

Techno Tron 50000

Alex Dietz

Kaitlyn McRann

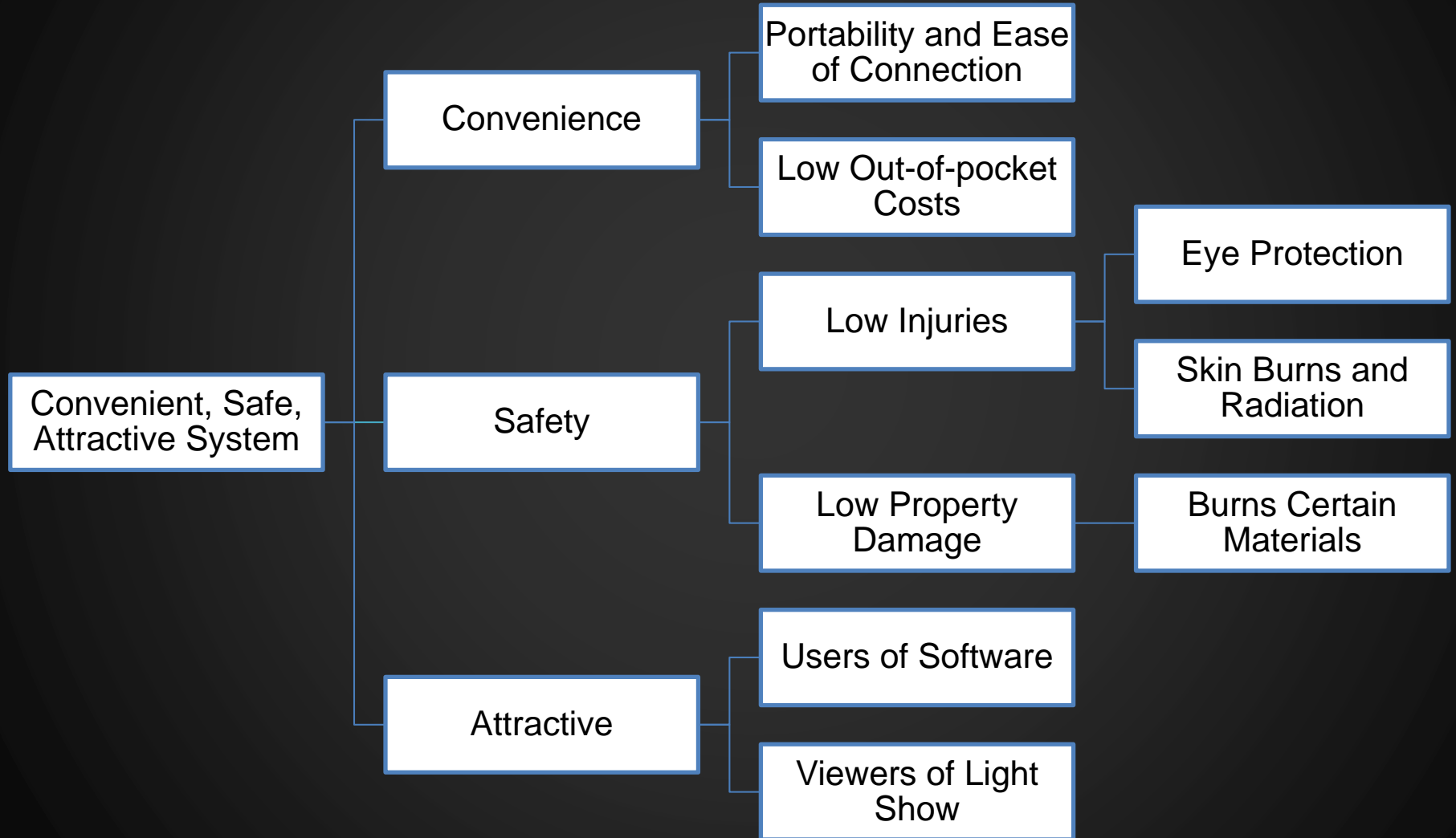
Tyler Plugge

Techno Tron 50000

- Its our laser projector's name
- able to put thousands of points per second on canvas of choice
- Used as a drawing tool, capable of animation
- Coded in C++ for Windows machine



Objectives



Lasers

According to the FDA, *Laser* means any device that can be made to produce or amplify electromagnetic radiation at wavelengths greater than 250 nm but less than or equal to 13,000 nm or, after August 20, 1986, at wavelengths equal to or greater than 180 nm but less than or equal to 1.0×10^6 nm primarily by the process of controlled stimulated emission.

