CNC Based Pen Using Arduino

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ABSTRACT

This work represents the a ordable model of a CNC pen and an able to draw a 2D views and draw-ing.The idea behind is to fabricate a low cost CNC pen in order to reduce the cost and complexity of machine.Rapid growth in the industries, uses and utilization of CNC machine are increased also advancement in the technology,the demand for computer numerical control i.e CNC pen n educa-tional institutes and laboratories increases day by day.The features of low cost CNC machine is achieved by PC with ATmega328 micro-controller in an arduino.The user need to convert text or image le into G code using INKspace software and then feed to the CNC pen.

Keywords : CNC, arduino ATmega328, L293D IC, inkspace software, CD/DVD drives.

I. INTRODUCTION

The CNC based pen using Arduino is a special type of printer that uses for drawing and writing on the solid surface. rst CNC machine was built in the 1940. Most of the CNC system built today are electrically controlled. Idea behind this project to make mini CNC pen which is used to draw, sketch, writing & designing purpose. Its uses three axes i.e X, Y, Z along with motor can rotate as per the instruction given by the user or operator. During drawing or writing synchronization between this axis very di cult task. A pen touches the solid the surface and draw or write on the surface for 'logic 1' & lift up in the air for the 'logic 0' instruction, wait for the next command execution. Computer numerical control is an advancement form of soft automation developed to control the motion & operation of CNC machine tools.

In CNC pen, Atmega328 micro-controller is capable of processing logical instruction interfaced with a computer. T processing logical instruction provided by the computer are in the coded form of code of text or image which is converted into machine language by micro-controller to be executed by the machine. It mainly consists of three steps i.e receive data, interpreting data control action.base on the special character and image code from a program called as part program(sequential instruction that are used to control the machine function) is used for automatic operation of a manufacturing machine to produce speci c part of speci c dimensions.[1]IRJET

OBJECTIVE

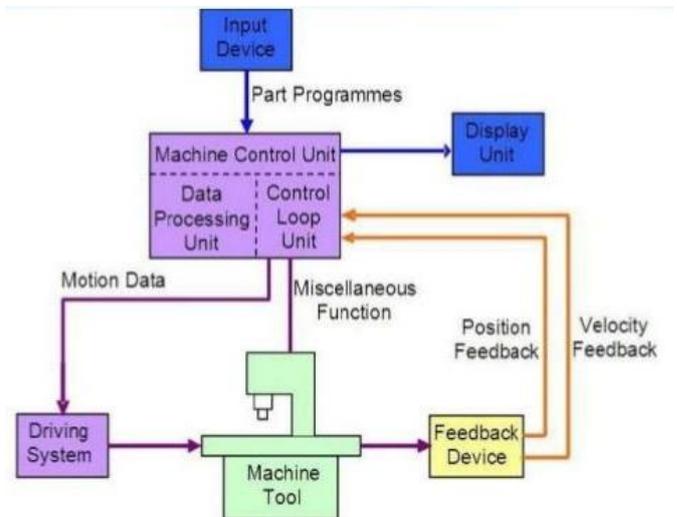To develop a low cost automatic mini CNC pen for 2D views. This reduce the cost of machine and increase the exibility.

Figure 1: Block diagram of CNC pen

II. METHODS AND MATERIAL

Methodology

The G code is interfaced with ATMEGA 328 CNC based controller by FTDI module which is used to

convert the code in convenient controller code i.e serial to USB converter. Hence it acts like interfacing module between PC to Controller. This code is further passed to stepper motor by easy drivers which converts the code and as per instructions the stepper motor moves. need three axises X,Y,Z which operates as follows X stepper these We motor move left and right Y stepper motor moves front and back and Z stepper motor up and down as per given dimensions even axis will move on.

Block Diagram

The main idea behind this project, ATmega 328 micro-controller which easily available the platform for interfacing between logical instruction and computer.The resulting is more code e cient and 5 to 10 time more faster than CISC micro-controller.

