Automatic Writing & Drawing Machine

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Abstract: *Nowadays more and more individuals are turning to robots to do their work, because robots are more versatile, accurate, and reliable and also reduce human efforts. Robotic arms are programmed robot with similar function of a human arm. Aim of our project is to develop a robotic arm which helps the physically handicapped person to write. The mechanism is programmed with speech recognition system and makes the user to write what he speaks. The robotic arm is programmed to write down the words that patient or individual pronounces to the microphone. To perform the writing operations, the robotic arm will be fitted with a pen. It can also make you draw small sketches. It will be a low cost device that can be programmed to enable the people who are physically challenged to write. This paper describes the basic design of automated writing arm..*

Keywords: Arduino UNO, CNC Shield Board, Servo Motor, Stepper Motor, Motor Driver, G-Code File

I. INTRODUCTION

The design and development of a CNC (Computer Numerical Control) writing and drawing machine using Inkscape, a popular open-source vector graphics software, involves several key steps. This paper presents an overview of the process, which includes defining requirements, selecting components, designing the mechanical structure and electronics, assembling and testing, developing software with Inkscape integration, fine-tuning and optimization, incorporating safety features, documenting, manufacturing, and conducting testing and quality control.

The advent of computer numerical control (CNC) technology has revolutionized various industries by automating and enhancing the precision of manufacturing processes. One such application of CNC technology is in the field of writing and drawing, where CNC writing and drawing machines have emerged as powerful tools for creating intricate and precise designs, illustrations, and calligraphy. A CNC writing and drawing machine is a computer-controlled system that uses motors and actuators to move a pen or a stylus across a surface, replicating digital designs onto paper, canvas, or other materials. These machines are capable of producing high-quality artwork, precise lettering, and complex patterns with exceptional accuracy and repeatability, making them ideal for artists, designers, architects, and hobbyists alike. The design and development of a CNC writing and drawing machine involve various key components and considerations, including the mechanical structure, control system, software, and materials used. The machine's mechanical structure typically includes a frame or chassis, linear motion systems, a pen holder or stylus assembly, and a surface for drawing or writing. The linear motion systems, such as stepper motors or servo motors, are responsible for controlling the movement of the pen or stylus in the x, y, and sometimes z directions. The control system of the CNC writing and drawing machine typically consists of a microcontroller or a computer, which processes digital commands and translates them into motor movements. The control system communicates with the motors, which drive the pen or stylus across the surface according to the instructions received from the software. The software used in CNC writing and drawing machines is a crucial element that allows users to create, edit, and send digital designs to the machine for execution. This software may include (INKSCAPE) programs for creating designs, and (G-CODE) software for generating tool paths and controlling the machine. Some CNC writing and drawing machines also have built-in software that provides pre-loaded designs or allows for importing designs from external sources. The materials used in CNC writing and drawing machines can vary depending on the desired output. Common materials include paper, canvas, cardstock, fabric, and wood. The machine's capabilities, such as pen pressure, speed, and precision, can also be adjusted depending on the type of material being used.

Problem Definition

The present open record for every one of the exchanges and that at any point occurred in the system, the development is steady and the extent of the system likewise develops in parallel. The record is ethical and can without much of a stretch convey on the arrangement of substances of the entire framework surrendered to the lack of interest. Homework composing machine is an auto composing machine through which you can make your work simple by programmingyour venture. According to the title this is a straightforward task utilizing Arduino to make Homework composing machine at your home. This machine can draw any outline and compose any sort of fonts. You can see sharpness and flawlessness of writing in photographs. The machine utilizes a gantry to move the composition tip along the X on an and Y tomahawks. The flexible-nib pen is mounted servo engine which turns the tip onto the composition surface, dealing with the third hub.

Goals

This machine-controlled writing and drawing device is employed to save lots of the wastage of your time.

There are heaps of machine-controlled drawing machines. However, this is often helpful among all.

By this we are able to build the notes in our own handwriting simply by giving the input to the machine. we do not have to be compelled to waste a lot of time by sitting ahead of the work

This machine is able to draw and write the assignments and different hand written notes in our own handwriting • by this we are able to save our time.

