Design and Fabrication of 3 Axis CNC PCB Milling and Drilling Machine-Design Parameter

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Abstract: **This paper examines the structuring and execution of 3-Axis Single Sided Circuit Drawing Machine utilizing Arduino improvement board dependent on the use of modernized numerical controller (CNC). Open source programming utilized are Android IDE, Computer, Arduino ATMega328p Board, CNC Shield, Motor Driver and Servo Motors are the segments utilized in this undertaking. The fundamental point of this venture is to decrease the massiveness of PCB which offer ascent to new innovation of Flexible Electronics by empowering to print the circuits on any surface. The structuring of this task is to lessen mistake and increment exactness and profitability. The thought behind this venture is model gadgets circuits on each surface utilizing conductive ink. In this undertaking Autodesk Eagle is utilized to assemble PCB Layout**

Index Terms: **CNC Milling, Turning, Machining Processes**

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I. INTRODUCTION

The requirement for creating a model circuit emerges regularly in gadgets, including instruction and research labs. In asset poor nations in the creating scene, this is prevented by the significant expense of business Printed Circuit Board (PCB) prototyping machines and long pivot business manufacture process. Useful, hands-on research center instructing and experimentation gets important to improve learning in gadgets. In this task and in the accompanying arrangement of instructional exercises, an ease build your-possess (BYO) semi-robotized three-pivot PCB processing machine for twofold sided PCB prototyping is created utilizing business segments and open source equipment and free open source programming to give understudies, educators, and specialists a justifiable, reasonable hotspot for PCB prototyping. Additionally, the fundamental issues experienced during creation of PCB have been referenced and the strategies used to understand are talked about in detail.

II. OBJECTIVE

- To make electronic circuits at a less expensive rate

- An alternative of breadboard to test different circuits

- Research and Development cost behind structure any circuit diminishes

- It can be effectively operable

- It is anything but difficult to interface

- It expends less force

III. METHODOLOGY

- Research about the better approaches to model

- Component Selection and Testing

- Hardware Implementation

- Designing of PCB Layout

- Create the hex record of the picture

- Programming the Controller utilizing IDE

- Burning the program

- Debugging the circuit

- Configure the Microcontroller to PC to get to Gcode

IV. BLOCK DIAGRAM

This undertaking comprises of various units, for example, Power Supply Unit, Workstation Unit, Microcontroller Unit, Driver Unit.
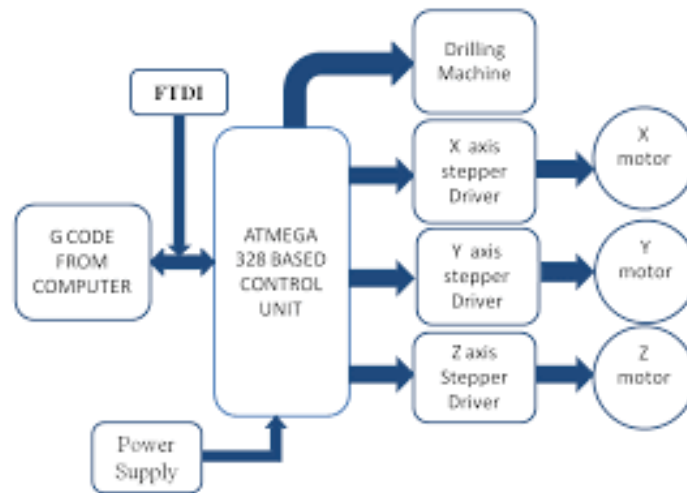

FIG-1: Block diagram of 3-Axis PCB Milling and Drilling Machine

Power Supply Unit

Force Supply unit comprises of different sign molding hardware. It is utilized to step down different voltages which can be utilized to bolstered to different parts of the circuits. Force supply unit is planned so that every part can get to appropriate current to work. The all-out force supply require is 12v,2A.

Workstation Unit

Workstation unit comprises of different programming like Autodesk Eagle, Arduino IDE. Autodesk Eagle. It comprises of different drivers introduced that are utilized for correspondence between microcontroller and itself.