ATmega328

The Atmel AVR is combination of set of rich instruction with 32 general purpose register.All the 32 register are connected to Arithmetic logic unit(ALU).The resulting is more code e cient and 5 to 10 time more faster than CISC micro-controller.The ATMEGA 328 is a single chip controller which is created by Atmel and it belongs to MEGA AVR series.It is 28 pin IC and it is of 8 bit. It is based on RISC (Reduced Instruction Set Computer) architecture. It has 26 I/O pins, 32 working registers, 32Kb of ash memory, 2Kb RAM and 1Kb EEPROM.The maximum operating frequency of ATMEGA 328 is 20 MHz It has external and internal interrupts. Each pin of micro-controller provides 5 Volts, 40mA current. It has 16 digital and 8 analog channels. If we want more than 16 digital channels then we can convert the analog channels to digital channels by using in build ADC.
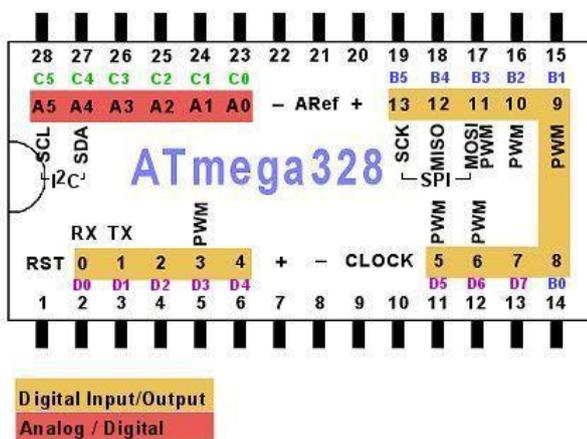

Figure 2: Pin layout of ATmega 328

by writing the proper code.
Temperature Range: -400C 1050C
SpeedGrade :
4M Hz@1:8 5:5V
10M Hz@2:7 5:5
OperatingV oltage : 1.8 to 5.5
P owerConsumptionat1M Hz; 1:8V; 250C
P owerActiveM ode : 0:2mA
P owerDownM ode : 0:1uA
P owerSaveM ode : 0:75uA

2.2   G Code from PC

G Code is nothing but the language in which people tells computerized machine tools how to make something.The How is de ned by instructions on where to move, how fast to move, & through what path to move.

2.3   Serial to USB Convertor

It is used for making the communication between USB based computers and serial devices. We use here, FTDI (Future Tech Devices International) serial to USB converter is used. FT232RL IC is used. It is bidirectional converter. This converter is used to load the data which is coming from the PC system into the controller. This converter converts human interpretation language into its ASCII value which is understandable by the controller. FT232RL is 28 pin IC. It is FIFO technique.

2.4   L293D IC

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Dual H-bridge Motor Driver integrated circuit (IC).There are 4 input pins for L293D, pin 2,7 on the left and pin 15 ,10 on the right as shown on the pin diagram. Left input pins will regulate the rotation of motor connected across left side and right input for motor on the right hand side. The motors are rotated on the basis of the inputs provided across the input pins as LOGIC 0 or LOGIC 1.In simple you need to provide Logic 0 or 1 across the input pins for rotating the motor.

2.5 Stepper Motor

There are two basic winding arrangements for the electromagnetic coils in a two phase stepper motor.i.e bipolar and unipolar.A unipolar stepper motor has one winding with center tap per phase. Each section of winding is switched on for each direction of magnetic eld. Bipolar motors have a single winding per phase. The current in a winding needs to be reversed in order to reverse a magnetic pole.The speed of rotation of stepper motor is directly proportional to the pulse frequency. The higher the output voltage from the driver, the higher the level of torque drive.Stepper motors eectively have multiple toothed electromagnets arranged around a central gear-shaped piece of iron. The electromagnets are energized by an external driver circuit or a micro controller.This means that when the next electromagnet is turned on and the rst is turned o, the gear rotates slightly to align with the next one. From there the process is repeated. Each of those rotations is called a step, with an integer number of steps making a full rotation. In that way, the motor can be turned by a precise angle.A stepper motor is a brush less, synchronous electric motor that converts digital pulses into mechanical shaft rotation in a number of equal steps.

III. CONCLUSION

This project is about building a Electronics prototype of a CNC pen which is able to draw any image/text on a given solid surface. It consumes low power and works with high accuracy. This is a low cost project as compared to other CNC product.The required component are easily made available and spare parts. It is designed for private manufacturing and small scale applications in educational institutes. The pen is designed with a very simple construction scheme and can be carried anywhere without much e ort. The algorithm used is simple.Software that has been used is open source and user friendly. The pen can be replaced with a pinhead or laser head or any other tool for di erent purpose of use.

IV. FUTURE SCOPE

1.The servo can be replaced with a stepper motor and the pen with a 3-D pen to make it a 3-D printer which can print objects with dimensions. By extrapolation of the axes, the working area of the machine can be extended keeping the algorithm unaltered.

2.The pen of the machine can be replaced by a laser to make it work like a laser engraving or cutting machine. Engraving machine can be used on wood. The pen can also be replaced with a powerful drill so that it can be used for both milling and drilling purposes

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