# CNC MACHINE (DRAWBOT)

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# ABSTRACT

To create a device capable of reading g-code corresponding to various 2D shapes and recreating them on paper with pencil, paper, marker etc. Even in the 21st century, there are many instances where hand written documents, letters etc. are needed. But this requires a lot of time and labor especially for lengthy articles. To make this process automated, we have used an ARDUINO based microcontroller specifically the ARDUINO UNO R3 along with A4988 stepper motor drivers to drive two BIPOLAR STEPPER MOTORS. We have two separate pieces of code, one on the ARDUINO UNO to control the stepper motors and take commands from SERIAL COMMUNICATION and the second reads a G-code file and translates it into commands for the Arduino to run the motors in specific manner through serial communication [1].

# INTRODUCTION

CNC is an acronym for Computer Numeric Control. CNC Machines are basically Computer Controlled Machinery. This “Machinery” is usually some kind of Motor or a whole system of Motors coupled with Rotary Drill, Laser Engraver, Hot-End filament extruder etc. The main aim of CNC Machines is to reduce Human Error involved in Machinery control by handing over control to a Computer which has been programmed to carry out specific repeated movements with the help of Motor along which feed-back control which makes certain tasks easier, automated and more precise and accurate. CNC machines are widely used in industry because they reduce human labour and increase production and efficiency [2]. But due to their functionality, they are also used in other fields such as workshops, wood engraving, 3D printing for hobbyists etc.

Our project is a simple 2D CNC Machine capable of reading a G-code file and sending commands over serial communication to an Arduino which converts transmitted signals to electrical signals suitable for driving two stepper motors which trace out the shape encoded in the G-code file. Basically, we are converting digital models into signals for a 2-axis arrangement of motors which can trace out lines or dots on a piece of paper.

The goal of the project is to create a cheap and functional CNC machine along with operating code capable of sketching out 2D images and texts on paper with basic writing tools such as a pen.

# Existing Similar Work

Such a simple 2D plotter is a common project for hobbyists, students, engineers etc. There are many different implementations of this idea that can be found on the internet.

Some examples are:

1. Plotter machines in Educational Institutions for blind students, handicapped and temporary fractured people which convert voice to text [3].
2. Small 3D printers made with 3-axis CNC machine attached with 3D printer pen or Hot-End Filament Extruder [1].

# FEATURES

Our CNC machine will have the following features:

1. Standard CNC machines made by hobbyists and students use already available CNC and G-Code Controller software. Our Aim is to create a custom program to run our CNC machine.
2. Two modes of operation. One for converting G-code into image on paper and another for controlling motor movements with arrow keys to use CNC machine like a mechanical pen.

References:

1. Patil, Sheetal N., and Prashant G. Patil. "Implementation of Arduino UNO based Two Directional [2D] Plotter."
2. Shivakumar, M., et al. "Robotic 2D plotter." *International Journal of Engineering and Innovative Technology (IJEIT)* 3.10 (2014): 300-303.
3. Pandey, Udit, and Swapnil Raj Sharma. "Model and Fabrication of CNC Plotter Machine." *International Journal of Advanced Research in Computer and Communication Engineering ISO 3297: 2007 Certified* 6.6 (2017): 336-337.