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A Real Time Design and Development of Pen Plotter Machine for Authentication System and Signature Plotting

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Abstract - *This project describes a serial communication based CNC Pen Plotter Machine based on software and hardware for signature making based on Fingerprint authentication system and signature of the authentication person. Mini CNC Plotter Machine is an embedded system that works on the Principle on 'Computer Numeric Control (CNC)'. The system basically works with three stepper motors (two for X-axis & one for Y-axis) and micro-servo motor (for Z-axis). Where in Arduino Circuit plots the input given from the computer through 'ENSCAPE Software' on the sheet which is placed on the drawing board using raspberry pi 3 model B. The plotter has four axis control (2 X-axis and 1 Y& Z axis resp.) and a micro-servo motor for movement of pen. This system reduces human effort and also reduces the chances of error. The efficient and correct mounting of all the parts and proper use of software and correct alignment of circuit makes the system more efficient.*

Key Words*: Computer Numeric System (CNC), Servo Motor, Raspberry Pi 3 model B, Fingure Print module.*

1. INTRODUCTION

This project is about to design and to save the signature of any person in the database of the module which will be start printing as per the user thumb authentication system. This technology will help the disable person for giving signature as per their thumb impression. This technology based on CNC machine pen plotter system. Introduction to plotter: In today's world the basic requirement of any industry is to produce large quantity and quality products with low production and installation cost having high surface finish and great dimensional accuracy. So this can be achieved by a machines which are controlled by computer i.e. Computerized Operated Machines. They are basically known as CNC machines. By using a CNC machine the products are produced at a faster rate with high accuracy and less human interference. The CNC machines usually are of various types. The most common used CNC machines use two-axis CNC machine and three-axis CNC machine. The CNC machine is a system. This system consists of three important parts viz. Mechanical design, Drive modules, and system software. The mechanical design consists the body of the system. The drive modules consists of the raspberry pi. And finally the System Software is used to generate the drawing on the sheet. Mini CNC plotter Machine is the automation of machines that are operated by precisely programmed commands. The main function of CNC plotter is used for plotting various drawings of products. The working principle of CNC plotter is very similar to CNC machine. In this system instead of plotting the drawing of product by hand, it is plotter by a computer controlled pen. It produced a high quality work as compared with the human work. Automation and precision are the main advantages of CNC plotter table. In this project we will show how to build your own low cost mini CNC plotter. The printing area will be restricted to 400*400mm, because it works on serial communication.

2. LITARATURE REVIEW

"Low Cost Computer Numeric Controller Using Open Source Software and Hardware". Muhammad Yaqoob Javed, Sayyed Tahir Hussain Rizvi , M. Amer Saeed, Kamran Abid, Osama Bin Naeem, Adeel Ahmad, Kamal Shahid[2015]

This paper will present the design and fabrication of Laser Powered 3axis computer numerically controlled(CNC) machine which comprise the use of a graphical user interface(GUI) and Arduino micro controller to produced pulse width modulation(PWD) outputs in order to run the stepper motors that will be used in this work have heavily increase a passion in future studies on the design of body structure that can holds an electrical and electronic platform with a cooling system hence in this project the temperature of stepper motors and easy drives in increasing after an 90 minutes of running condition while cooling would help to increase reliability term performance.

"A Literature Review on Machining Of Different Materials with CNC". Er.Manpreet Singh, Er.Sanjeev Verma, Dr.Sanjiv Kumar Jain [2014].

The reliability of any automated fingerprint based recognition system strongly relies on the precision obtained in the extraction process. Extraction of appropriate features is one of the most important and also difficult tasks for a recognition system. There have been many algorithms developed for extraction of both local and global structures. Most algorithms

"Metrological Control of Selected Surface Types of A Mechanical Part By Using on-Machine Measurement System" Michal OMAMIK, Ivan BARANEK [2011].

Has proposed the CNC control for machine centres with learning ability and automatic intelligent generating of NC program on the bases of a neural network which is built in into a CNC unit of a special device , this neural network is used for mining drilling threading operation alike has learned to generate NC program which is part of CAM system.

3. OBJECTIVES

The objectives of this project is to design and implement a CNC plotter machine which will be able to draw a signature of any person by using authentication system on a solid surface.

4. METHODOLOGY

As per the block diagram the fingerprint module will scan the user thumb and find the authentication for digital data processing by the Raspberry pi 3b model . After authentication the processor will display the status of the system and give command to the servo Motor to process the writing the command to the device. Here we are about to use raspberry pi 3 model B for data processing and control of the system.

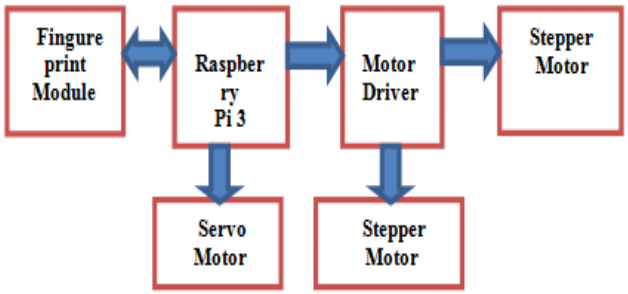

Fig.1 Block Diagram of Pen plotter

5. WORKING

The main components used in block diagram as given below.