Why Lasers?

- Commercial grade components and software are thousands of dollars
- Lasers are incredibly awesome and an affordable laser projector at your disposal should be a life goal
- Currently one of the first groups to code for our hardware setup.

Definitions

- DAC – Digital to Analog Converter
- TTL – Transistor to Transistor Logic modulation can be used to enable, inhibit, or regulate a laser. At 0v the laser is off, at 2-6v the laser is on.
- mW - milliwatt
- Galvos – Galvanometers (Mirrors)
- GUI – Graphic User Interface

Overview

Hardware

- DAC
- Laser with TTL modulation
- Galvos

Software

- Driver
 - Networking
 - Threads
- GUI
 - Threads
 - Data Structures

Communication Between Components

Hardware



Driver



GUI

Project Phases

Phase1

~~Build Custom
Hardware~~

Connect new
Hardware

Phase2

Write Driver
and connect
to Hardware

Phase3

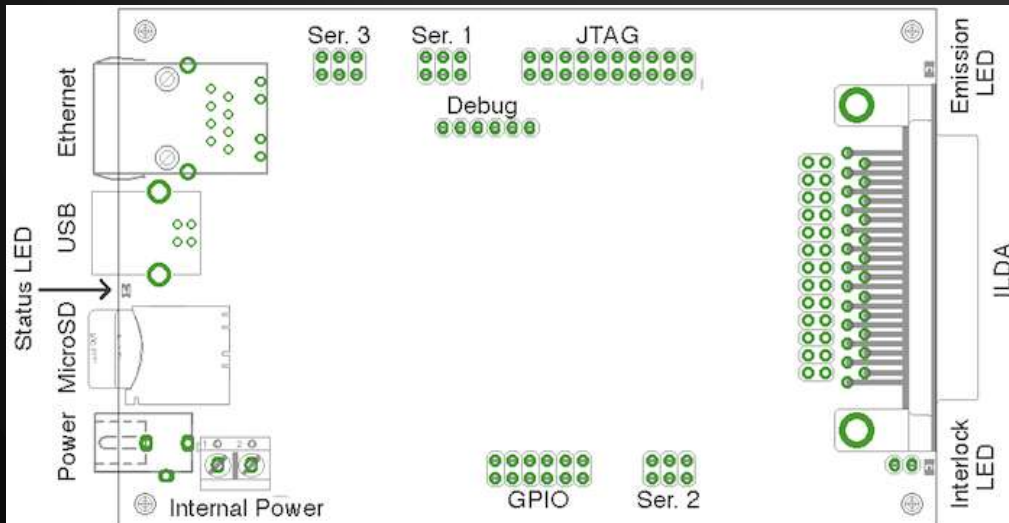
Optional

Write GUI
and connect
to Driver

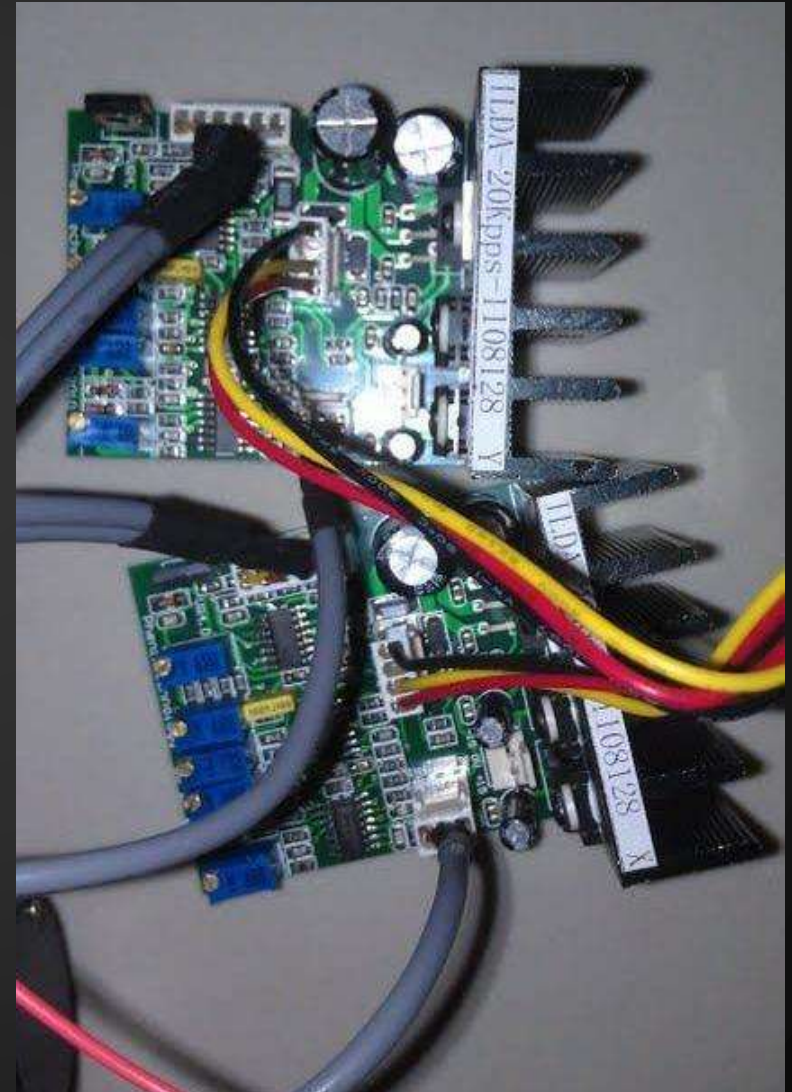
Digital to Analogue Converter



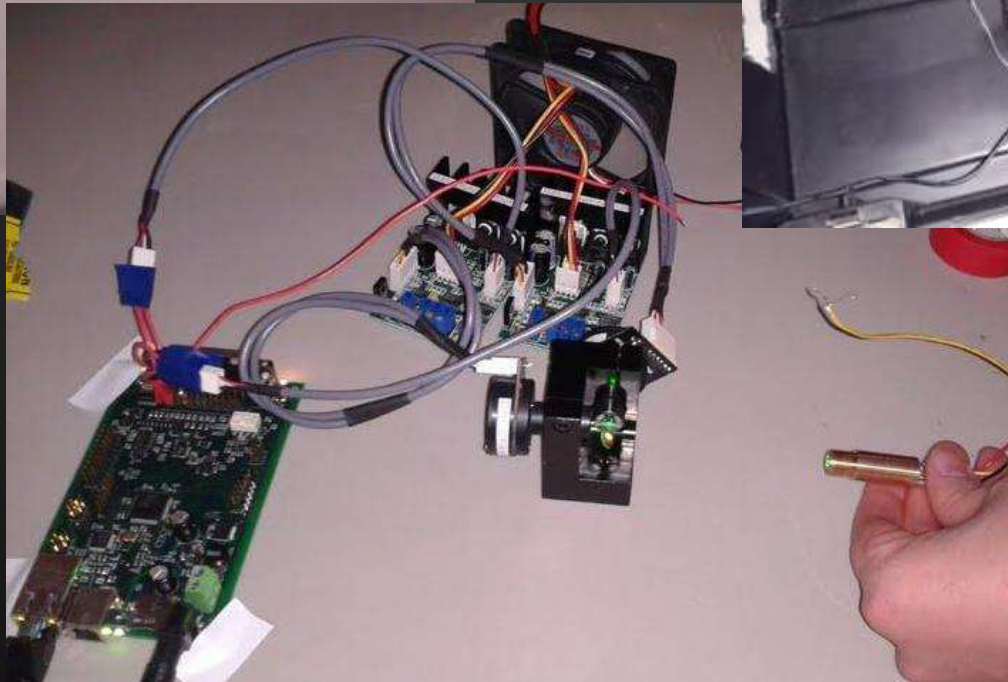
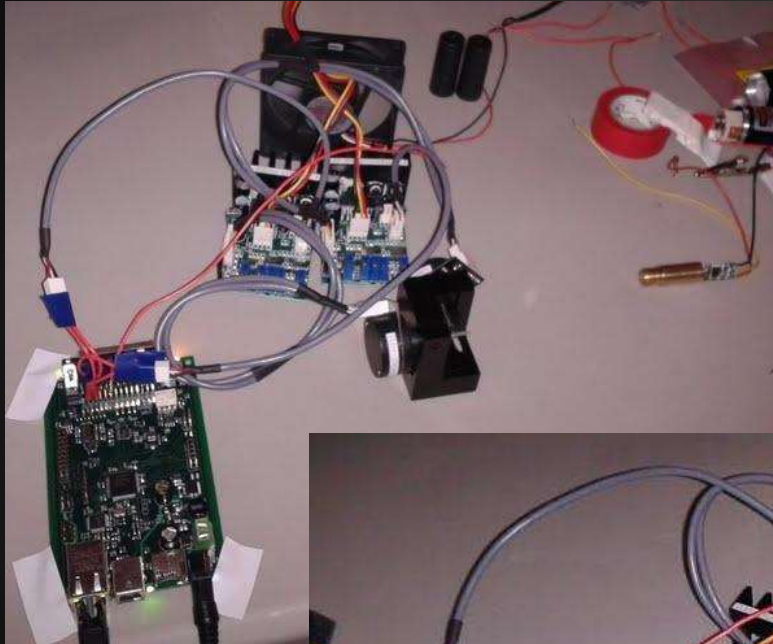
- Very new DAC, not much support
- Has the capability to connect many different items such as Other lasers, smoke machine, USB devices, etc.