Autodesk Eagle

Autodesk Eagle is a product which is utilized to plan the board format of any circuit. It is accessible in Windows, Mac and Linux working framework. It comprises of different highlights like measured structure squares, multisheet schematics, Electrical Rule Checking (ERC), real-time design synchronization, deterrent evasion steering, auto switch, BGA fanout. A case of 5v,1A force supply circuit is readied. This format is sent out into perfect representation record.
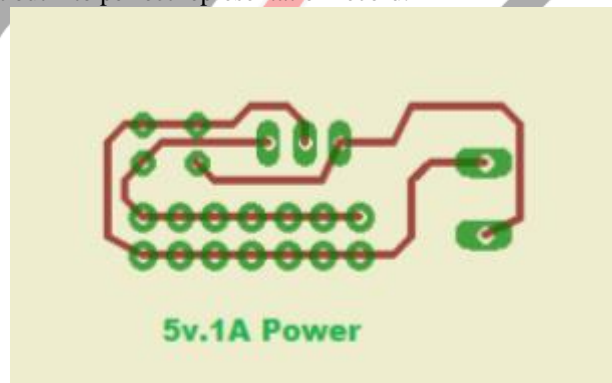
Flatcam

FlatCAM lets you take your plans to a CNC switch. You can open Gerber, Excellon or G-code, alter it or make from scatch, and yield G-Code. Disengagement directing is one of numerous undertakings that FlatCAM is ideal for. It's is open source, written in Python and runs easily on most stages.

Candle- GRBL Controller

Controlling GRBL-based CNC-machine by means of reassure directions, fastens on structure, numpad. Observing CNC-machine state. Stacking, altering, sparing and sending of G-code records to CNC-machine. Envisioning G-code records.

Arduino Uno R3(ATMEGA-328)

Arduino Uno is a microcontroller board dependent on ATmega328. Its working voltage is +5V. it comprises of 14 advanced I/o pins. It can withstand input voltage from 7-20 V. The DC Current per pin 40ma. It has 32kb of glimmer memory. It working default clock recurrence is 16MHz.

Fig-4: Arduino UNO R3

CNC Shield V3

CNC Shield V3.0 can be utilized as drive extension board for etching machine, 3D printer and different gadgets. There're 4 openings in the board for stepper engine driver modules, can drive 4 stepper engines. It has an info voltage of 8-36v.
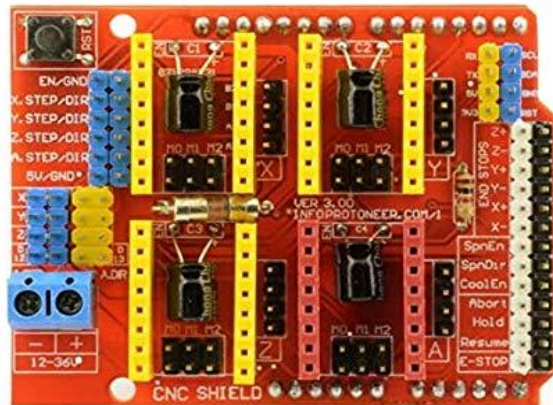

Fig-5: CNC Shield V3

Motor Driver Circuit

The contribution of engine driver is given from CNC Shield V3. The engine driver circuit is set on CNC Shield circuit. Engine driver circuit(A4988) is a 28pin circuit. Its most extreme stock voltage is 35v and greatest current rating is 2A. It takes three contributions from microcontroller. first info is the stockpile voltage given to enable (EN)pin to empower the IC, and second and third information chooses the heading of turn of engine. In this task, we have utilized 3 engine driver circuit, one for every pivot.
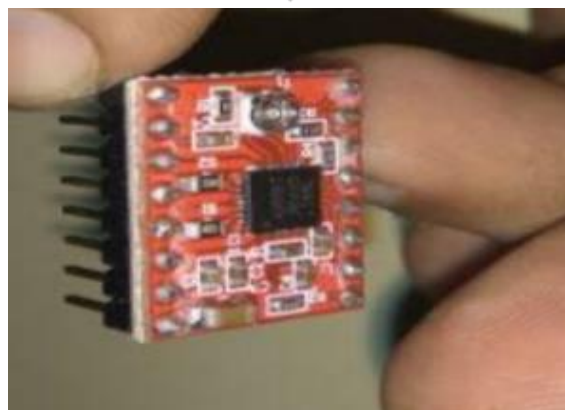

Fig-6: Motor Driver(A4988)

Motors

A NEMA 23 stepper engine is a stepper engine with a 2.3 x 2.3 inch (58.4 x 58.4 mm) faceplate. Its size is just a coarse sign of its capacity. The first standard Reprap (Darwin) had a NEMA 23 engine.

Fig-7: Stepper Motor

Output Component

The output device used in this project is drill bit. The other devices which can be used are conductive ink pen, cutter, laser etc. the output devices depend on the application.

V. CONCLUSION

This paper has displayed the advancement of a minimal effort PCB milling and drilling machine. As it is coordinated effort of both equipment and programming the remaining task at hand decreases. G-codes is used to plot the area effectively. Making a little machine will create PCB at modest rate and make it adaptable to create circuits on any medium.

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