5.1. Fingure print module

Finger Print Sensor (R305) -TTL UART is a finger print sensor module with TTL UART interface. The user can store the finger print data in the module and can configure it in 1:1 or 1: N mode for identifying the person. The finger print module can directly interface with 3v3 or 5v Microcontroller. A level converter (like MAX232) is required for interfacing with PC.

5.2. Raspberry pi 3 model B

Fig.5.2 Raspberry pi 3 madel B

The Raspberry Pi 3 Model B is the third generation Raspberry Pi. This powerful credit-card sized single board computer can be used for many applications and supersedes the original Raspberry Pi Model B+ and Raspberry Pi 2 Model B. Whilst maintaining the popular board format the Raspberry Pi 3 Model B brings you a more powerful processer, 10x faster than the first generation Raspberry Pi. Additionally it adds wireless LAN & Bluetooth connectivity making it the ideal solution for powerful connected designs.

6. SCHEMATIC ARRANGMENT

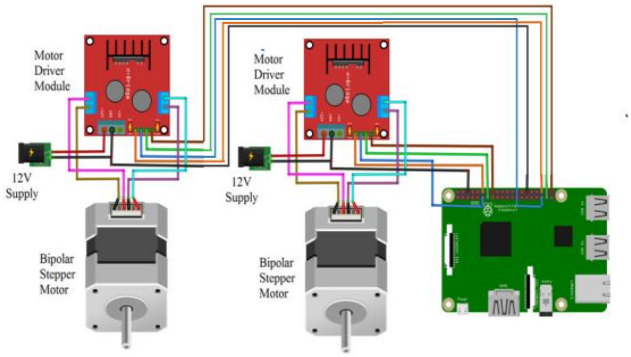

Fig.6.1 Circuit Diagram

7. SOFTWARE AND CODDING

- **Language :**
  - Python

Why? Python is an interpreted high-level programing language or general purpose programing. Python syntax is very clean, with an emphasis on readability and uses standard English keywords. Start by opening IDLE from the desktop.

8. HARDWARE IMPLIMENTATION

A. Mechanical Design Of Cnc Plotter

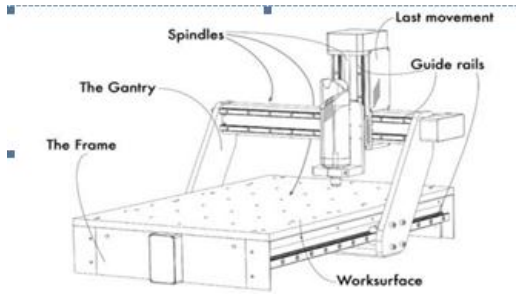

Fig 8.1 setup of mini cnc plotter

B. Components Required

- Stepper Motors (2 Pieces)
- Servo Motor
- USB To TTL Converter
- Fingure print module (R305)
- Motor Driver module
- Pen

C. Mechanical Body Discription

- **Fingure Print Module :-**The USB adapter is labeled, but the fingerprint sensor cables are not. However, the cables have a clear colour, which we can identify and connect to the USB converter. We only need four cables.
  - **Red**: Depending on the accepted voltage of the sensor(3.3vor 5v)
  - **Whight**: RXD
  - **Green**: TXD
  - **Black**: GND
- **Servo Motor :-** This servo motor is placed in z- axis for the up and down movement of the pen Servo motor have three pins, power (+5),ground, and a signal pin. Connect power pin of the servo motor to +5v pin in raspberry pi 3 model B **.** Connect the servo signal pin with raspberry pi's **GPIO** pin 17. Servo motor consumes more power.

Fig.8.2 Servo Motor

- **Motor Driver Module :-**

Raspberry pi transmit the converted pwm signals to the input pins of motor driver then this driver give command to the stepper motor and stepper motor start rotations in forward and backword direction. This motors connects with x and y axis. As shown in fig 5. below.

D. COMPLETE CNC PLOTTER

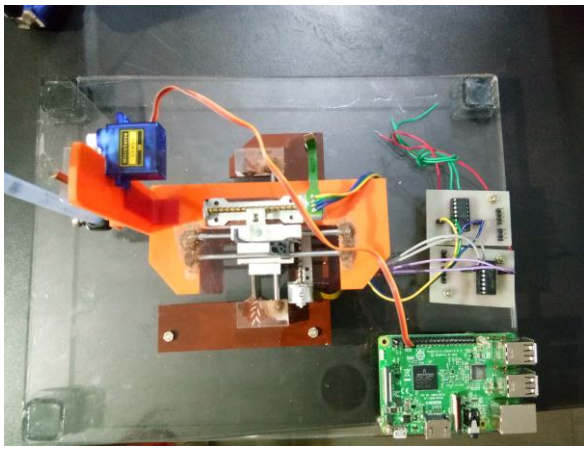

Fig.6 Complete CNC Plotter Model

9. RESULTS AND DISSCUSION

Using mini CNC pen plotter machine I am able to draw signature of any disable person by the fingerprint authentication system on a solid surface .

10. FUTURE SCOPE

- Design optimization of Geneva mechanism for internal combustion engine application.
- Bottel Indexing and Filling Mechanism.
- It can be used in pen Changed Mechanism in plotters.
- It has a great scope in automated sampling industries.

CONCLUSION

As per result oriented we can complete abstract a serial communication based CNC Pen Plotter Machine based on software and hardware for signature making based on Fingerprint authentication system and signature of the authentication person. Mini CNC Plotter Machine is an embedded system that works on the Principle on 'Computer Numeric control (CNC).

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