

## Wireless Cnc Plotter

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**Abstract** : In today's world humans and man labor is being taken over by machines and the future of humans in the field of engineering will be replaced by these machines which will be fully automated, now in today's automation field "CNC" is a machine which is used to do particular jobs by just a click or in a press of buttons, inspiring to this we have created a CNC plotter which does the job of creating easy and complex designs by just simple software and it is just made out of scrap dvd drives, the idea of using dvd drives strikes because it consists of two stepper motors which has proper provision of axis. Transmission of command is done wirelessly using Zigbee which makes this system portable. The power requirement of this CNC plotter is very low because it is based on a very low level motor mechanism. The project has a main Arduino input as its brain to understand the language and convert it to the digital signals understood by the servo motors in axis.

**Keywords** - : CNC plotter , Arduino, Zigbee, wireless, dvd drives

### I. Introduction

These days in industries from small scale to big companies, machinery designing work has become more complicated. It also requires designs and layouts from PCB to huge machinery parts which need to be drafted in form of real time diagrams (no prints). There is also need of overlaying of texts and auto configuration of drawings in industrial ease. It is difficult to draw user defined diagrams directly on blueprints. Manually drafting of layouts and designs may compromise its accuracy and also consumes man power. As human efforts are increased it affects the production cycle which results in consumption of more time. Also the machine fulfilling these needs consume high power and is not affordable. Due to extensive requirement of low cost automated systems in various industries, there is a great surge in the demand of the CNC based machines. This paper describes the system based on CNC technology to plot the layouts and designs[4]. This CNC plotter works on wireless transmission using Zigbee to make the system portable and to accommodate with ease.

The Mini CNC Plotter Machine works on input given by G codes of Design and converting it using Arduino, Stepper Drivers, CNC Shield, Stepper Motor to a rotate the lead screw. Our CNC machine consist of three axes x, y, z axis for three dimensional motion of tool. Arduino is an Open source microcontroller which used for control of the motors and software is used for executing the G-code for machining applications[3]. To control the motion and operation of machine tools, Computer numerical control is developed. G codes are predefined Function Associated with the movement on machine axes. In CNC Plotter Machine only G codes are used. G codes are used to give the direction to move the pen in X, Y, Z directions [1]. It includes three main steps that is receiving data, interpreting data and accordingly controlling or performing action. Based on special characters letter codes and numbers a form of program called part program (a sequential instruction or coded commands that direct specific machine function) is used for automatic operation of a manufacturing machine to produce a specific part of specific dimension. The program is then converted in to electrical signal to feed as input to motors that run the machine and do the tool movements. There are axis of rotation x, y, z for three dimensional motion of tool plus an axis of rotation. The z-axis is one of the three which allows the movement of router in up and down direction. This axis is very important because it controls the depth. The y-axis functions as motor mount to move z-axis in addition with slide mechanism, x-axis uses two pieces one for front and one for back which serves as height stands. This project basically works on the movement of the x-axis and y-axis and dropping and picking up of servo motors which have a pen attached to it[3].

