

## Development of Cost Effective CNC Carving Router - Review

\*Suhas Magdum<sup>1</sup>, Akshay Kurle<sup>2</sup>, Prajay Kharat<sup>3</sup>, Ismail Mallick<sup>4</sup>,  
Pravin Bamane<sup>5</sup>

<sup>1</sup>(Professor, Department of Mechanical Engineering, SRTTC-FOE, Khamshet, Pune, India)

<sup>2,3,4,5</sup>(UG Students Department of Mechanical Engineering, SRTTC-FOE, Khamshet, Pune, India)

Corresponding Author: Suhas Magdum<sup>1</sup>

---

**Abstract:** Computer Numerical Control (CNC) Carving Router machines have been using around for a while however, their popularity is rapidly increasing in all areas. This is due to the impressive capacities and performance of these machines. Because of the ability to produce a complicated or difficult size and shape that would take the skilled worker much longer time, the commercial CNC's which are currently using in various industries are bulky, large in size and so much expensive to afford by small scale industries and enthusiast people at home workshop. Also due to larger size it takes more floor space which is not suitable for SSI's and hobbyist's. To reduce the size of machine with computer ability, mini CNC which is also known as CNC Router is introduced. In the past few years, there have been an increasing number of enthusiast peoples and businesses invested in a carving router system. In this paper, we are going to discuss the development of low cost CNC Carving Router machine.

**Keywords:** CNC Carving Router, Arduino Microcontroller, Universal G code generator, Stepper and Spindle motor

---

Date of Submission: 15-01-2018

Date of acceptance: 23-01-2018

---

### I. Introduction

Computer Numerical Control (CNC) is one inside which the capacities and movements of a machine device are controlled by methods for a readied program containing coded numerical information. CNC can control the movements of the work or instrument, the information parameters, for example, cut, feed, speed, and the capacities, for example, turning shaft on/off, turning coolant on/off. The most widely recognized use of CNC, and the one important to us, is the name given to gadgets that, under computer control can cut, draw, process, etch, assemble, turn and generally perform fabricating operations on different materials.[2] Ordinarily, a CNC machine can move a cutting or 3D printing head in 2 to 5 axis, implying that it can position that device head at an exact point in or on the material to make the cut or operation wanted by then. By moving the head through different points.

#### 1.1. What Is A Cnc Carving Router?

In short, CNC technology isn't terribly difficult. It's a tool controlled by a computer. It solely becomes additional subtle once considering, however the Computer controls the tool. A CNC Carving Router is a machine that carves out objects in 3 dimensions from a solid block of material. CNC carving router square measure unremarkably employed in trade to provide fewer components, and square measure more and more utilized by serious hobbyists, particularly woodworkers, to carve creations out of materials like wood, aluminum, steel, plastic and foam. A CNC carving router is incredibly similar in construct to a CNC shaper. CNC routers square measure typically on the market in 3-axis and 5-axis CNC formats. Coordinates square measure uploaded into the router from a separate program. CNC router owners should have 2 code applications like one program to create styles (CAD) and another to translate those styles into a program of directions for the machine (CAM i.e. universal G-code generator).[4] Like CNC edge machines, CNC Carving routers are often controlled directly by manual programming, however, CAD/CAM discloses broad prospects for contouring errors, dashing up the programming method. CNC carving routers are often terribly helpful once completing identical, repetitive jobs. It will cut back waste, frequency of errors, and also the time the finished product takes to urge to plug. A CNC router offers additional flexibility in the method. Important advantages of CNC router is flexibility, waste reduction, less errors. Areas of applications are assemblage of variety of things like sign boards, frames of wood, musical instruments, door carving, different decorations like exterior as well as interior etc.

## **II. Literature Survey**

2.1. A Low-Cost Build-Your-Own Three Axis Cnc Mill Prototype. By Sundar Pandian and S. Raj Pandian. (ISSN 2321-5747, Volume-2, Issue-1, 2014). The main motto of both of the authors is to build a Low cost B.Y.O 3-Axis CNC milling prototype to improve student learning process in the area of CAD, CAM and CAE, because in the most of college laboratories limited quantity of CNC mills and CNC lathes are available or accessible to the students, that is because of high costing of the machine. So to solve this issue author build their own prototype of sizing 178\*178\*50 mm in which they used 3x NEMA 17 bipolar stepper motor, Lead screw of sizing M8\*1.28 (3 Nos.), as well as 24-36V.D.C. Spindle motor whose RPM is between 5000-8000 and the main microcontroller i.e. Arduino microcontroller to control motion of machine using these components they build a prototype, they also mentioned that they build it in only 1/20<sup>th</sup> cost of existing machine cost.2.2. Methodology for Selecting Components for Fabricating CNC Milling Machine for Small Scale Industry.By Dinesh Awari, Manoj Bhamare, Akshay Ghanwat, Ketan Jadhav, Jagdish Chahande.(IJSRD - International Journal for Scientific Research & Development, Vol. 4, Issue 11, 2017, ISSN 2321-0613). In this authors studied the method for selecting components for developing CNC Milling Machine which is going to be used in Small Scale Industries. In which they used lead screw, simple ball bearing, and simple linear rods for moment of head or gantry system and linear ball bearing for rods, NEMA 23 stepper motor with 19Kg-cm torque to reduce cost of system.

