

5-axis milling machine using MACH3

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Aim of the Project

The Aim of the project is to convert a 4-axis milling machine to a 5-Axis milling machine using USB controlled MACH3 controller.

Background

LIT has a student build CNC machine onsite in 5A02. This project was a 4-axis CNC machine using a MACH3 software using an out-of-date PC to control the CNC. MACH3 using parallel port technology for data output was used to successfully convert G code into machine is X,Y and Z axis

The main components of the 5-axis Milling machine is servomotors, ball screws, USB interface, chuck, chuckie tool cutter, general safety guards and an E-stop.

The purpose of a 5-axis CNC machine is to machine very complex parts. One advantage of a 5-axis CNC machine is that the tool life increases. Drilling holes is made much easier. It also avoids collisions when machine the product



Comparing the old CNC with the new CNC machine

Wiring

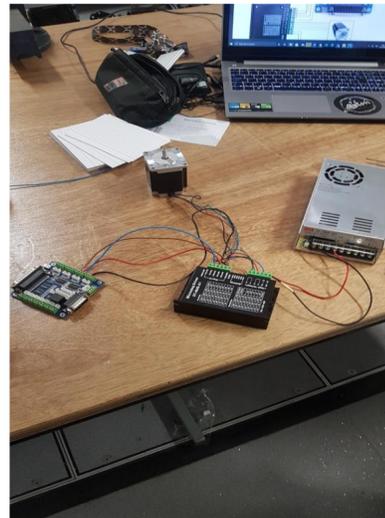


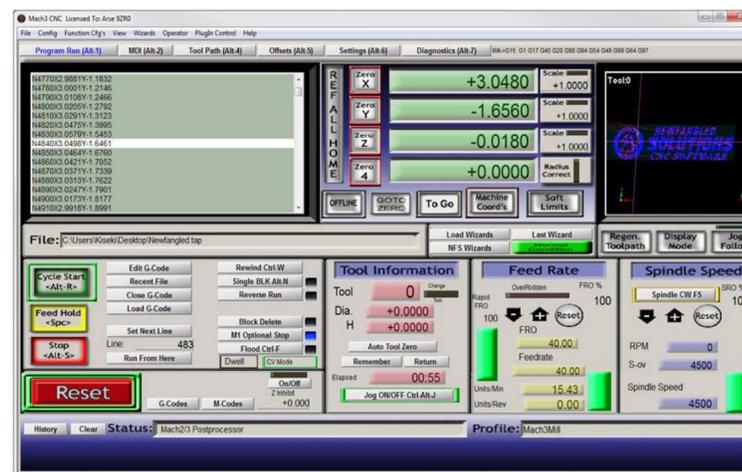
Figure 1 Mach 3 hardware

With the USB CNC 5-axis control board for MACH3 any laptop or computer compatible with windows can be used as a CNC machine controller. It has 7 general inputs to control limit switches, emergency stop etc. it provides 5 socket connectors to easily connect stepper

motors or micro step drivers to achieve 5-axis CNC machining. It has an external manual control port as well as a computer port. A laptop or computer that is windows compatible is connected to the CNC control board by either USB

Mach 3

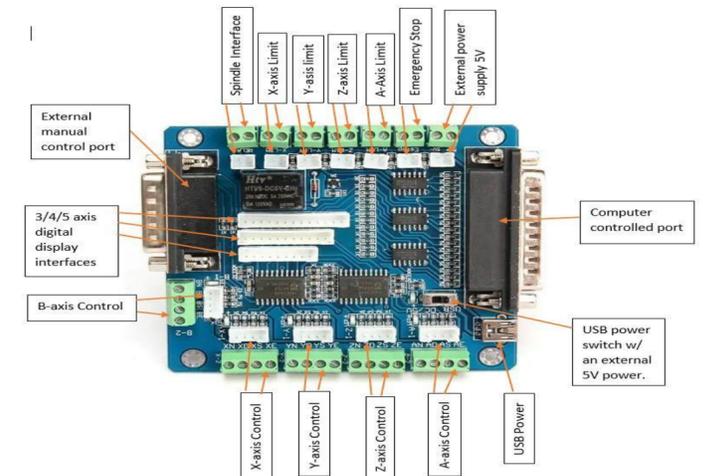
Extension: Mach3 converts a personal computer into a CNC controller, user could have even six-axis input/output features on their pc. **DXM allowance:** The program creates a path to make an easier way to import DXM files directly to the controller, (majority of different software's do not a). **BMP import:** The Bitmap



Mach3 Software

files are complicated for a pc to handle, Mach3 creates a path for the pc itself which allows this data to turn into a code that would be easier for a pc to read, also the Mach3 software allows the user for a USB port transfer from one pc to another. **Files from Joint Photographic Experts Group:** JPG files and other similar data can come into play then the pc is controlling the industrial machines. In this case the Mach3 solves this problem so this kind of files won't be causing lags in the machine. **Visual G-code:** Mach3 program uses LazyCam to convert a pc into a CNC controller going through a G-code creation. It makes the entire process simpler. **M-codes:** These are customizable M-codes that will transfer the machining data into the pc in form of the machine language. **VBScript:** Mach3 is the only software that uses VBScript to handle macros. **Special Features (Exclusive to Mach3).** **Spindle Control:** Mach3 applies a specific control system that can control the spindle speed. **Relay Control:** Mach3 controls multiple of relays at the same time. **Manual Pulse:** The program carries out pulses manually, allowing for external interactions with machines and the components. **Display:** Mach3 provides entire video display which gives the information about the machine instantly. **Touch capacitive:** Mach3 provides a high-quality toughing activity by control with the touch screen capacity.

Conclusion



In conclusion a 5-axis CNC machine is a more efficient machine compare to a 4-axis CNC machine due to its extra axis. The capabilities of a 5-axis CNC machine is greater than a 4-axis. The tool life gets better on the 5-axis.

References

- wikipedia. (2018, april tuesday). Retrieved from wikipedia : <https://en.wikipedia.org/wiki/G-code>
- edge, e. (2013, september friday). *engineers edge* . Retrieved from <https://www.engineersedge.com/manufacturing/three-axis-cnc-machining.htm#:~:text=Three%20axis%20CNC%20machining%20refers,tool%20spindle%2C%20see%20Figure%201>.
- <https://hallroad.org/mach3-usb-cnc-interface-board-in-pakistan-bl-usbmach-v2.0-mach3-cnc-board.html>