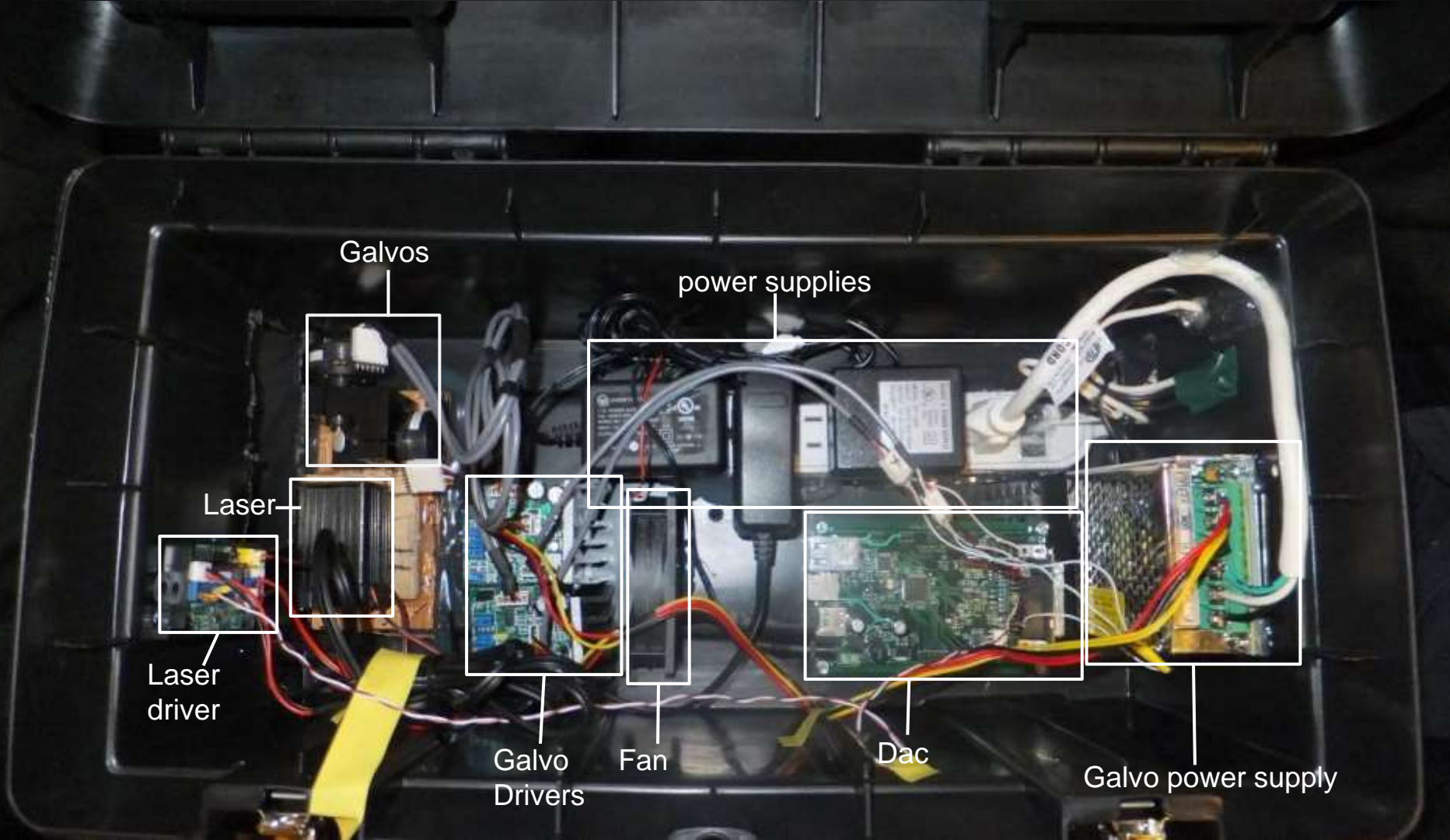


Galvos and Drivers



Building Stages





Galvos

power supplies

Laser

Laser driver

Galvo Drivers

Fan

Dac

Galvo power supply

Portable Setup

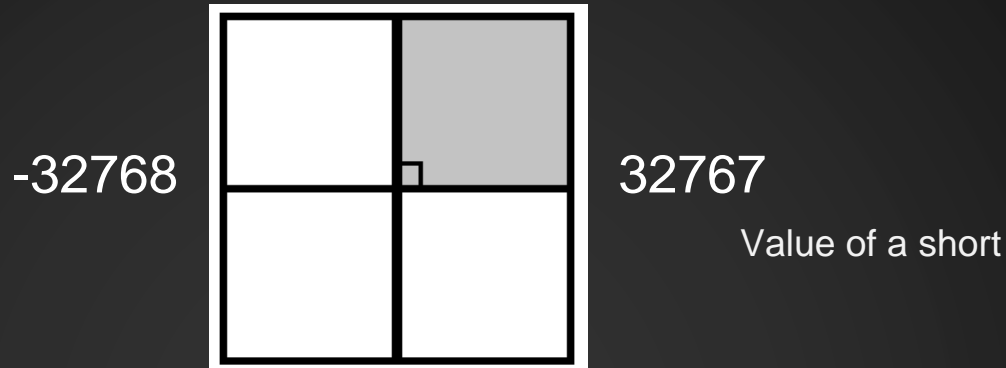


Protective housing means those portions of a laser product which are designed to prevent human access to laser or collateral radiation in excess of the prescribed accessible emission limits under conditions specified in this section and in 1040.11. (CFR - Code of Federal Regulations Title 21)

Drivers

- The code that runs the hardware and communicates with the higher level software
- Uses TCP and UDP networking
- Involves a lot of data conversions.
- Multi - threaded
- Computes playback rates to achieve 30fps
- Duplicates frames to reduce flicker

