CNC Machine

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BACKGROUND

The CNC machine market is flooded with overpriced bulky machines that could never be gotten for the average citizen or small-town business. They require massive amounts of maintenance to remain functioning for long period of time.

**Figure 1**

Credit: UTI

Price of Machine:

The price of these machines is in the hundreds to ten thousands for some of the larger ones. While they justify their price in size and ability to cut things this is just too high for the average person to acquire. This is mostly due to the massive size these machines must be in order to cut as much as possible in one go. As well as the variety of materials they can service.

Ease of Access and Speed: CNC machines can require a lot of work to transfer designs to code that can be worked on, this as well as the actual work process can waste significant amounts of time for the owner. While most can be incredibly easy to use and fast in its work that also increases the price and limited availability.

PROPOSED SOLUTION

Our proposed solution (Figure 3) was to create a smaller, cheaper and faster CNC machine that was affordable to the average customer. It involved 2 stepper motors to control the X and Y axis and a servo motor to control the Z axis. The three motors would drive a tool held in by a custom insert to provide high accuracy and speed. The brain of the operation is an Arduino Uno which provides the code and image from the source for the motors to create.
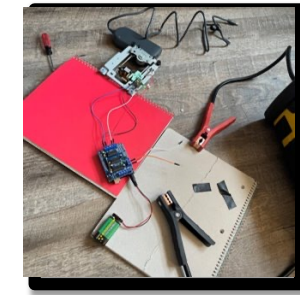
Figure 3: Setup
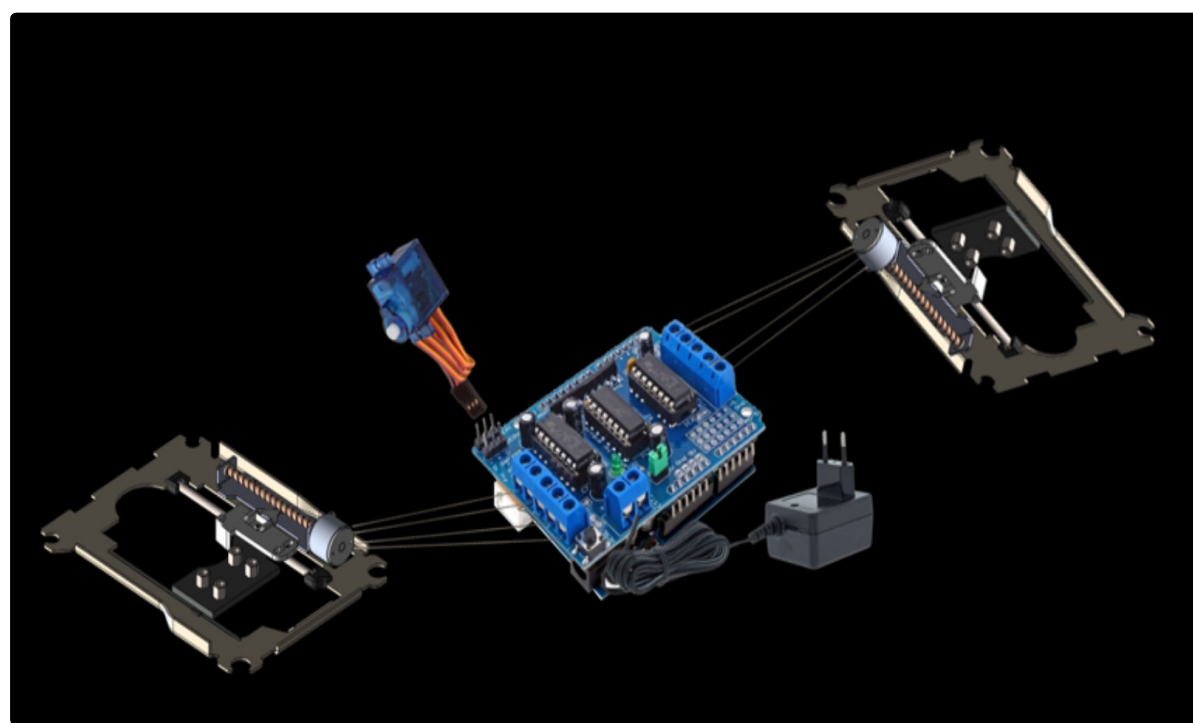
SYSTEM DESIGN

Motor Shield

By utilizing a motor shield the controller can precisely control input to motors for high precision.

Power Management
The power supply for this device is a simple power adapter of 12 volts output. That is sufficiently enough to power the three motors we have in the device as well as the controller itself.

Motors

The motors we used were recycled from old CD ROMS that were being unused, this allowed our device to have a low cost while also being beneficial to the environment of not wasting new material. They were small and efficient.

Tool Utensil

The utensil that was utilized in this design was a simple pen for the ease of access and long use that it provided, but this can be easily swapped out with another at the Customers desire. That is the main goal we wanted for this device was customizability. The customer is the one who decides what it will be used for.

