# Mechanisms of a 3-axis Pantrouter CNC machine design and experiment

[1]SUMIT KUMAR, [2]DR. MANISH GANGIL

*M.Tech.Scholar*[1], *Professor*[2]

*Department of Mechanical Engineering, RKDF, University Bhopal, (M.P.) India.*
[1]summitkumar007@gmail.com, [2]rkdfbhojpal@gmail.com,

* Corresponding Author: Sumit Kumar

**Abstract:**

CNC technology has become a requirement in the industrial world without complying with educational, pedagogical and private ratings. Manufacturers of this type of machine are trying to conform with the marketing requirements in terms of quality, price and quantity, so the CNC machine can meet the requirements and has acquired a leading position. The study and design of the three-axis CNC machine are based on the Fusion 360 software for the design and PROTEUS software for simulation to perfect our device.

## 1. INTRODUCTION

If a line drawing is traced thru the primary element, an equal, enlarged or miniaturized replica can be drawn by using a pen consistent to the alternative. Hence by means of making an parallelogram like similar mechanism via fixing on a slider to provide slider mechanism for transferring the device to x axis continuously and equal is the for y and z axis respectively. This mechanism is attached with an motor of excessive power of 30000 rpm which offers power for similarly device operations and consequently it may be used therefore ,higher and faster operations then earlier than. Therefore this venture is very well have a completely defined multipurpose use for shaping, lowering and trimming and plenty of others.

The design of devices at the level of research laboratories continues to progress. Each time, prototypes from different disciplines have been continuously designed and developed (Golnabi & Asadpour, 2007; Li,et al., 2019; Khechekhouche,et al., 2019 ). CNC (Computer Numerical Control) machines have not been shielded from this development; these machines can automatically perform many tasks in various fields of activity: engraving and drilling of printed circuits, the

production of small mechanical parts, the tracing and cutting of the various components of the scale models, and much more (Ye, et al., 2018). A growing number of model builders, electronics engineers and other enthusiasts are using digitally controlled machine tools. These small machines, most often milling machines, provide an almost professional quality result. But these machines are often very expensive to purchase, so many people design and build them themselves. Most CNC machines have three axes, but there are models with four or even five axes. Three-axis models are often sufficient in the majority of applications. Today, computer numerical control (CNC) machines, allow great flexibility in industrial production, during recent years, the control of electrical machines, has undergone significant progress, thanks to the technological revolution in electronics and computer science (Keefe & Jeffrey, 1991). A group of researchers used a servo system consisting of a monitor, a multi-axis motion control board, a servo motor, a servo motor and the load was installed. After connecting the various components, the machine edited the command interface software calling the interpolation process, which could realize the simulation control and real-time control of the servo motors. The comparative results indicate that the process simulation of the experiment is higher (Shafieifar,et al., 2017 ). In this paper, a simulation with the PROTEUS software, a realization with the fusion 360 software, a kinetic study and finally a study of the mechanisms of the X, Y and Z axes of the machine will be made in order to improve the competence of the numerically controlled machine.

## 2. MATERIALS AND METHODS

### 2.1. System overview

Three Axis CNC Machine (MOCN) as shown in Figure 1is a high precision machine designed to engrave a variety of metallic and non-metallic materials. It is a machine driven by stepper motors. These allow the direct conversion of a digital electrical signal into an angular positioning of an incremental character.

Figure 1.Three-axis CNC machine

### 2.2. Operating principle of a MOCN

The machine tool is equipped with a numerical control capable of carrying out the calculations of the coordinates of the points defining a path (interpolation), it is said to be

With a computer. It is called CNC (Computer Numerical Control). Most of the MOCNs are CNCs. The numerically controlled machine tool forms an assembly comprising: an operating part and an operating part, as shown in Figure 2.

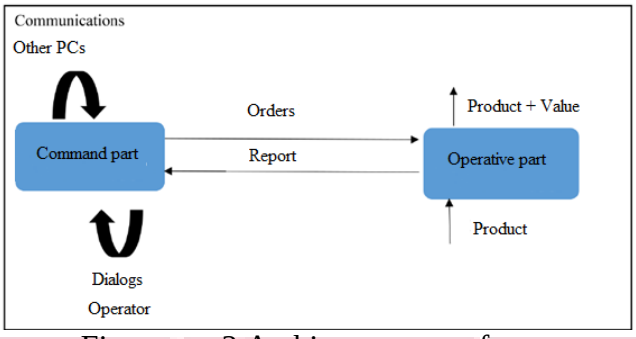


Figure 2.Architecture of MOCN

### 2.3. Characteristic of three axis CNC machine

The kinetic, dynamic, physical and electrical properties of each axis of the CNC machine are gathered while Figure 3 shows the kinematic diagram of the x, y and z axes.