Communication to projector

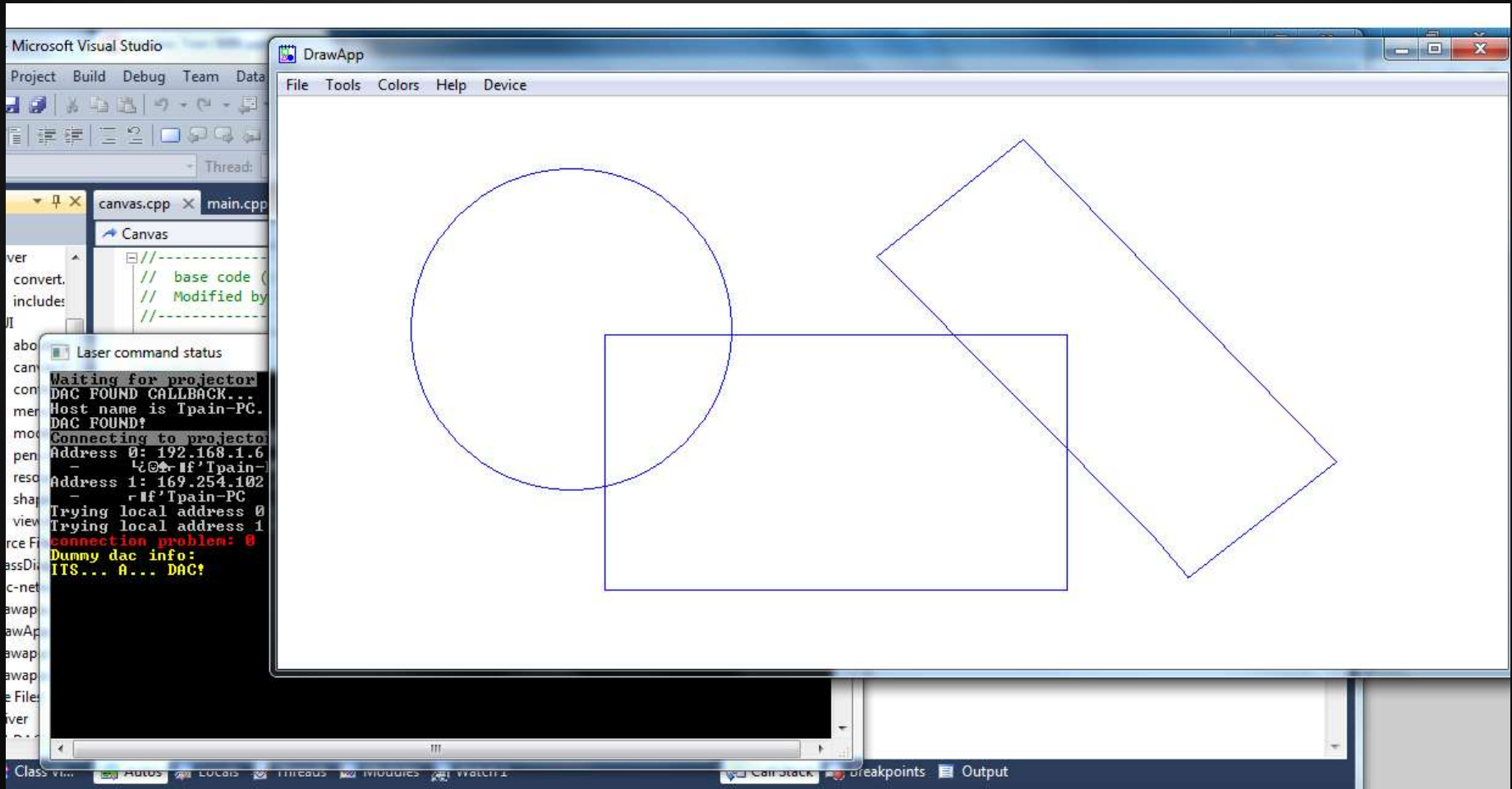


Windows API uses two points to represent every shape, the upper left corner and the lower right. This gets converted to points along the line then added to the driver where the points are duplicated to help prevent flickering. Then converted into full scale shorts for the x and y coordinates, along with playback rate values, and 6 laser control values, only one of which is used.

GUI

- Large Blank Canvas
- Decided for simple menus since we only have 1 laser hooked up
- Points must be inverted since windows has (0,0) in the upper left corner
- Start with 2 frames, then scroll to the right to add more frames

GUI Screenshot



FDA Approval



DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Food and Drug Administration
Rockville MD 20857

November 14, 2011

Alex Dietz

Dear Mr. Dietz:

Your petition to the Food and Drug Administration to approve a variance for a laser light show, was received by this office on 11/14/2011. It was assigned docket number FDA-2011-V-0831/VAR and it was filed on 11/14/2011. Please refer to this docket number in future correspondence on this subject with the Agency.

Please note that the acceptance of the petition for filing is a procedural matter in that it in no way reflects an agency decision on the substantive merits of the petition.

