

PEN PLOTTER

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ABSTRACT

Pen Plotter is the 2D graphic plotter. It draw largest image in short time of period. Pen plotter is the three axis plotter i.e. x-axis for paper, y-axis for pen holder and z-axis for up-down the pen. The computer give the image command to the pen plotter microcontroller and microcontroller give the direction to the cnc shield driver circuit. The cnc shield driver circuit manage the x-axis and y-axis stepper motor. The pen up-down function is controlled by the microcontroller. In this project Arduino Uno (ATmega328) are used and the a4988 stepper motor driver ic are used. The plotter arm with three degree of freedom and the two joint are given the flexibility to x-axis and y-axis but along with the z-axis. This arrangement of arm allow to plotter to perform the task at faster speed with high accuracy. This plotter is the low cost automatic machine and it is used for PCB designing and any graphical image drawing. And this machine is easily upgradeable for laser cutting, wood cutting, PCB drilling and 3D printer etc.

Keyword: - Computer Numerical Control (CNC), Degree of Freedom, Stepper motor, and Arduino Uno etc....

1. INTRODUCTION

The PEN PLOTTER is the special type of printer that uses a pen to draw the image on the solid surface. In this project the microcontroller are used which is capable of processing the logical instructions interface with a computer. The logical instruction is provided by the computer in the form of code, text, and image. Which is then converted into the machine language and this machine language is executed by the microcontroller to given the direction to the pen plotter machine. The PEN PLOTTER is the 3D controlled 2D plotting machine. Which uses the pen to draw the text and images on the solid surface and papers. It can be used for the purpose of PCB designing, logo designing and image drawing etc. This project based on the CNC plotting machine which increase the demand to use the CNC plotters in collages and laboratories.

1.1 Objective and Aim of work

The main aim of the project is to create a system which is the computer printer for printing the image on solid surface and papers. This plotter convert the soft copy into the hard copy. It draws the picture on paper using the pen. Plotters are used to print the designs of ships, machine, plans for buildings and so on.

1.2 Scope

The pen of machine can be replace with laser to make it work like a laser engraving or cutting machine. The engraving machine can be used on wood. The pen can be also be replace with a powerful drill machine so that it can be used for both milling and drilling purpose. The servo motor can be replace with a stepper motor and the pen with 3D pen to make the 3D printer which can print objects with dimension. And by extrapolation of the axes, the working area of the machine can be extended keeping with the algorithm unaltered.

2. BLOCK DIAGRAM

The block diagram of pen plotter is shown in figure 1. In the block diagram the microcontroller Arduino uno (ATmega328) are used for the controlling purpose and give the direction to the stepper motor to draw the image and also provide the pen up-down decision to servo motor. The cnc driver circuit are used to provide the sufficient voltage to the stepper motor.