## II. Hardware Design

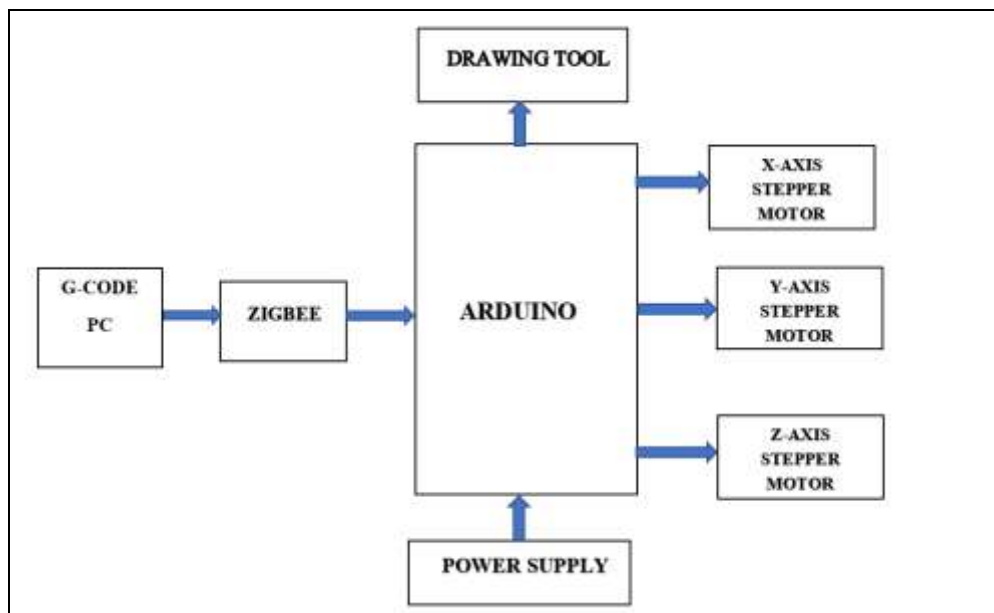


Fig.1 Wireless CNC plotter

### 2.1. Power Supply:

A power supply is an alternating source driven from main power station to provide supplies to the electronic devices. The primary function of a power supply is to convert one form of electrical energy to another form and thus power supplies are sometimes referred to as electric power converters. There are some power supplies that are discrete and stand-alone devices, whereas other are built into larger devices along with their loads. The examples of power supplies are the main power provided to the computers and other electronics devices. Here we have used 12v power supply adapter for the Arduino and also the servo.

### 2.2. Personal Computer:

A basic laptop or desktop computer can be used for this project it should have at least the minimum requirements of running ARDUINO IDE software and INKSCAPE.

### 2.3. Stepper Motor:

A stepper motor is a single phase synchronous brushless motor. The stepper motor consists of a permanent magnet which is surrounded by winding sort of stator. They create opposite polarity poles compared to the poles of the rotor. It can be driven in several different ways. The motor's position can then be commanded to move and hold at one of these steps without any feedback sensor (an open-loop controller), as long as the motor is carefully sized to the application in respect to torque and speed[1].

### 2.4. G-codes:

G code is the format of the file which your machine can understand. Suppose you have to draw some text with machine so you need its G code; so here the Inkscape software provides us with the facility to convert image or text into G code. The converted G codes are transmitted to the control unit with the help of Zigbee [2].

### 2.5. Zigbee module:

To achieve communication between two Zigbee, first one Zigbee is connected to Arduino and the other Zigbee is connected to sensor, microcontroller or computer. Energy consumption of Zigbee is low and is designed for multi-channel system. The Zigbee module can be now connected with the microcontroller using Arduino board. The G codes from the computer are transferred to the Arduino through the Zigbee module.

### 2.6. Arduino:

Arduino is a simple microcontroller board. Arduino board is a printed circuit board and on that board is the integrated circuit. It can stand-alone or can communicate with the software of the computer. Arduino software can run on Windows, Linux and Macintosh OSX. It provides an Integrated Development Environment (IDE) which is written in Java for programming microcontrollers. It supports high level languages so anyone who knows the basic programming of C and C++ can easily work with Arduino IDE.

It is very simple. Arduino has built-in functions. It can access serial port. It does not need to access the register details. It can simply call the functions and easily perform the functions. This makes the coding and debugging are fast and efficient. Arduino IDE displays the data which is into and out of the serial port. Here the Arduino basically work as the brain of the CNC machine. A CNC code when uploaded to the Arduino the G codes stream to it and the Arduino commands the motor shield to run stepper motors[3].

### 2.7. X-Y-Z- axis Stepper Drivers:

We have used three stepper drivers which control the movement of stepper motors along the X, Y and Z axis[1]. Stepper driver are mounted on Arduino. It is an easy-to-use professional stepper motor driver, which could control a two-phase stepping motor. Stepper motor current can be controlled by it. Motor will be gives result as a rotation of lead screw. Lead screw will be control the movement of pen. In X direction Stepper motor will be move left and Right , Y direction stepper motor will be move in front and back direction, Z direction Stepper motor will be move in Up and down.

## III. Conclusion

CNC machines these days are found in almost all industries, from a small scale industry to big companies. There are hardly any manufacturing machines that are not acquainted by CNC automation. CNC machine can be very beneficial to the company as it increases the accuracy, flexibility, repeatability and efficiency of the manufacturing product. With ease of use and independence of production process it has ability to use shorter production cycles. The safety of the operator is also maintained using a CNC machine. The CNC automation technique is commonly used to draft real time diagrams, blueprints and to draw complex designs on plane. There is a transient rise in the demand of the CNC machines in various industries due to its extensive applications.

## Acknowledgements

We would like to appreciate the work of all those who provided us the possibility to complete this paper. A special gratitude we give to our final year project guide, Ms Ameya Jadhav, who contributed in stimulating suggestions and encouragement, helped us to coordinate our project especially in writing this paper. Furthermore we would also like to acknowledge with much appreciation the crucial role of the staff of Electronics department, who gave the permission to use all required equipment and the necessary materials to complete the task. We have to appreciate the guidance given by other supervisors who helped in our project presentation that has improved our presentation skills.

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