Self Propelled 2D Plotter Implementation

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Abstract :- Our CNC machine consist of three axes x, y, z axis for 2-dimensional motion of tool. The numerical data required for working of the plotter is provided by a program called part-program which in turn converts the numerical data to electrical signals. These electrical signals are then given as input to stepper motors. Each signal specifies a specific point in the coordinates and according to the point the toolmove, in our project we are trying to implement simple and efficient 2D plotter.

Keywords:-Arduino microcontroller, plotter, Visual Basic.

I. INTRODUCTION

Computer numeric control (CNC) is the automation of the machine tools by means of computer executing preprogrammed sequence of machine control command. Motion is controlled along multiple axes, normally at least two (X and Y) development of computer numerically controlled (CNC) machines has also made possible the automation of the machining processes with flexibility to handle production of small to medium batch of parts. In the 1940s when the U.S. Air Force perceived the need to manufacture complex parts for high-speed aircraft. This led to the development of computer-based automatic machine tool controls also known as the Numerical Control (NC) systems. Commercial production of NC machine tools started around the fifties and sixties around the world.
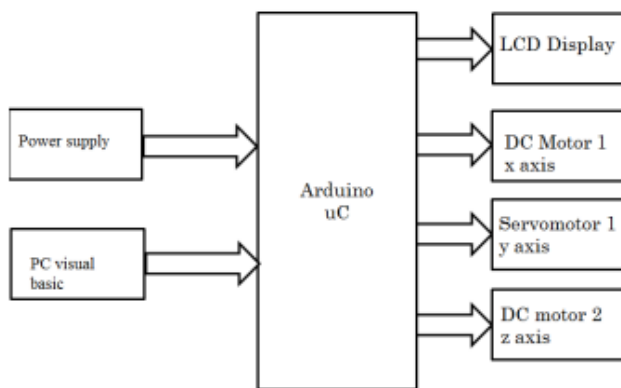
II. BLOCK DIAGRAM

Fig.1 :- Block diagram of 2D plotter

The figure 1 shows the block diagram of 2D plotter. We have used Arduino uC, DC motor, Servo motor, Power supply, Visual Basic as input from Pc. The input from PC
Is given to the microcontroller and microcontroller sends it to the motors on different axis, motors control the cd drive with pen/plotting assembly then the desired output is plotted on surface.

III. METHODS AND MATERIAL

- *Arduino UNO*

This is one of the most usable microcontroller in industry. This controller is simple and efficient to use. The coding of this controller is also easier. This controller uses flash memory technology so that we can write erase it many times. It has 14 digital I/O pins of which six can be used as PWM output 6 analog inputs, a 16MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button.

- *Stepper Motor*

A stepper motor or step motor or stepping motor is a brush less DC electric motor that divides a full rotation into a number of equal steps. The motor's position can then be commanded to move and hold at one of these steps without any position sensor for feedback as long as the motor is carefully sized to the application in respect to torque and speed.

Fig. 2:- Stepper Motor

- *Serial Communication Port*

It is used to transfer the function between computer and the plotter. We have use RS 232 for serial communication.

- *DC Motor*

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical. We have used 2 DC motor for controlling X-axis and Z-axis the main control movement is provided by these motors.

- *Visual Basic*

Visual Basic is a third-generation event-driven programming language and integrated development environment from Microsoft for its Component Object Model

programming model first released in 1991 and declared legacy during 2008.The Visual Basic software will map the figure in co-ordinates. These coordinates are mapped using DC motor and stepper motor.
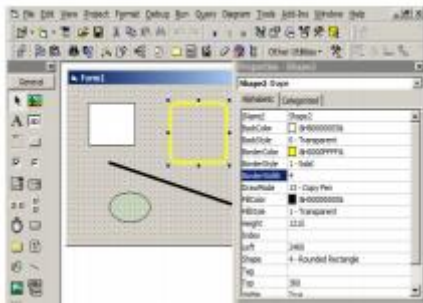

Fig. 3:- Visual Basic Software

- *Operation/working of 2d Plotter*

The image/diagram which we want to plot is given as the input to PC with the help of Visual Basic software. The Visual Basic software will map the figure in co-ordinates. These coordinates are mapped using DC motor and stepper motor. The image is further given to an Arduino microcontroller, where the controller is able to perform its operation between pc and controller.

The micro controller receives these co-ordinates and will first put the pen down using the Z axis motor. After this the micro controller starts moving the DC motor and stepper motor in X and Y direction until the whole design is drawn on paper.

Driving system includes stepper motor, which converts electric pulses into discrete mechanical rotations of motor shaft. These pulses are provided by the machine control unit. Stepper motor would be the best simple device that can be applied to CNC as it converts digital data to actual mechanical displacements. They are mainly used because of slow speeds, low torque, and low resolution and easy to slip in case of over load.
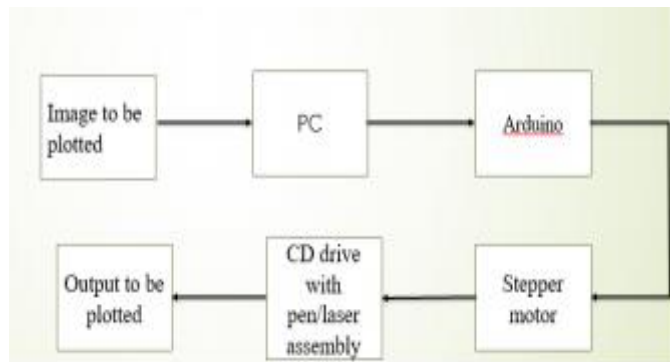

Fig. 4:- Operation

- *Actual Hardware*

Fig. 5:- Actual Hardware

IV. RESULTS AND DISCUSSION

As we will get the output through pen assembly, it is easy to handle, portable no need of highly skilled labour, LCD will display the on and of condition of plotter. We can easily control the axis and further is can be easily modified.

V. CONCLUSION

In this project, we have presented the concept of a simple, efficient, low cost three axis CNC 2D plotter. We have designed a cheap and accurate2D plotter. This sort of design will bring down the overall cost of the product. The Visual basic software used is easy to use and easy to install it. It can be used for long hours at a stretch which is not possible in existing ones.

VI. ACKNOWLEDGMENT

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