II. LITERATURE SURVEY

GAKKEN a Japanese company that was started within the year 1946 developed the massive mechanical hand. The GAKKEN automotive vehicle writing machine comprises a hand after you stick a pen to its holder can write the characters. an enquiry is to use Associate in Nursing autopen for writing in easiest method. The automotive vehicle author works by having a tough disk for storing an oversized quantity of information and 3 plates that rotate and caught by 2 sliders that then pull the spring loaded hand to draw the need form. In this section, we summarize the most relevant existing research are - [1] XY Plotter is entirely different from the older CNC Machines. It is capable to write and draw the critical structures with the exact output. [2] Plotters are simple mechatronic systems with two degrees of freedom in the XY plane. Not only the pen plotters, but also cutting plotters, die-cut machines, welding machines or 3D printers use the same basic architecture. [3] Recently it has become important to focus on the requirements of the system and how to take them and analyze them to determine the system infrastructure through which they will be relied upon in the rest of the system building. [4] Text extraction is an important phase in document recognition systems. In order to differentiate text from non-text objects, it is necessary to detect all possible text regions in the document. [5] This low cost drawing bot is an embedded system which Works on the basis of Computer Numerical control. This paper deals with the design, implementation and analysis of a low cost drawing robot for educational purposes. [6]The paper presents an approach to design user friendly and fluid movements of CNC machine to perform writing tasks.[7]The Automatic Writing Machine is a device which helps the physically handicapped people to write, as they face difficulty in physical writing on paper. [8] Nowadays more and more individuals are turning to robots to do their work, because robots are more versatile, accurate, and reliable and also reduce human efforts. Aim of our project is to develop a writing machine which helps the students or office workers to write. [8] Parallel Manipulator is one of the trending research topics in the field of robotics. Recently, the 3-RPS parallel manipulator is widely being used for novel applications.

III. METHOD OF DISEASE DETECTION

A fundamental tenet of CNC machines is that all of the motors can be managed by a computer via software. In this study, a machine that has been constructed features three motors, including one servo motor and two stepper motors. The stepper motors' job is to divide a whole rotation into a number of equal steps for the XY plane. as a tool for

precisely altering the pen's angle. Motion of the stepper is managed by motor drivers (A4988).Servo motors are controlled by motors and microcontrollers. Two wooden components serve as the Xmounting axis's points, allowing it to function as a vertical cutting and construction tool. The Z-axis is free to move along the 2D plane, while the Y-axis is positioned horizontally with regard to the plotter base. The pen is grasped by a servo motor to move up and down in the Z-axis (X-Y).

Algorithm

The G-Code file created by the assistance of Inkscape Software then the process code is employed to send the GCode file to the Arduino controller unit (via USB) then The CNC protect drive send the dominant signals to the stepper motors and servo motor. Currently the sex chromo some axis that operates as follows by the directions given to the controller unit.
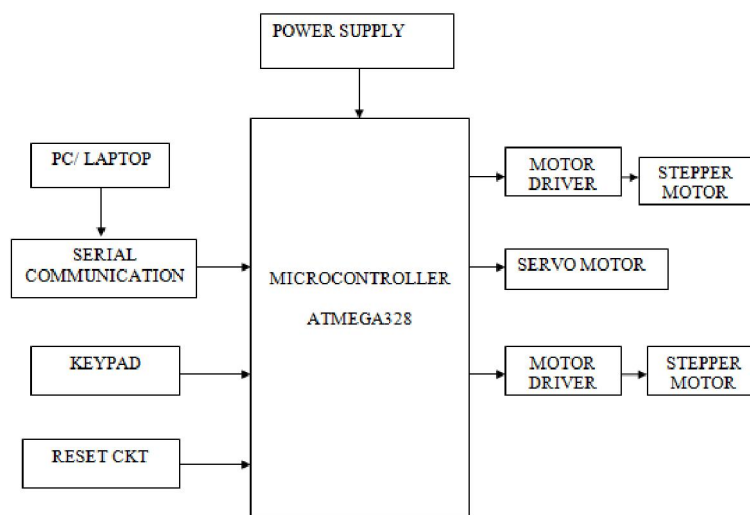

Fig. 1. Block Diagram

As shown in the block diagram of the automatic writing machine (AWM) it represents the working process of AWM. The laptop or pc is connected with Arduino with help of USB cable and Arduino connected to the motor driver and act as an input. Its pass the signal to the motor driver and motor driver give the signal to stepper motor. The stepper motor is place in linear position for moving the direction of X & Y.X movement left to right and Y movement forward and backward direction, servo motor is gives the movement of pen or marker up & down.

Arduino Uno

Arduino/Genuino Uno may be a microcontroller board supported the ATmega328P (datasheet). it's fourteen digital input/output pins (of that half dozen may be used as PWM outputs), half dozen analog inputs, a sixteen MHz quartz, a USB association, an influence jack, associate ICSP header and a push button. It contains everything required.

to support the microcontroller; merely connect it to a laptop with a USB cable or power it with a AC-to-DC adapter or battery to urge started you'll be able to tinker together with your UNO while not militant an excessive amount of regarding doing one thing wrong, worst case state of affairs you'll be able to replace the chip for some greenbacks and begin another time0.

