter moving as per given instruction in G-code and Z plotter is ready to draw letters or sentence or picture.



IV. METHODOLOGY

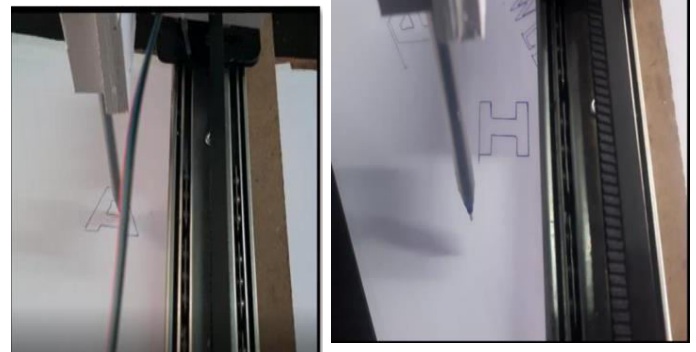
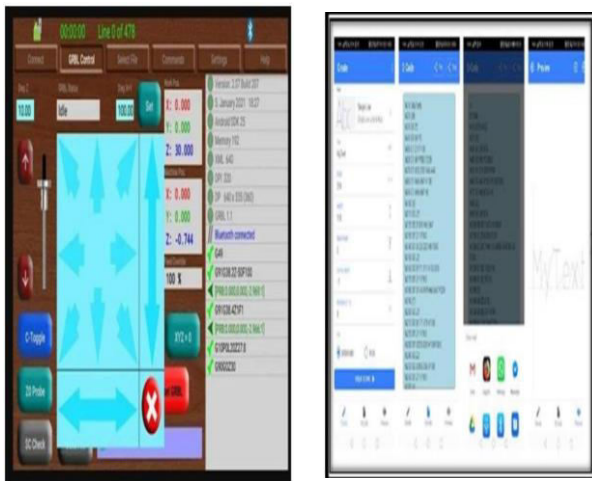
The aim of this project is to design a cost effective, user friendly and highly accurate router. We will use some free but working software and hardware and technical support from various sources for achieving our goal. We also need Arduino, stepper motor, drivers, power supply. The Figure 1 below describes the outlines how all of these items work together. The G code is interfaced with Arduino CNC based controller by GRBL module which is used to convert the code in convenient controller code that is serial to USB converter. Hence it acts like interfacing module between PC to Controller. This code is further passed to stepper motor by easy drivers which converts the code and as per instructions the stepper motor moves. We need three axis X, Y, Z which operates as follows: X stepper motor move left and right Y stepper motor moves front and back and Z stepper motor moves up and down as per given dimensions. These axis's will move on the first step in the operation of CNC machine was calibrating the tool. It was aimed to know whether the stepper motor and any other system were working according to the program that has been configured followed by setting the starting position of the spindle drill on the CNC machine. Standard wooden carving machine using Bluetooth which has control only of the "y" axis, the "x" axis and "z" axis being continuously fed to provide a plot of some variable with time to overcome this drawback X-Y-Z plotter are used which has control over the axis. Inkjet and laser printers use a very fine matrix of dots to form images, such that while a line may appear continuous to the naked eye, it in fact is a discrete set of points instead our machine draws a continuous line, much like a pen on paper. Manual wooden carving machine Bluetooth is probably incompatible in precision and accuracy. These are more prone to mistakes. Even though a skilled person may be precise and accurate in his drawing, and writing. Stepper motor, timing belt, timing pulley are used for positioning and to provide better accuracy. G codes insist the stepper motor rotate or stop the process whenever needed. Making a small machine brings a flexibility to do work. This is a low cost project as compared to other CNC product. The machine is designed with a very simple construction scheme and can be carried anywhere without much effort. The algorithm used is simple. The pen can be replaced with a pinhead or laser.

V. DESIGN AND IMPLEMENTATION

Bluetooth is connected two modules then first is the G-Code 2GRBL and second is the text to G-code and third is the Inkscape. We use Code 2GRBL and second is the text to G-code and third is the Inkscape. We use Code 2GRBL this app because bluetooth connection is very important in our project. We connect Bluetooth module with mobile Bluetooth by using code 2GRBL app. Our Bluetooth module name is HC-05. Second app is Text To G-code this app convert any text or letters in G-code format so we use this app and third app is Inkscape this for any picture to G-code format. We required G-

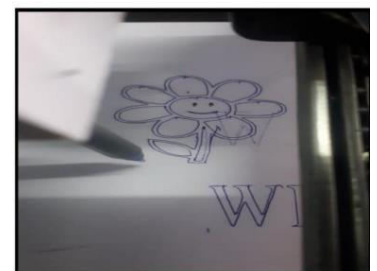
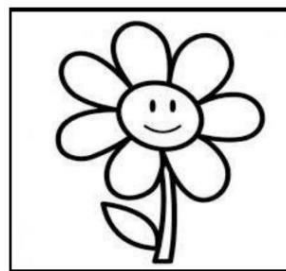
Code so this app will use. This app can generate G-code and send this G-code by using Bluetooth module. We have done the programming for Arduino and tested the project. We have tested all the components and modules and assembled it on one board. First X axis sliding assembly is tested by giving signal to X axis stepper motor. Same for Y axis and Z axis. Sample program for drawing circle is tested free Android application from play store is used to send G-code. Android phone is connected to system using bluetooth.

shown any type of alphabet and any type of design. Mainly letters of the English alphabet are supported. Manual wooden carving machine Bluetooth is probably incompatible in precision and accuracy.



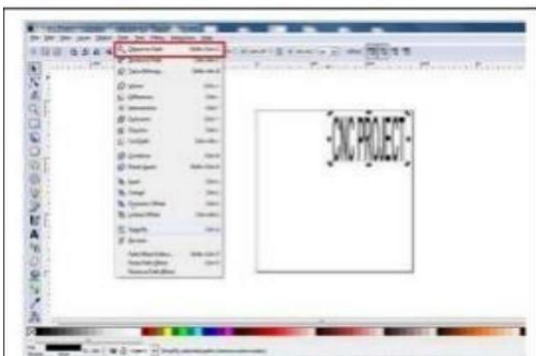
OUTPUT OF LETTER A

OUTPUT OF LETTER H



BEFORE DESIGN

INKSCAPE APP DESIGN



VI. RESULTS

In this we used three app GRBL, Text To CNC GRBL app. Using this we draw the H letter, A letter, and we easily design to any type of design properly. Inkscape is used to design the plotted diagram or text. The output of project is

VII. FUTURE WORK

The pen of the machine can be replaced by a laser to make it work like a laser engraving or cutting machine. Engraving machine can be used on wood. The pen can also be replaced with a powerful drill so that it can be used for both milling and drilling purposes. The Pen with a 3-D pen to make it a 3-D printer which can print objects with dimensions. By extrapolation of the axes, the working area of the machine can be extended keeping the algorithm unaltered

VIII. CONCLUSION

In the dissertation work we have implemented a low cost three-axis mini CNC plotter. The existing CNC machines are of high cost, difficult to maintain and requires highly skilled operators. Our CNC plotter trying to overcome these problems. It is of low cost and easy to control and there is no need of highly

skilled operators. It can be used for long hours at a stretch which is not possible in existing ones. It is hoped to extend this work for future development. A small scale three axis CNC milling machine is designed and analyzed under very limited budget.

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