

Voice Based 2-D Text Plotter

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Abstract

This paper constitutes the usage of Arduino Uno and motor driver Integrated Circuits enabling the user to plot any text, image or graphic on a 2- dimensional solid surface. The overall purpose of the study was to design a device that supports the disabled community to effectively write on a 2D surface. The main research problem pertaining to this paper was to make a low -cost plotter with maximum accuracy. The idea behind this research was to help the community of over 12 million disabled people in India. Out of them, about 0.11 million are total amputees(people with below elbow limb loss). Using this 2D text plotter, one can easily pen down their thoughts, declarations, or even answer sheets during examinations. Traits of the research show that the cost of the plotter is too high for numerous of these amputees. Thus, it becomes a significant task to make the plotter affordable. The evidences from previous research proved that there exist few plotters that assists in writing the given text on a paper instead of printing it. The unique implementation made on this plotter was to use Google Text-to-Speech along with the Arduino Uno to make it a more easy-to-use device.

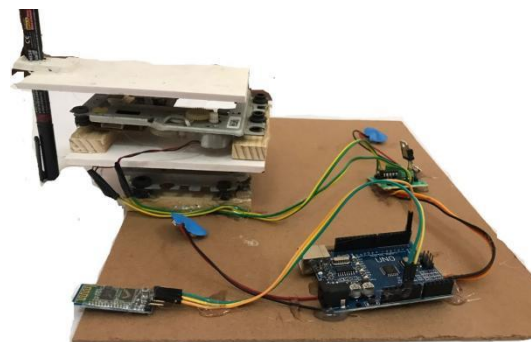
Introduction

The involvement of technology in education is pretty common nowadays. But, the cost of implementing this technology is quite expensive. Computers, softwares and the interface available between the softwares and hardwares has given education a boom like never before. There was a period when visualization and verification were extremely difficult tasks to execute. Low-cost robots are of a huge potential and can serve a lot of purpose to education. The basic use of plotters is to generate digitally controlled 2D plots. The upgraded edition of this 2D plotter machine can use the different lasers. These laser sources can

help it cut materials of varied strengths in 3-Dimensional plots. The job of the 2-Dimensional plotters is to record and plot 2-dimensional information on a rectangular coordinate system. It is basically a 3-dimensional controlled 2D device that use a pen or marker for drawing image or type on any solid surface. G-code programming is used for the CNC machine. The G-Code function makes the capable of doing certain operations like moving at various points at a speed desired by the operator, controlling and adjusting the speed of the spindle and turning on and off the machine at several positions as per the operator's command. Meanwhile, easy-to-control functions of the Arduino system helped heavily on simplifying the circuits in microcontroller.

Modelling

The idea was executed with sheer perfection and the model of the text plotter was made. The modelling was done using the CAD software which is commercially available. The described 3D model of the low-cost plotter is in fig 1.

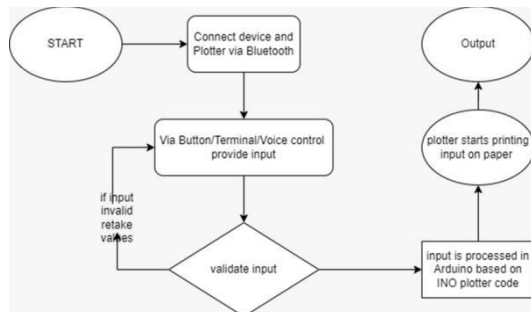


This model constitutes of 3 degrees of independency to move. The pen attached to the plotter can move upwards and downwards following the Z-axis. It can also move along 2-Dimensional plane axis(X-axis, Y-axis). The

servo motor provides the impetus to the pen to move in upward and downward direction. The entire setup comes with a base enclosing the circuits. The base system initiates the plotter to move in X-Y direction. The motor carry the pen which is attached to the base. In total, there are two bi-directional motors. The first one helps in the movement towards X-axis and the second one towards the Y-axis.

Methodology

A separate program is used to upload the coordinates to the machine controller. The software helps in converting the image files into the G-codes. The transformed G-code is transferred to microcontroller that instructs the motor to draw/plot text on solid surface. The machine consists of total three motors to implement the three axis of the coordinate plain. The servo motor will be fixed along the Z-axis for proper positioning of the pen or marker. The pen will move up by the logic '0' and move down by the logic '1'. The positioning of the marker while drawing on the the surface will be monitored by the stepper motors. One can view the system overview in figure 2.



Two plastic parts are used to fix the X-axis. Those plastic parts are cut to fit in the construction domain. We ensured putting the Y-axis straight to the 2-dimensional plotter base. The X- axis will go vertically in this construction model. Over that surface, the Z-axis which ultimately is our servo motors, gets attached to the pen base. The pen must be capable of moving up and down smoothly with the help of servo motor. Later, we have to attach a hard surface on Y-axis.

Three softwares are used for finishing the entire project-

1. Arduino IDE
2. Inkscape
3. Processing

● Arduino IDE

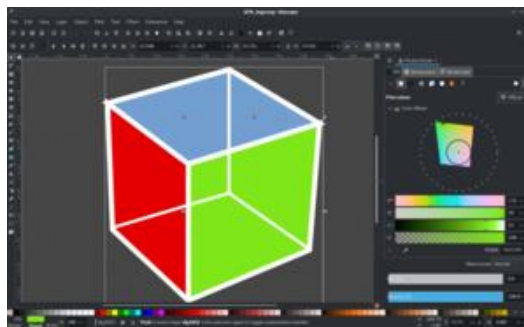
The Arduino IDE constitutes an editor for code writing. It also has message area, a toolbar with buttons for common functions, a text console and a series menu. The arduino and genuino hardware assists in uploading the programs and communicating with the servo motors. The software to program the Arduino Uno is shown in fig. 3.



Figure 3: Arduino UNO

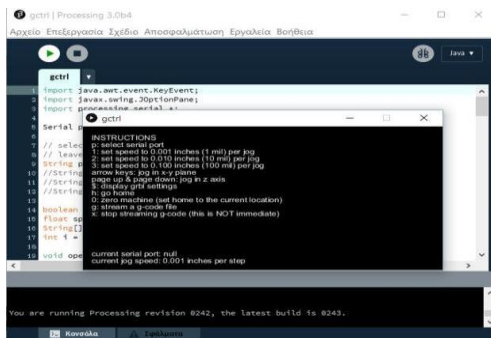
● Inkscape

The main purpose of Inkscape is to transform images into graphic codes commonly called G-code. We have to integrate G-Code with suitable extension files to generate the G-code format. The codes are generally written in Python programming language. These G-code tools are part of an open source Inkscape extension. The Inkscape software is shown in fig.4 which transforms an image into G-Code.



● Processing

It is a programming language software which is open source and mostly used for electronic drawings. In order to transfer G-code files from UI to CNC machine, we used GTCRL program. The Arduino Uno port gets selected after we press the 'P' button. The Arduino waits for the files after the full code gets uploaded. The Arduino starts processing the G-Code on 2D plane after receiving the commands from the processing software. Fig.5 shows a processing software.



Results and Declaration

The pen is placed on top of CNC plotter. The motor coupled gears helps in controlling the movement of the plotter. It moves the pen in their image before converting into the G-Code files. The file runs in Java language and then attached to the processing software. The processing language enables user to perform certain kinds of operations. A user can specify the L293D driver IC'S to monitor DC motors. The DVD drives helped in the assembling the X-Y plotter. This CNC machine helps in fabricating the PCB. Inkscape becomes a very significant



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