

CNC Using Arduino

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⁵Project Guide

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Abstract— A CNC machine or computer numeric machine is designed to control various machinery functions using computer programs. In this project, the machine is made such that the code made for it can be used to draw the outcome of that code. This concept is used to make logos, drawings and other artwork in real less time. Portraits and sketches can be made like as of an artist's masterpiece. All we have to do is make a code of that picture. Yes! So what we are doing in this project is that firstly, we need a picture in png. or jpeg. form and that picture's outline is converted into g-code (this can be done with the help of various apps that offers to do so. So the g-code is a program that will be used to run the CNC machine to draw that code's picture. We have already prepared some g- codes for our CNC machine, which includes the outline of a tattoo. We are using plain white sheets as a screen where the pen inserted in a machine can draw. The movement of this pen is controlled by the motors used for X, Y and Z axis (where these axes are instructed through the G- code). We are using 8mm motor for X and Y axis and one servo motor for Z-axis.

Keywords: CNC, Arduino

I. INTRODUCTION

CNC drawing robot is a special type of printer that uses a pen to draw letters on solid surfaces. In Computer Numeric Control (CNC), ARDUINO is used which is capable of processing logical instructions interfaced with a computer. The logical instructions are provided by using a computer in the form of code or text or image which is then transformed into a machine language by ARDUINO to be executed by the machine. A CNC plotter machine is a 3D controlled 2D plotting machines which uses a pen to draw text or image on any given solid surface.

It can be used for the purposes such as PCB Design, logo design, etc. This project is based on CNC plotter machine. With the increasing demand for the use of CNC plotters in universities and laboratories, a cheap and less complex design is an absolute need. The parts used for the plotter in our project are easily available at a very low price and spare parts are also used. CNC stands for Computer Numerically Controlled and basically means that the physical movements of the machine are controlled by instructions, such as co- ordinate positions that are generated using a computer. Digital image processing has become an functional as well as popular research area that goes from specialized

photography to several different fields such as astronomy, computer vision, medical imaging, among others.

The main goal of digital image processing is to improve the pictorial information .The area of digital image processing refers to processing digital images by means of a digital computer Effects such as refraction or poor focus can result in objects with boundaries defined by steady change in intensity.

So, there are problems of false edge detection, missing true edges, edge localization, high computational time and problem due to noise. In order to significantly reduce the complexity of image processing algorithms, edge detection is used as the pre- processing step which helps in reducing the amount of data to be processed.

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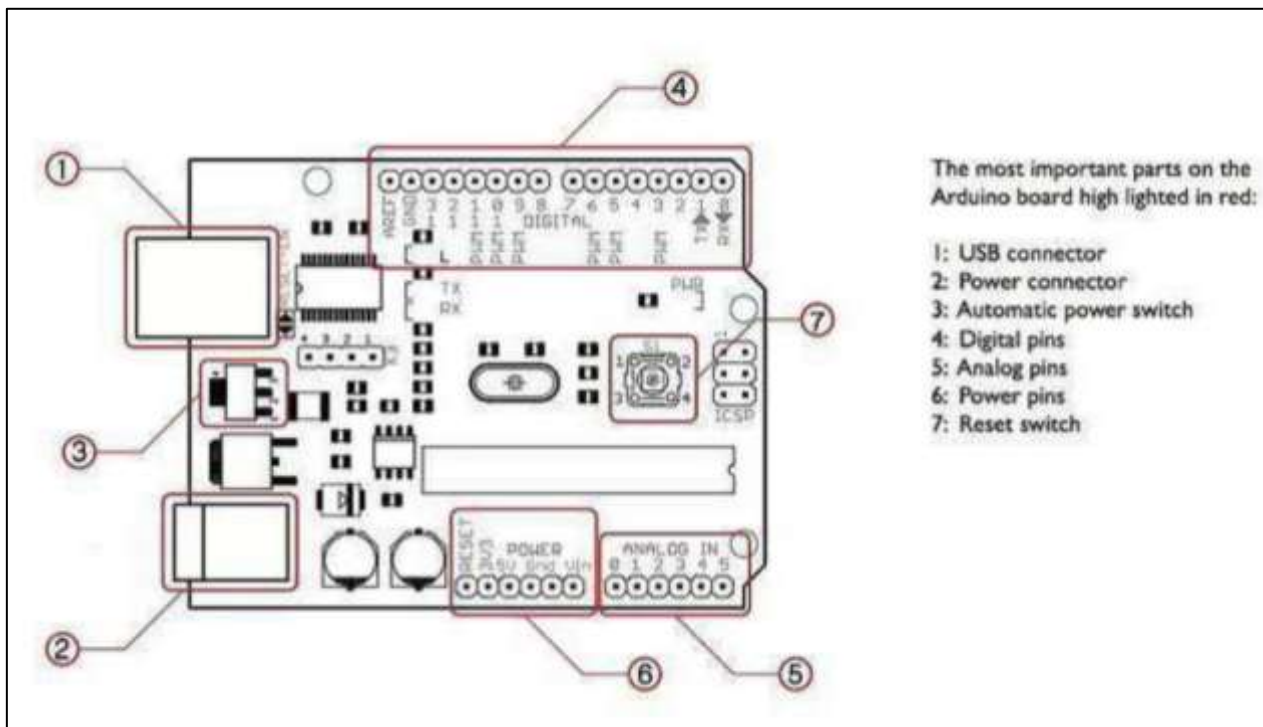
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Therefore our objective is to compare and analyze the performance of various edge detection techniques based on various parameters like role, type of edge, nature and edge. Digital image processing has become an functional as well as popular research area that goes.

