

Introduction

Previously sampling a snip of caudal fin was done by hand using sterilized paper punches or scissors to extract DNA/RNA and/or other physiological sample from individuals. This method is time intensive due to the required manual collection and does not scale with the desired number of samples.

Method

This introduces the 1st prototype for an automated sampling system called fin sniper which would be efficient, flexible, and resilient to withstand implementation in a hatchery environment.

The proposed system utilizes an image recognition algorithm that communicates with a CNC controlled Pneumatic punch to collect the fin-clip biopsy.

Working

A camera is used by the system's image detection algorithm to locate the closest point at the end of the fish's tail, and the method is built to produce (x, y) coordinates.

The punch attached in the z axis is then moved using these coordinates in accordance with the ones generated. The Rambo 1.4 board, which is specifically made to drive stepper motors coupled in the x, y, and z directions, is used by the CNC system.

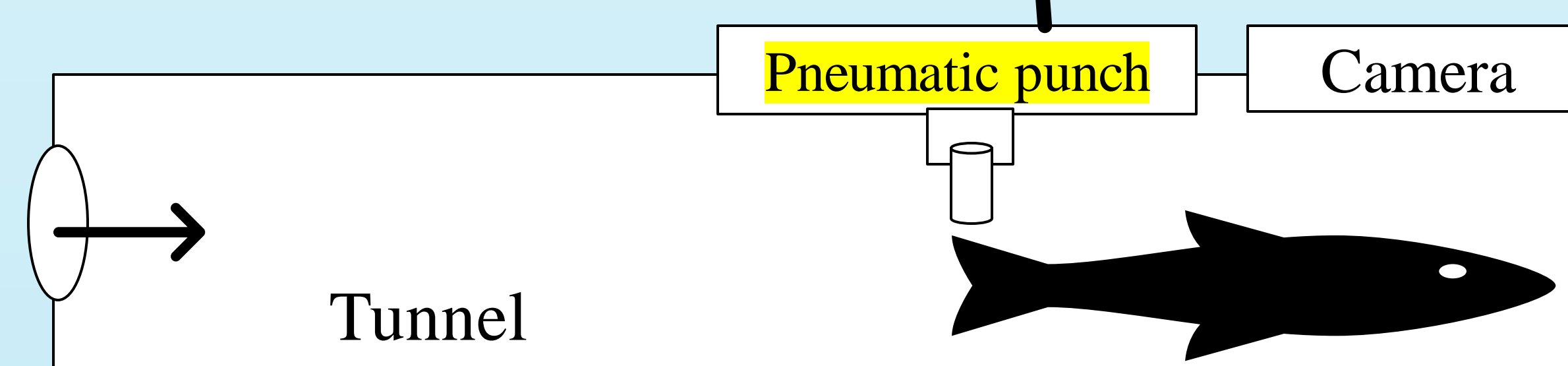
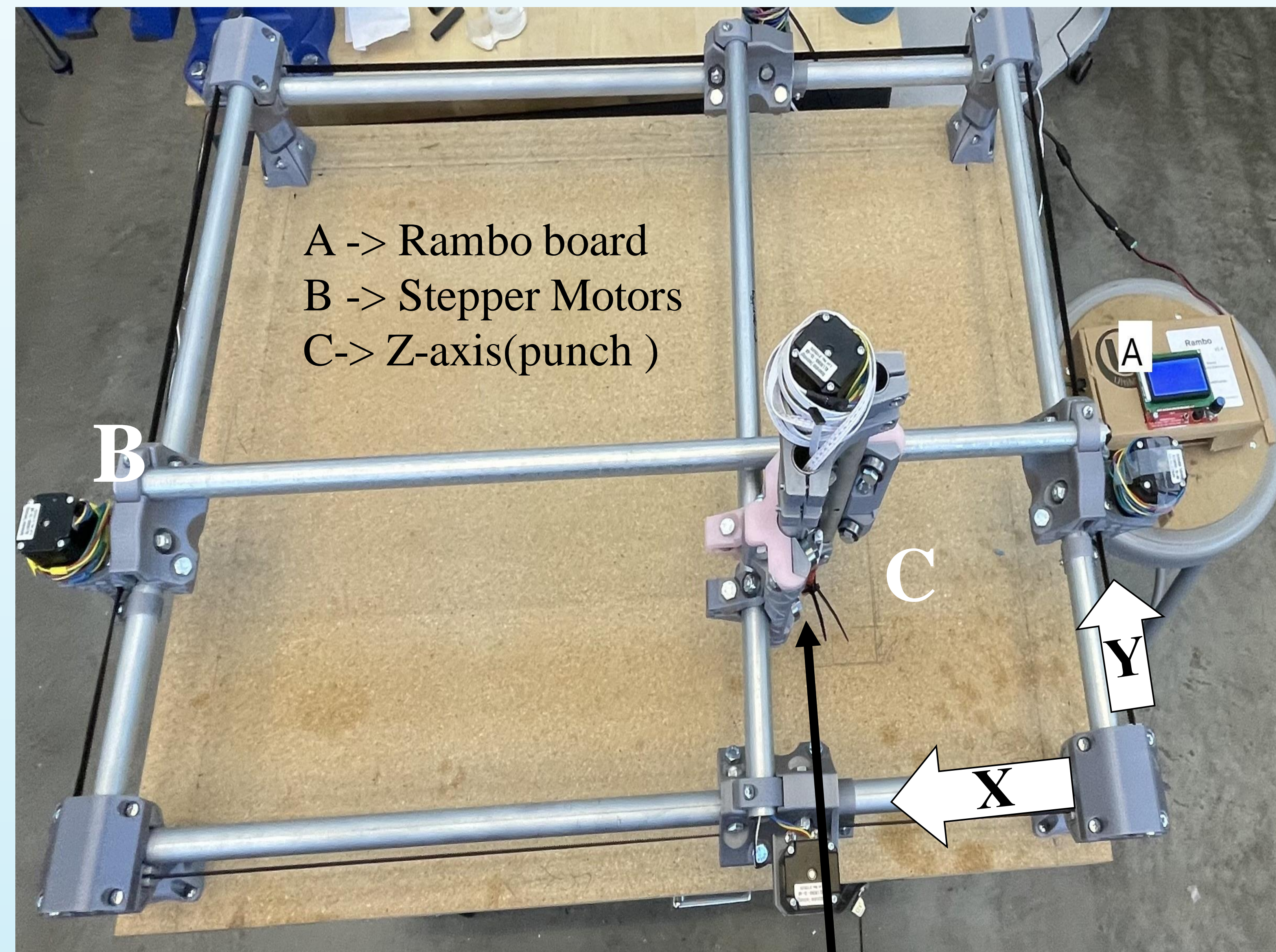
The processor on the Rambo1.4 (A) board is running Marlin firmware. This open-source firmware is typically used to power 3D printers and CNC machines for milling, drilling, and other operations.