Sincerely,

Karen Kennard
Karen Kennard

Director, Division of Dockets Management
Office of Public Information and Library Services
Office of Shared Services
Office of Management

DEPARTMENT OF HEALTH & HUMAN SERVICES

PUBLIC HEALTH SERVICE

FOOD AND DRUG ADMINISTRATION
CENTER FOR DEVICES AND
RADIOLOGICAL HEALTH
10903 New Hampshire Avenue
W066-4817
Silver Spring, MD 20993

November 21, 2011

Alex Dietz

Reference: 11A0190-000

This is to acknowledge receipt of your October 26, 2011, document, which was filed pursuant to the regulations for the administration and enforcement of the Radiation Control for Health and Safety Act of 1968 (title 21, code of Federal Regulations, Subchapter J) as they pertain to Variance Request requirements.

Your document has been assigned an accession number of 11A0190-000, and has been classified as a(n) Variance Request (pursuant to Part 1002, Subpart B of the Regulation referenced above).

Further, the submittal has been assigned an informal subject title of "This submission is a(n) Variance Request. These Laser Light Show/Display is for the University of Wyoming Laser Light Show, using Projector is built from scratch, no part number, not for sale. (Docket No. 2011-V-0831)."

This acknowledgement does not constitute approval of the document. You will be contacted if any questions or comments arise concerning your document.

If your current laser light show variance provides for an automatic one year extension of the variance on December 31st, remember that submission of your annual report for the current year is also required as the condition that permits the automatic renewal for next year to occur.

Please note that your firm is required to submit an Annual Report to CDRH every year by September 1.

All Radiological Reports may be prepared using FDA's Electronic Submissions software which can be downloaded at <http://www.fda.gov/ForIndustry/FDAeSubmitter/ucm108165.htm>. For more information on the FDA's eSubmitter program please see the following websites:

Radiological Health - <http://www.fda.gov/Radiation-EmittingProducts/default.htm>

Electronic Submissions (instead of paper reports) -
<http://www.fda.gov/ForIndustry/FDAeSubmitter/default.htm>

FDA Electronic Submissions Gateway -
<http://www.fda.gov/ForIndustry/ElectronicSubmissionsGateway/default.htm>

Thank you for your cooperation. If any questions or concerns arise during our review of your report, we will notify you. If you have any questions, contact us at (301) 796-5710.

Sincerely Yours,

Robert J. Doyle
Electronic Products Branch
Division of Mammography Quality and Radiation Programs
Office of Communication, Education, and Radiation Programs