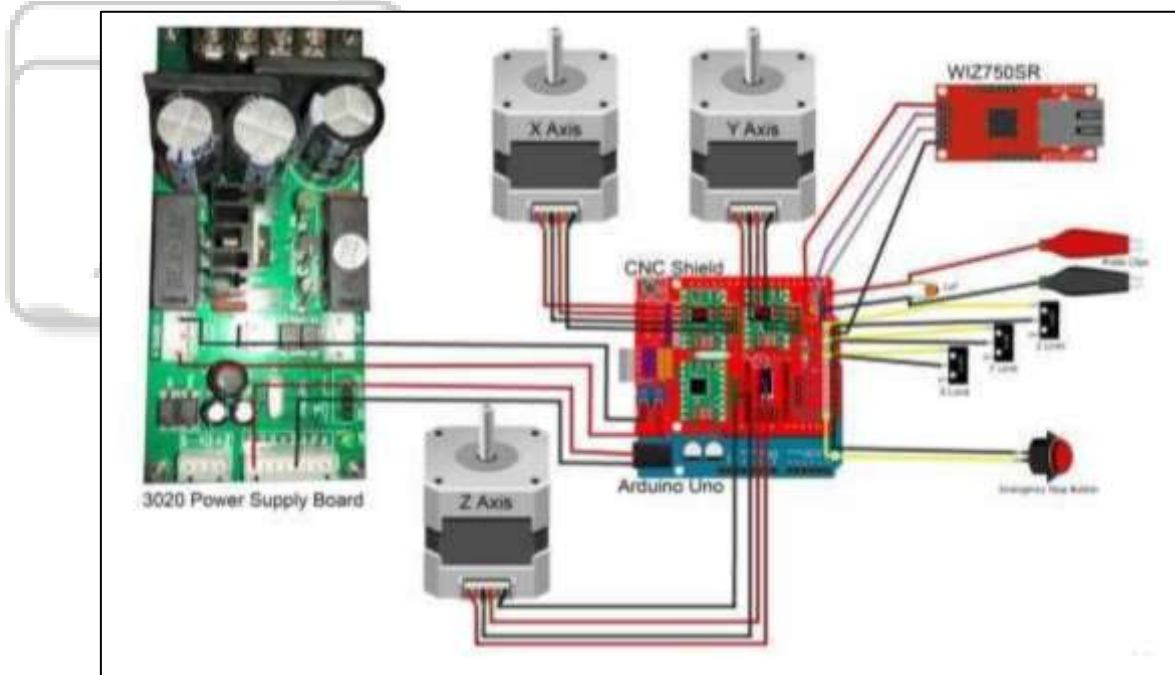
II. THEORETICAL FRAMEWORK

A. Arduino UNO REV

The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.