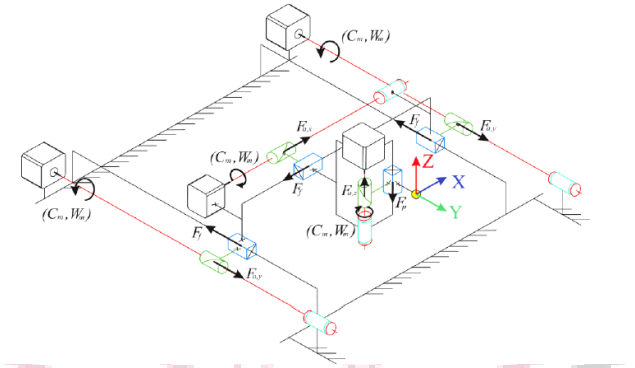


Figure 3.Kinematic diagram of the CNC machine

### 2.4. Design and mechanisms of the X, Y and Z axes

The CNC machine is designed in two parts, an electrical part and a mechanical part. The elements in the assembly gives this machine, are shown in Figure 4. All the elements of the machine are designed beforehand by the Corel DRAW software than they are really manufactured on the basis of this software. Corel DRAW software is a graphics suite developed by software publisher Corel

since 1989. Originally, it was Corel DRAW vector drawing software. Over time, other software such as Corel Photo Paint and Corel R.A.V.E were added and the software became a graphics suite.

However, due to the lack of intelligence in machining process planning, machining procedure of products mostly depends on process planners rather than CNC machine tools. To make product quality less dependable on process planner's ability and improve the efficiency of process planning in order to fulfill changeable market, this paper presents an approach to design and develop CNC machining process knowledge base using cloud technology. Users can submit task and resource descriptive files to the cloud through CNC controller and get machining process solutions from knowledge base. Evaluation mechanism is also adopted to filter low-quality knowledge.