Figure 4

Patient Device

Figure 5

3D Printed Parts
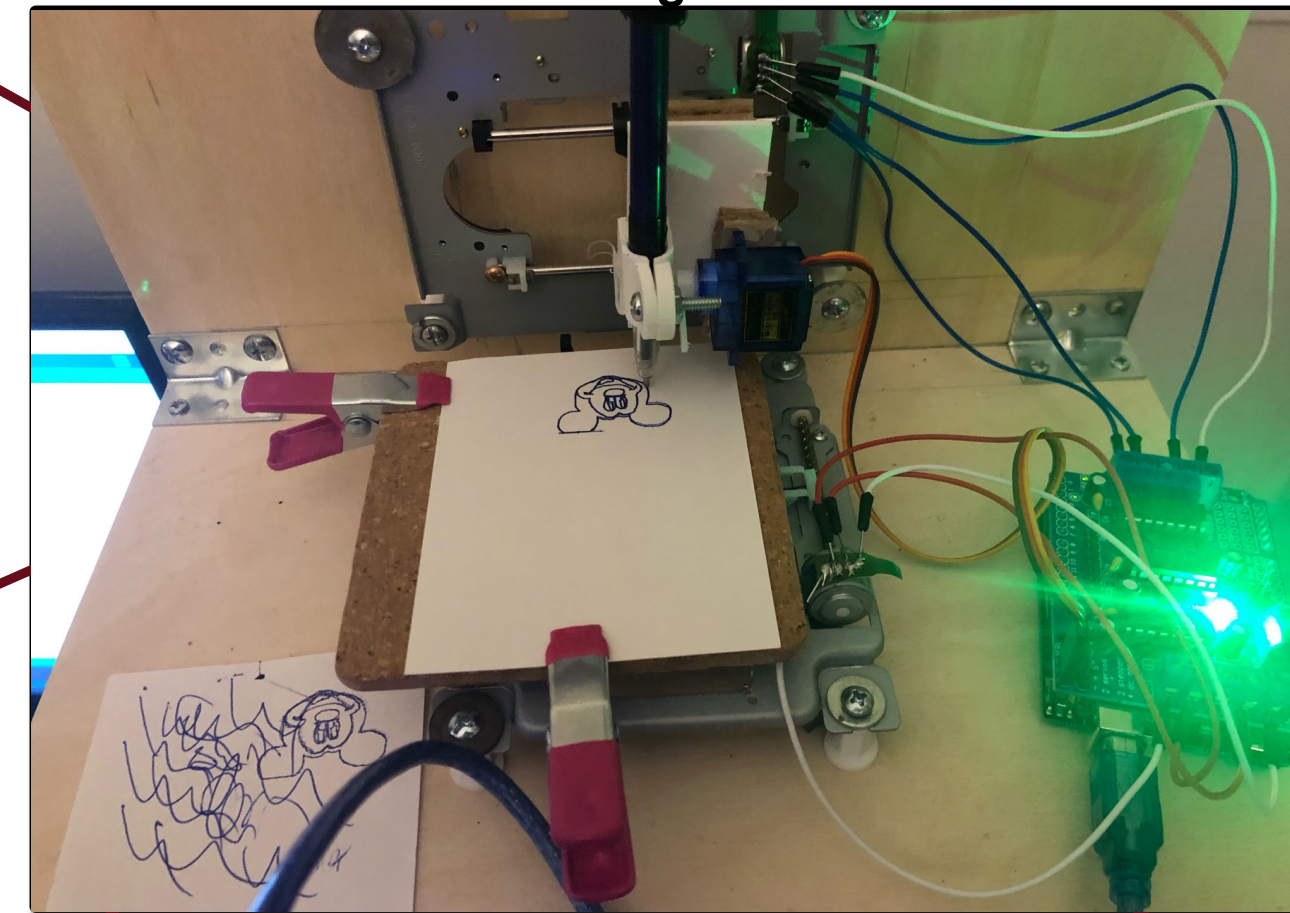
Arduino UNO R3: We used this microcontroller for its wide capability to use many different types of code and get a productive result with it. With 16MHz processor and 32kb storage it was perfect or our project.
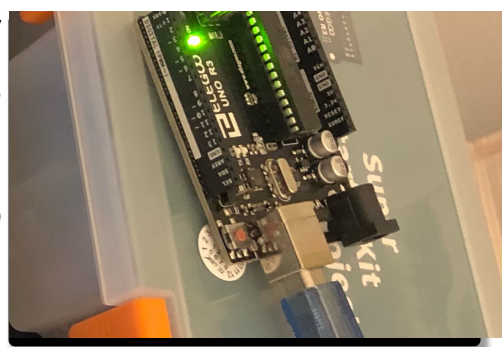
Tool Holder

The tool holder is a custom-made 3D printed device that can be adjusted to hold a variety of tools. Made of a durable plastic it will resist the test of time and will not break under prolonged use.
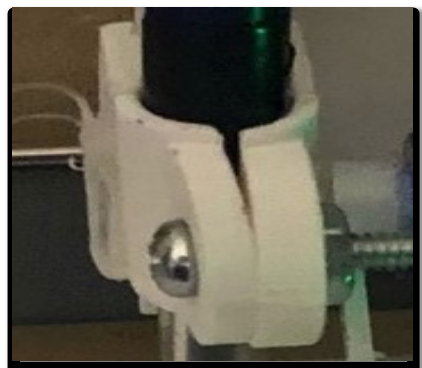
Frame and Housing

The frame is made out of a wooden sheet of plywood cut to a 4x5" area. This allowed for a durable and stable base.

Connection Device

The connection device used was an Arduino connected to a USB drive that leads to the computer of the customer. This allows strong connection and a trade of information for the code to be uploaded and used.

Price

Given that most of the parts we used were recycled or easy to come by the price for the device is very low. The board was the main price as well as the motors which achieved our goal of lowering the price.

FUTURE DIRECTION

- Expand device to include a larger surface area for workspace. Current is small and only useful for business card logos.
- Add a fan to decrease overall temperature buildup to allow for longer running time.
- Surround device in a protective material to prevent rogue operation and protect device. In addition, protect cables from outside interference.

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CONTACT INFORMATION

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