FDA Requirements

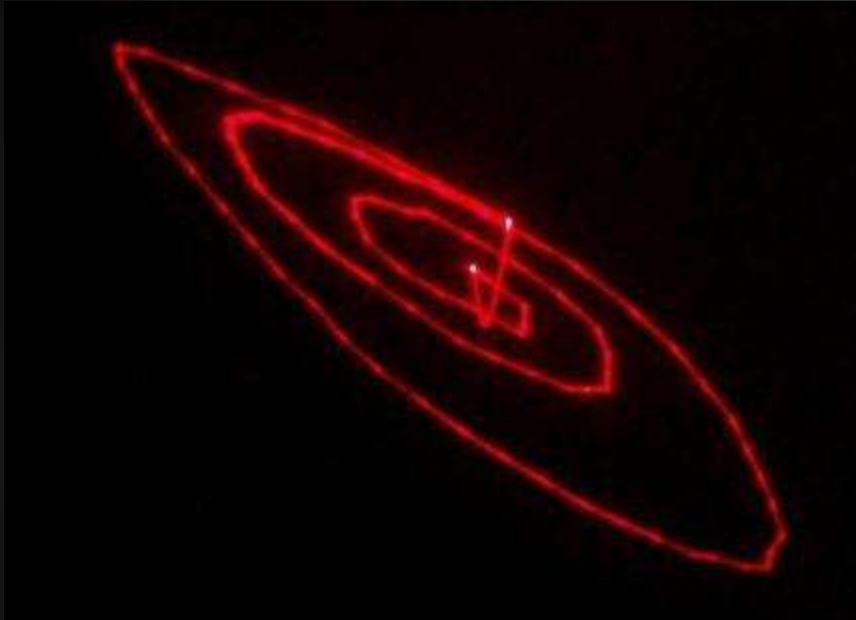


Safety Signage Required

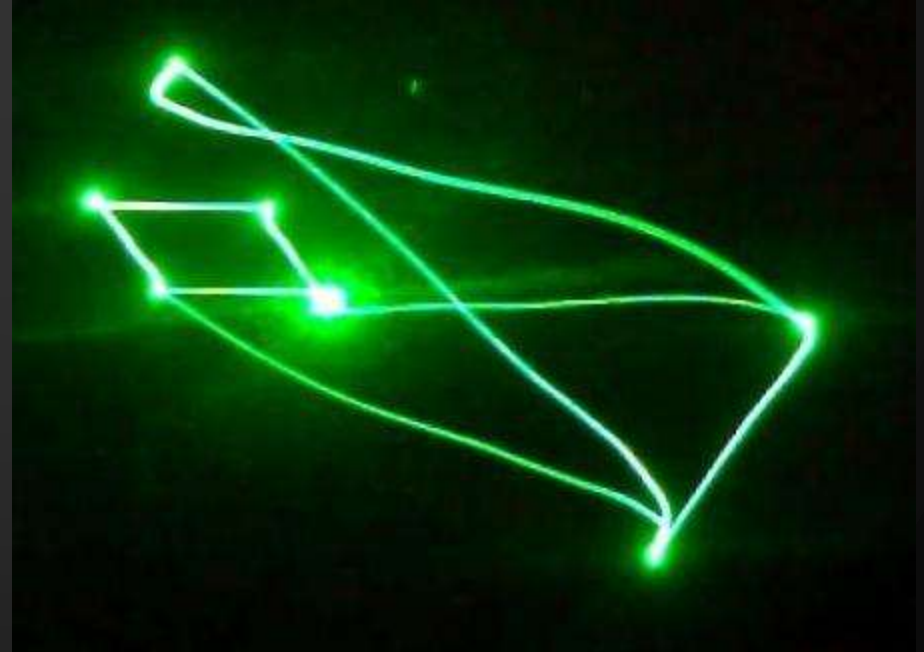


Safety Glasses

First Tests



Screen shot of very first animations working with our drivers



Picture of our code acting a bit buggy for lasers without TTL modulation

Cost Breakdown

- DAC = \$275
- Galvos and Power Supply = \$86
- Laser = \$230
- Misc(Fan, power strip, toolbox...) = \$50

Total = \$641

Problems Encountered

