Automated Marker

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ABSTRACT

IN THE 21ST CENTURY WE MAKE AN EXTENSIVE USE OF PLYWOOD, STEEL SHEETS AND ALUMNIUM SHEETS IN OUR DAY TO DAY LIFE FOR VARIOUS PURPOSE

BUT MOST OF THE TIMES WE NEED THESE MATERIALS IN IRREGULAR SHAPES AND WE HAVE TO CUTOUT THEM FROM AN RECTANGULAR SHAPED SHEETS

WE HAVE DEVELOPED A ROBOT THAT CAN AUTOMATICALLY OPTIMIZE IRREGULAR SHAPES AND FIT THEM INTO MINIMUM AREA SO THAT THE AREA WASTAGE IS MINIMUM CONSEQUENTLY THE MATERIAL WASTAGE IS MINMIZED.

INTRODUCTION

The Main Intention of this project is to reduce the wastage of the sheet materials used for various purposes.

Generally when we have to cut out some shape from any type of sheet we cut them randomly due to which a lot of material is wasted

At the same time while marking the dimensions of shapes on the sheet error arises this is not desirable

Generally for this purpose industrial nesting software and CNC machines are used but they are costly to use and have their limitations

By the use of Automated Marker we can reduce the Material Wastage at the same time mark the shapes accurately

TECHNICAL BACKGROUND

Traditionally for cutting we have been simply randomly marking the shapes and then cutting them with use of various cutting tools

For efficient cutting we use ‘Nesting Software’ along with CNC machines

But these methods have their disadvantages and limitations

Using CNC machines along with Nesting Software is not handy and CNC machines are costly

In CNC machines one can cut out on a fixed size of sheet

PROPOSED SOLUTION

By use of Automated Marker one can draw shapes on sheets of any dimensions

As compared of CNC machines it is easier to use

It can be used on any type of material other than CNC machine where it is material dependent

But the output is comparable to the output of the CNC machines

Once the shapes are drawn on the sheet we can cut them out using a suitable cutting tool according to the material used

IMPLEMENTATION

Tab 3

For the Automated Marker we have used a Tricycle Design (inverted)

Two wheels in front and a castor wheel in rear

The motor used for giving motion to the robot are 'Stepper Motors' with a step angle of 1.8° with a wheel of 3.5 cm radius

Specifications of Stepper Motor: NEMA 17, step angle 1.8°

For driving the motor we used A4988 Driver IC

All the processing is done on SRA board with a ATMEGA 16 Microprocessor

Coding of Robot Motion is done on 'Embedded C'

Coding of Shape Optimization is done on Python

WORKING

As the our project needed high accuracy we had two options to set our robot into Motion

1. By using DC Motor + Encoder

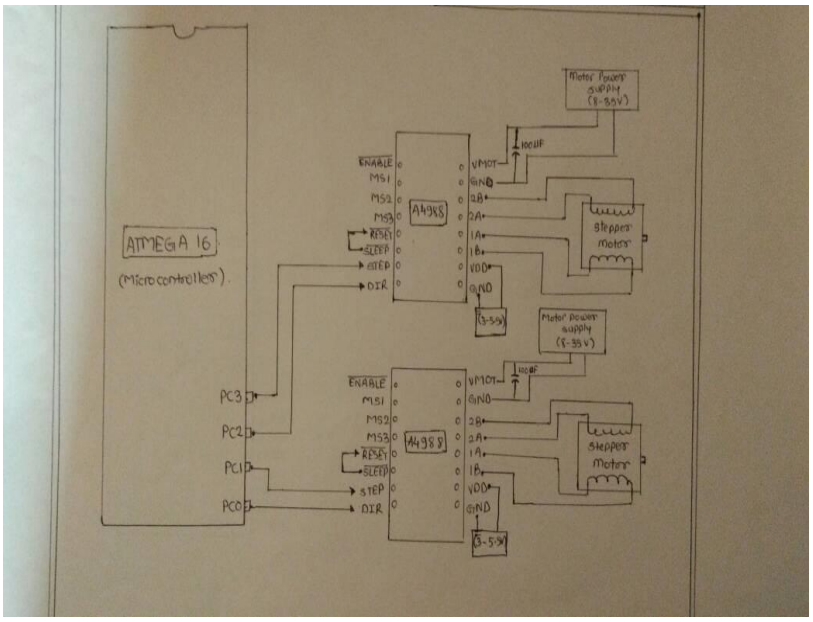
2. By using Stepper Motor

As the encoder disk of desirable ticks were not available in market we tried 3D printing the encoder disks we printed disks with 50 & 100 ticks but there were irregularities in the prints which may cause huge error in the Motion and thus effect on accuracy of Robot significantly

As a result we had to use Stepper Motor it was relatively costly but the efficiency and accuracy overshadowed the extra cost

WORKING OF STEPPER MOTOR

A stepper motor works very differently then a normal DC motor. It moves when HIGH LOW pulse is given to it. Each pulse will make it move by one step angle so by applying mathematics($s = r\theta$) we can determine the angle/steps to traverse specific length



Tab 4.2

The Body of the robot is made out of Aluminum. As the clamps of Steeper Motor were not available we made the clamps manually using aluminum

The pen is mounted in between the wheels on the axis of the motors and on the midpoint(approx)

The processor Board is mounted on the Robot itself but it is powered externally with a 12V Battery

The robot is programmed to move from one co-ordinate to another it can also be programmed to make some specific shapes by applying geometry

The optimized shape co-ordinates are fed into robot and the shape is drawn

RESULT

The robot is successfully making shapes with appreciable accuracy

Slight error is observed due to the mechanical body, motor vibrations, improper floor point contact of pen and uneven surface

Optimization of shapes is a tough problem statement there are lot of algorithms for packing of shapes but we were not able to convert them into a code that could optimize shapes

However we tried to optimize rectangular shapes and we were successful up to a good extent but not as efficient as the industrial shape optimization

REFERNCE

Wikipedia

Youtube

Stackoverflow

Mathstackoverflow

Github

http://en.wikipedia.org/wiki/Pneumatics

http://en.wikipedia.org/wiki/Pneumatic_cylinder

http://youtu.be/dFvLuEz7fFM