B. Detailed Design of the Project

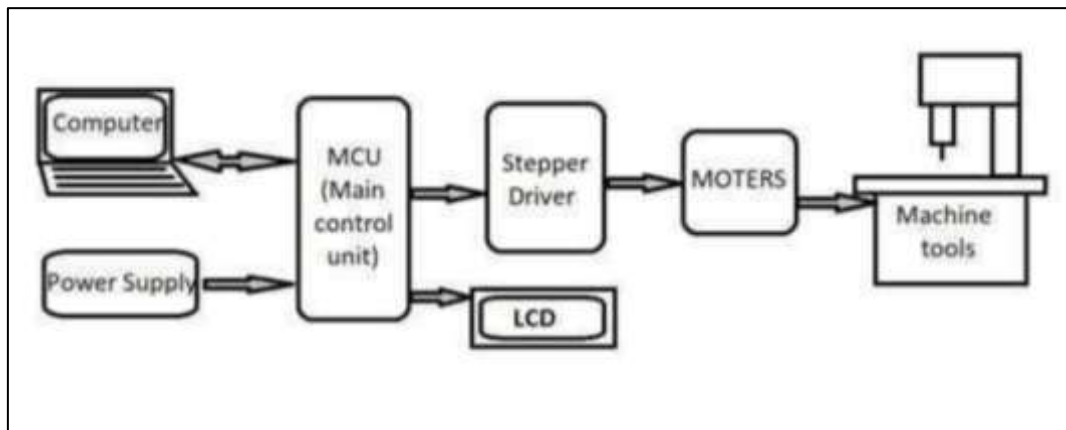


III. IMPLEMENTATION OF DESIGN

The frame of the CNC machine is made using MDF wood to reduce the project cost. Holes are made in the appropriate places to fix the stepper motors. Our machine has three axis X, Y and Z. X and Y are placed perpendicular (90 degrees) to each other. Z- axis controls the lifting and lowering of the DC motor. The smooth rod helps to slide the assembly whereas threaded rod is used to transfer the motion from the stepper motor to the assembly.

It is a DC motor which consists of multiple coils that work in an organized manner to move once at a time to get more accurate positioning. Connect the GRBL shield to the Arduino Uno board. GRBL shield which is used to control the stepper motors using Arduino platform. Once all the connections are done upload the firmware to the Arduino board using X Loader. Now with the help of Universal Gcode sender, you can able to give the inputs in the form of G-codes and M codes.

IV. BLOCK DIAGRAM



V. WORKING

G-code can be made by using the software as we need Inkscape or converting our figure into the 2D G-code. you can also use other software to make G-code like Mak3Mill, CAMotics, etc. We also need a G-code sender software, in this project, I am using processing-3 software for print a G-code in the board, also you can use another software Like Google G-sender.

In this project, we need some basic equipment like a laptop, cables and some software. This machine can draw any 2D figure by converting any 2D image or file into G-code (geometrical-code).

A. Hardware Requirements

- 1) ARDUINO UNO
- 2) L293D
- 3) 16PIN IC BASE
- 4) SERVOMOTOR
- 5) STEPPER MOTOR
- 6) 4PIN RELIMATE MALE/FEMALE CONNECTOR
- 7) SOLDER WIRE & SOLDER FLUX
- 8) BOLT 1.5 INCH
- 9) USB CONNECTOR
- 10) DVD READER

B. Software Requirements

- 1) UNIVERSAL Gcode SENDER
- 2) ARDUINO IDE

VI. PROBLEM AND SOLUTION

A. Problem

- The result of this research is prototype of arduino uno CNC machine that can create and print pattern or drawing design.
- The main purpose of this research is to design and make prototype of CNC machine which can work for both mass and job production.
- With this machine, it is expected to provide solutions for paper cut craftsmen so that design / pattern is not done manually.
- The research method used in this thesis is descriptive method.

B. Solution

- CNC machine is a complex machine, by using arduino the work gets easier.
- Small objects such as company logo, 2d drawing and some other clear images can be done with this machine.
- High skilled labour is not required.
- Its structure is simple and compact and it is portable.

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