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ISSN
2581-9429
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DOI: 10.48175/568

Fig. 2. Arduino Uno

CNC Shield

This growth board as a driver growth board may be used for engraving machines, 3D printers, CNC. It's a complete of 4 slots, will drive four A4988 stepper motor. Every road stepper motors solely would like 2 IO ports. In alternative words, six IO ports may be well managed 3 stepper motors. • A4988 motor driver: The A4988 may be a complete micro stepping motor driver with inherent translator or straightforward operation. it's designed to work bipolar stepper motors in full-, half-, quarter-, eighth-, and sixteenthstep modes, with Associate in Nursing output drive capability of up to thirty-five V and ±2 A.
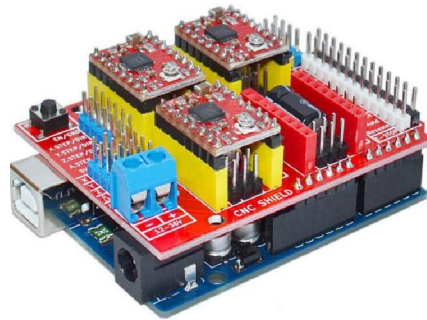

Fig. 3.CNC Shield

Servo Motor

HC-A servomotor is a actuator or linear actuator that permits for precise management of angular or linear position, rate and acceleration. It consists of anappropriate motor coupled to a detector for position feedback. Servomotors square measure utilized in applications like AI, CNC machinery or machinecontrolled producing.
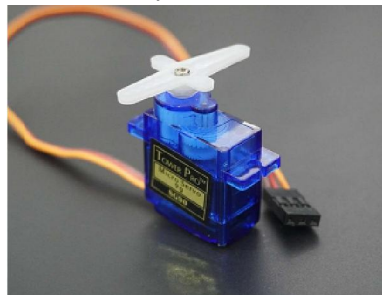

Fig. 4.Servo Motor

Stepper Motor

The stepper motor is a magnetic attraction device that converts digital pulses into mechanical shaft rotation. Benefits of step motors area unit low price, high liableness high torsion at low speeds and an easy, rugged construction that operates in nearly any atmosphere.

Fig -5: Stepper Motor

Flowchart

The input text is transformed to G-code using Inkscape, and then sent to the microcontroller using the Universal G-code Sender. The 'G-code tools' extension of the Inkspace software can be used to transform the image content into G-code. To feed G-code into the microcontroller, utilise a universal G-code sender. Using the Arduino IDE software, upload the appropriate module's sketch to the Arduino board. To be able to control the movements of the X-Y Plotter, pair the Universal G-code sender and microcontroller.
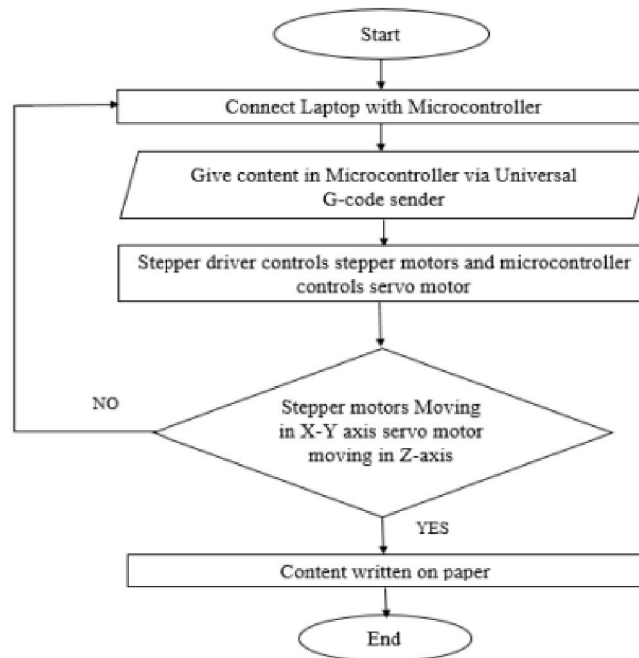

Fig. 6.Flowchart

IV. CONCLUSION

This project involves the creation of a portable writing and drawing device that has two axes of motion (X and Y), and uses a servo motor to control the movement of the pen in a vertical direction (Z axis). Stepper and servo motors are used to produce its output, and G-code, the only code that can comprehend a CNC machine, is crucial to the machine's smooth operation. This conversion is made simple with the aid of the Inkscape software and Universal G-code Sender. This code conversion is delivered to the microcontroller, which then instructs the motor drivers to move in accordance with the task. The data is then plotted using the pen in accordance with the task. It will eventually be usable by people for writing and drawing tasks. Plotter components with a similar level of accuracy can be used to obtain precise coordinates and locate the pen more quickly and accurately. The design and development of a CNC writing and drawing machine requires a multidisciplinary approach, involving mechanical, electrical, and software engineering principles. The methodology involves defining design objectives, designing the mechanical structure, selecting appropriate motors and control system. developing software for INKSCAPE/G-CODE, material selection and preparation, assembly and integration, testing and validation, documentation, and continuous iterative improvements. A well-designed CNC writing and drawing machine can offer a precise, accurate, and efficient solution for creating artwork, designs, and calligraphy with consistent quality.

ACKNOWLEDGMENT

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ISSN
2581-9429
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DOI: 10.48175/568

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ISSN
2581-9429
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DOI: 10.48175/568