2.3. Design And Analysis Of Base Structure Of Cnc Router. By Pratik Bhambhatt, Mr.Piyush Surani, Mr.Dhaval P Patel, Amarishkumar J.Patel, Sunilkumar N.Chaudhari. (JETIR (ISSN 2349-5162) April 2017, Volume 4, Issue 04). In this paper they submitted the structural analysis of Base Structure of CNC Router using Finite Element Analysis Method. The steps they included for analysis are as follows-

1. Preparation of assembly using solid works.
2. Geometry Check for meshing.
3. Selection of material per component.
4. Preparation of meshes using Solid mesh.
5. Defining Boundary condition.
6. Applying forces.

Using this method they designed the product and after that analyzed it by applying forces on the body as a result, they get values of Von miss stress, strain, displacements and deflection on base for given optimized structure.3-Axis CNC Router Modifiable to 3D Printer. By Dipayan Dey, Souvik Mondal, Arijit Kumar Barik. (IJIRSET, Vol. 5, Issue 9, September 2016(ISSN 2319-8753)). This paper is based upon a fabrication of CNC router which is compatible to expel as a 3D printer and also to reduce costs to make them affordable in less size with less amount of power consumption with user friendly interface. Where they used Threaded rod and nut, simple ball bearing, NEMA17 stepper motor, which are cheaper than other standard materials.

2.5. Fabrication of Low Cost 3-Axis Cnc Router. By Dr.B.Jayachandraiah, O.Vamsi Krishna, P.Abdullah Khan, R.Ananda Reddy. (IJESI, Volume 3 Issue 6, June 2014, PP.01-10(ISSN 2319 – 6734)). Idea of these authors is to fabricate CNC Router in low cost which is capable to 3-Axis simultaneous interpolation operation. They achieved lower cost by incorporating the standard PC interface with an Arduino based embedded system. Their system also features an offline G-Code parser and then interpreted to microcontroller using USB and smaller size of machine which also helps to reduce cost.

## **III. Conclusion**

Considering the above efforts by researchers, the aim of these paper is to give the effective solution to the small-scale industries and hobbyist people, who are really looking for the quality and productivity using the CNC router for different materials including wood. Hence the aim of achieving the dual goal in single stroke is performed on CNC router machine used for manufacturing of precise part and to reduce cost of machine without any imperfection in accuracy or precision of machine.

## **References**

- [1]. A Low-Cost Build-Your-Own Three Axis Cnc Mill Prototype. By Sundar Pandian And S. Raj Pandian. International Journal On Mechanical Engineering And Robotics, Volume-2, Issue-1, 2014.
- [2]. Methodology For Selecting Components For Fabricating Cnc Milling Machine For Small Scale Industry.By Dinesh Awari, Manoj Bhamare, Akshay Ghanwat, Ketan Jadhav, Jagdish Chahande.Ijsrd-International Journal For Scientific Research & Development, Vol. 4, Issue 11, 2017.
- [3]. Design And Analysis Of Base Structure Of Cnc Router. By Pratik Bhambhatt, Mr.Piyush Surani, Mr.Dhaval P Patel, Amarishkumar J.Patel, Sunilkumar N.Chaudhari.Jetir, Volume 4, Issue 04 April 2017.
- [4]. 3-Axis Cnc Router Modifiable To 3d Printer. By Dipayan Dey, Souvik Mondal, Arijit Kumar Barik. Ijirset, Vol. 5, Issue 9, September 2016.

- [5]. Fabrication Of Low Cost 3-Axis Cnc Router. By Dr.B.Jayachandraiah, O.Vamsi Krishna, P.Abdullah Khan, R.Ananda Reddy.Ijesi, Volume 3 Issue 6, June 2014.
- [6]. Elements Of Workshop Technology Vol.Ii Machine Tools, By S. K. Hajra Choudhary, A. K. Hajra Choudhary And Nirjhar Roy, Pg No-571, Media Promoters And Publishers Pvt. Ltd.
- [7]. R. K. Jain , Production Technology, Khanna Publishers , Pg No-975.

International Journal of Engineering Science Invention (IJESI) is UGC approved Journal with  
Sl. No. 3822, Journal no. 43302.

Suhas Magdum."Development of Cost Effective CNC Carving Router - Review." International  
Journal of Engineering Science Invention(IJESI), vol. 7, no. 1, 2018, pp. 96-98.