This firmware was chosen since it accepts the g codes and contains an internal G-code library that can be readily modified.

The G-code language is used to program CNC (Computer Numerical Control) machines. This language is used to instruct machines on what to do and how to do it. The G-code commands give the machine instructions on where to move, how quickly to move, and which path to take.

Sample g code **G## X## Y## Z## F##** where f is the federate and x, y, and z are the cartesian coordinates.

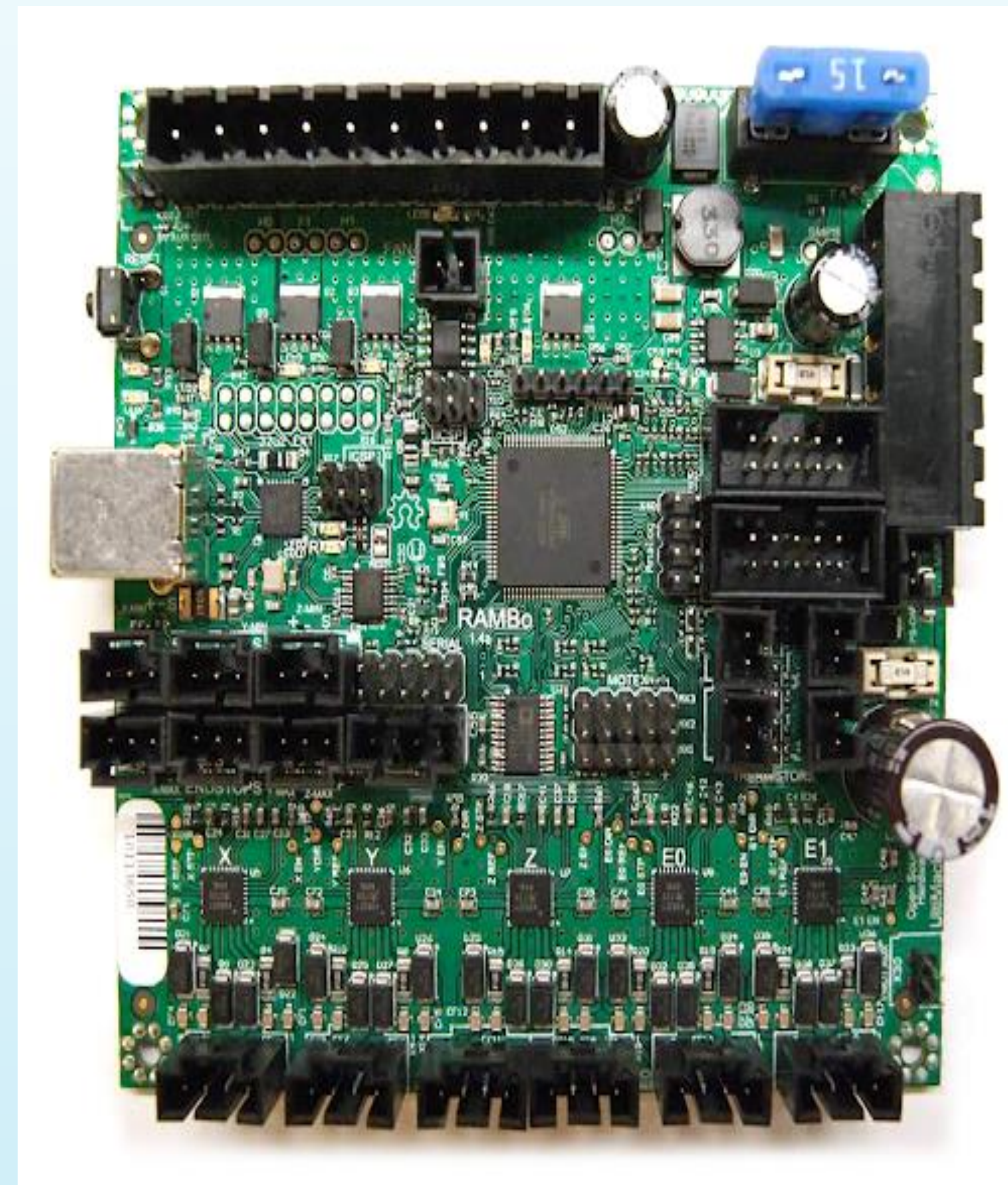
This G code assists in moving the punch to the specified X and Y coordinates.



Steps To Calculate Pneumatic Cylinder

- 1) First, we need to calculate the bore of the cylinder where bore is the round space where pressurized fluid lies and exerts force.
- 2) By using the formulae, we can calculate area of the cylinder as
$$(a) = \pi d^2 / 4$$
- 3) Based on the area now we can calculate the force using ,
$$force = area * pressure$$

Which is the key parameter to determine how efficient the punch works.



Rambo 1.4 board used to drive stepper motors and limit switches.

Future Works

To create water-tight housing and install metal detectors to find coded wire tags .

To design a system that will allow the punched-out component to be collected into a sample collection system.

To increase its sampling frequency to sample more fish in a shorter amount of time.

Acknowledgment

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