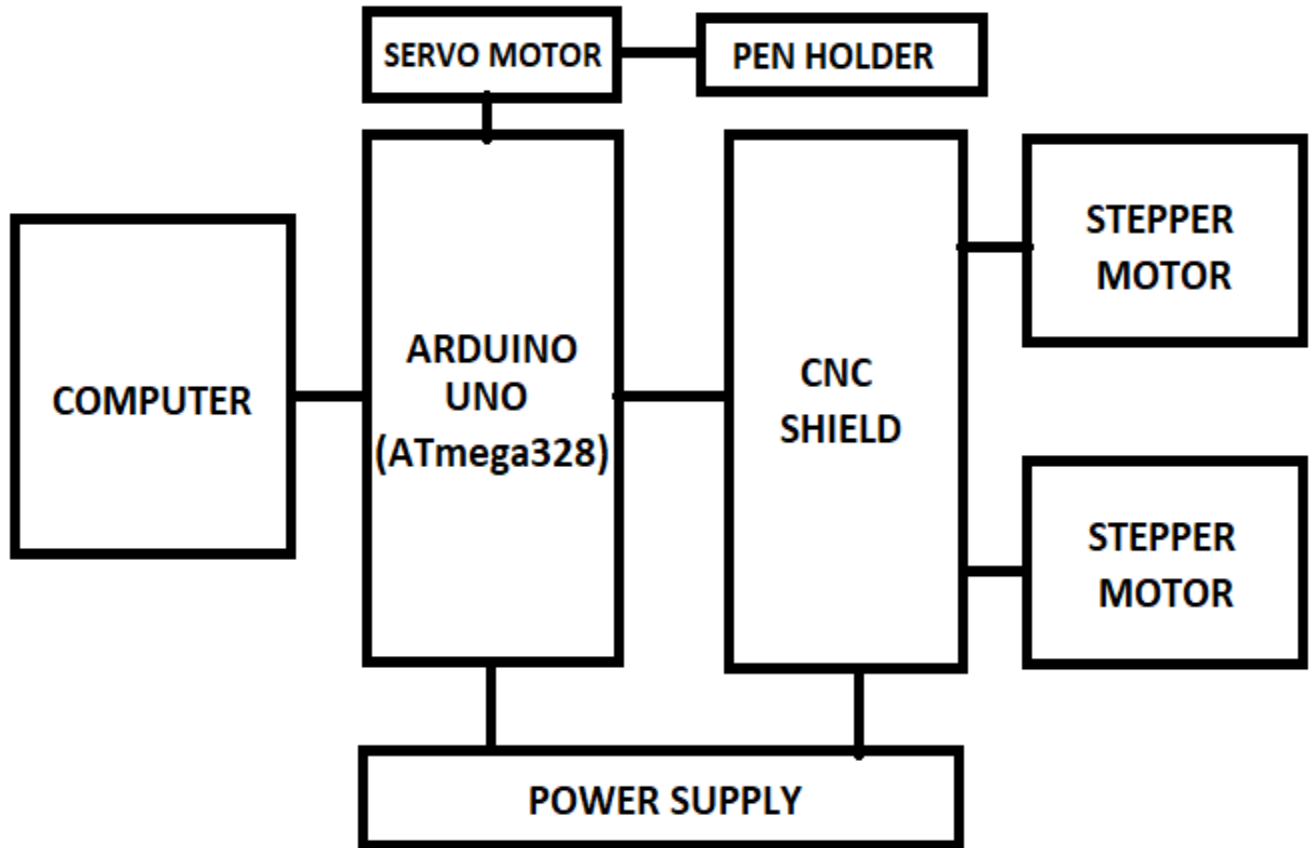


Fig -1: Block diagram of pen plotter

2.1 Servo motor

A servo motor is an electromechanical device that converts electrical energy into mechanical energy. Servo motors can be powered by current sources. Microcontrollers command these motors through the motor-controller circuit to take the necessary action. A servo motor mainly consists of a DC motor, gear system, a position sensor which is mostly a potentiometer, and control electronics. The DC motor is connected with a gear mechanism which provides feedback to a position sensor which is mostly a potentiometer.

2.2 Stepper motor

Stepper motors can be viewed as electric motors without commutators. Typically, all windings in the motor are part of the stator, and the rotor is either a permanent magnet or, in the case of variable reluctance motors, a toothed block of some magnetically soft material. In other word, stepper motor is a brushless DC Motor that works based on rotation in an equal step of full rotation

3. MICROCONTROLLER (Arduino uno-ATmega328)

Arduino is an open-source electronics prototyping platform based on flexible, easy to use hardware and software. This microcontroller is very powerful where it can perform many tasks including robot control. The on-board chipset is using ATMEL microprocessor and can easily be programmed by using Arduino programming language and Arduino development environment. Commercially there are many type of Arduino in the market such as Arduino Mega, Arduino Leonardo, Arduino Uno, Arduino Nano and etc. Those entire microcontrollers had difference features and difference in size which suit to difference project. For instance, Arduino Uno is suitable to build mini robot that only have a few application due to its small size Besides, Arduino also comes with Arduino shields that capable to install on the Arduino main board. Those shields equipped with extra component like Ethernet port, Wi-Fi card, and motor driver IC. To drive motor by using Arduino microcontroller, it is advisable to use with Motor Shield that can drive the DC motor, Stepper motor or a RC servo motor. User can easily change the speed of the motor by connecting the motor with the motor driver to the PWM pin on the Arduino main board.

In this project, Arduino UNO is chosen as the main microcontroller. This is because the on board pins that are allocated for user are more than enough to operate two stepper motor and one servo that make this XY plotter functioning.



Fig -2: Arduino uno (ATmega328)

3.1 Power supply

The function of regulated power supply is to supply a stable voltage to a circuit or device that must be operated within certain power supply limits. This is used to supply the power to the microcontroller and the driver circuits.

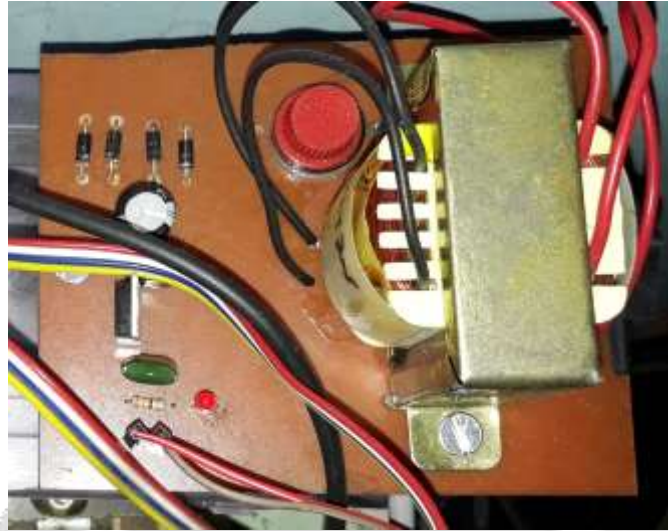


Fig -3: Power supply

4. CONCLUSIONS

The pen plotter finds its application in many fields. It is a useful device in field of graphics. Letters and images can be drawn by taking the input from computer. Further additional improvement can be done by incorporating the graphical user interface for making the arm more user friendly and developed application interface so that arm could be controlled in remote place by the benbox application.

5. ACKNOWLEDGEMENT

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