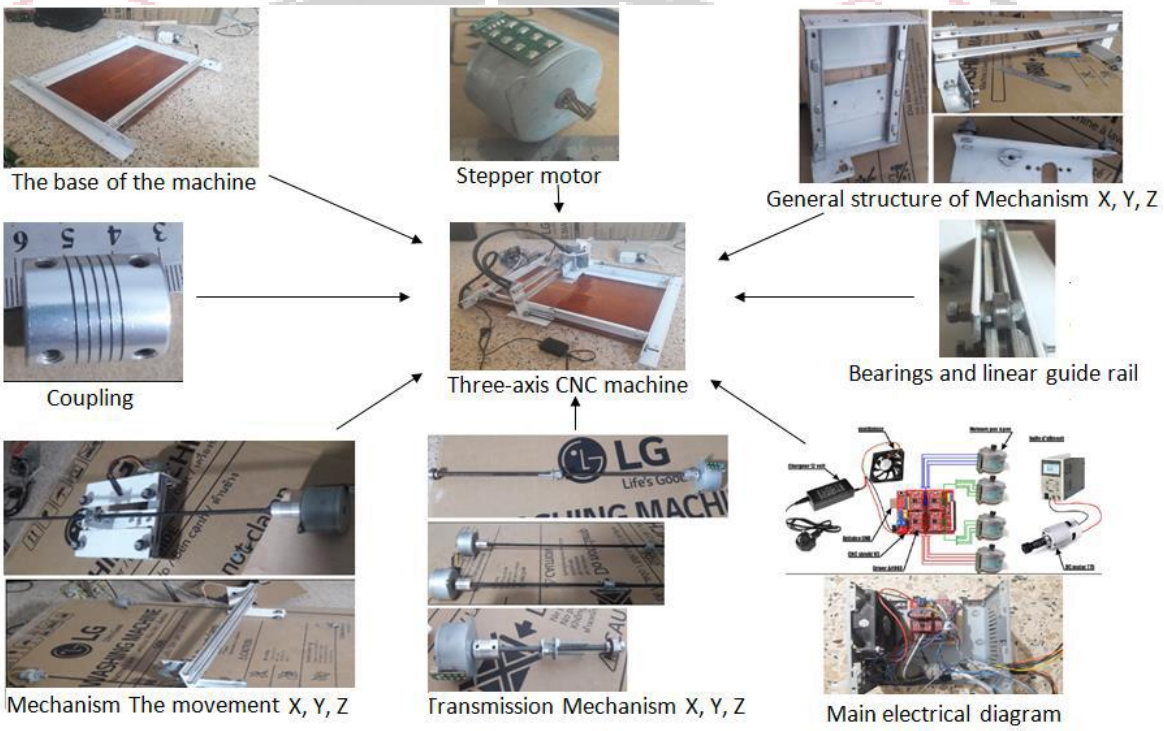


Figure 4.Different parts of the machine CNC

## 3. FEATURES OF THE CUTTING TOOL

Figure 5 shows the tool used in the experiment. It is a metal punch with a diameter of three mm which we modified to carve on different types of wood. In the experiment, engravings were carried out on different wood panels, and we obtained the following results.

Several calculations have been made on the mechanism of the three axes X, Y, and Z such as the number of steps, angular speed, motor entry and exit power and many others. We notice that the other numerically controlled machine to perform several cutting shapes on the wood which shows our device is effective.

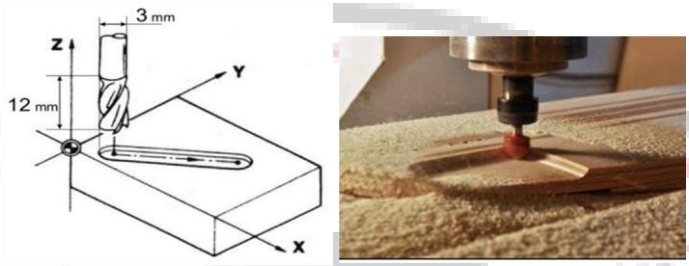


Figure 5.Features of the cutting tool

## 4. CONCLUSION

Our study focused on a 3-axis CNC machine. This expensive device was designed and programmed with two available software and aluminum and iron building materials. After the construction of the machine, the results show that the device perfectly executes the commands entered in the PC. Different geometric shapes were engraved on pieces the different woods with very acceptable precision. With strong structure and powerful motors, this machine can process in future aluminum metal surfaces.

## REFERENCES

1. Golnabi, H., Asadpour, A. (2007). Design and application of industrial machine vision systems, Robotics and Computer-Integrated Manufacturing, 23(6), 630-637.
2. Li, J., Weng, J., Xu, H., Zhou, C., Zhang, D., Lu, G. (2019) Design of robotic mannequin formed by flexible belt net. Computer-Aided Design,110(2019), 1-10.
3. Khechekhouche, A., Elsharif, N., Kermerchou, I., Sadoun, A. (2019). Construction and performance evaluation of a conventional solar distiller. Heritage and Sustainable Development,1(2), 74-77.
4. Ye, Y., Hu, T., Zhang, C. (2018). Design and development of a CNC machining process knowledge base using cloud technology. The International Journal of Advanced Manufacturing Technology,94(2018), 3413–3425.
5. Keefe, Jeffrey H. (1991). Numerically controlled machine tools and worker skills.

Industrial and Labor Relations Review,44(3), 503–519.

6. Shafieifar, M., Farzad, M., and Azizinamini, A. (2017). Experimental and numerical study on mechanical properties of ultra-high performance concrete (UHPC).Construction and Building Materials,156(2017), 402-411.
7. 1. Alam Md Tawqueer and Gangil Manish "Effect of Carburization on the Mechanical Properties & Wear Properties SAE 1020 Steel" Research Journal of Engineering Technology and Management (ISSN: 2582-0028) Volume 3, Issue 2, June 2020.
8. Alam Md Tawqueer and Gangil Manish cc Employees Skills Inventory using Deep Learning for Human Resource Management" Research Journal of Engineering Technology and Management (ISSN: 2582-0028) Volume 2, Issue 4, December 2019.
9. Shantilal Sonar Prashant and Gangil Manish "Warehouse Sales Forecasting using Ensemble Techniques" Research Journal of Engineering Technology and Management (ISSN: 2582-0028) Volume 2, Issue 4, December 2019.
10. Shantilal Sonar Prashant and Gangil Manish "A Review of Optimization-associated examine of Electrical Discharge Machining Aluminum Metal Matrix Composites" Research Journal of Engineering Technology and Management (ISSN: 2582-0028) Volume 2, Issue 3, September 2019.
11. Kumar Hemant Dave Kush and Gangil Manish "An Approach to Design of Conveyor Belt using Natural Fibres Composite" Research Journal of Engineering Technology and Management (ISSN: 2582-0028) Volume 2, Issue 3, September 2019.