**California State University Sacramento**

**Electrical and Computer Science Department**

**EEE 193A/CPE 190 - Product Design Project I**

**Final Project Report**

**CNC Laser Cutter and Engraver**



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Abstract –

Keywords:

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# Design Overview

## ****Introduction****

In the industry, a widely used component for cutting and engraving materials is a CNC laser cutting machine. The machine operates by using a high-energy infra-red laser light beam. A focusing lens is attached to the laser in order to concentrate the energy into single focal point, thereby vaporizing and melting the material of interest. In order to alter the position of the laser into a desired location, a computer program known as CNC drives the positon of both the x and y axes. Asides the orientation of the axes, CNC codes can adjust the intensity of the laser to optimized the speed of the engraving or cutting of the material. Finally, by using machine vision, through the process of object orientation we can determine the position of the material. This process allows alteration of the material for better result, so that during the process the engraving or cutting is accurately done. The creation of the CNC Laser Machine will be conducted into four different parts: the mechanics between the positions of the CORE x-y axes, the laser machine circuit, CNC software for control and intensity, and finally detection system.

## ****Equipment List****

1. Mechanical Parts:
   1. Stepper Motor (x2):
   2. Belts
   3. Rods
   4. 3D Printed Parts:
      1. Mounting….
2. Laser System:
   1. Laser Diode:
   2. Laser Driver:
3. Computer Vision:
   1. Web Cam (x1): Logitech C270 720p 3-MP
4. Microcontroller:
5. Arduino Shield:

## Team Member Summary

## Detailed Description

### Mechanics

### Laser System

### Software

### Computer Vision

# ****Proposals****

## Funding Proposal

## Product Proposal

# Work Breakdown Structure (WBS)

## Outline of WBS

### Mechanics

### Laser System

### Software

### Computer Vision

## Project Timeline

### Milestone I

### Milestone II

### Milestone III

# Risk Assessment

### A. Laser

### B. Mechanics

# User Manual

### Operation

* Safety considerations: Room Requirement, Objects to be cut/Engrave, Goggles

### Hardware Requirements

* Laptop: MATLAB, Inkscape
* Power Supply
* On/Off switch

### Software Requirements

* MATLAB, INKSCAPE, ReplicatorG

# Design Documentation

# Breakdown of Hardware Subsystems

### Camera

### Laser Diode

### Arduino

### Block diagram

# Breakdown of Software Subsystems

### Object Detection Algorithm

### Generating of G-Code

### Laser control

### Flow Chart

# Mechanical Drawings and Documentation

# Test Plan for Hardware

# Test Plan for Software

# Integration Plans

# Accomplishment

# Conclusion

# Appendix A: References

# Appendix B: Code