- Attempt at building DAC from sound card couldn't produce predictable voltage output
- First lasers melted
- Small fireball explosion from DAC
- Windows API
- Making a GUI
- Debugging code with breakpoints
- A project of all firsts
- Lack of tools!

Hardware Testing!



<http://www.youtube.com/watch?v=r9RFrxv3m>?feature=player_embedded&v=r9RFrxv3m

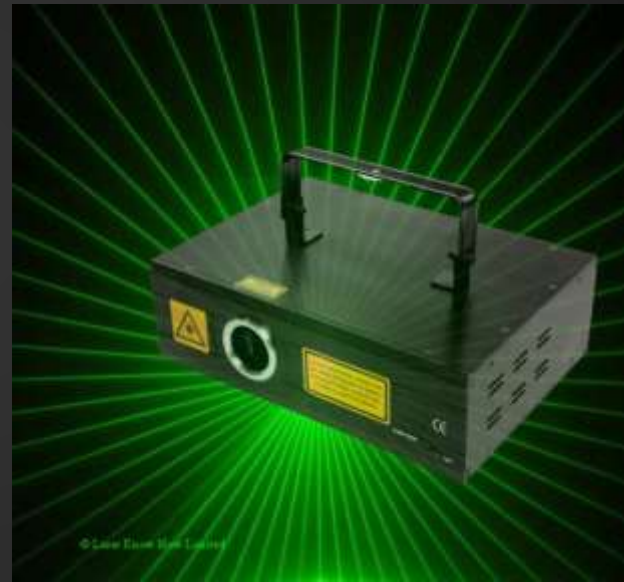
Possible Future Additions

- More animation tools
- Wireless connectivity
- Use extra ports
 - Smoke Machine
 - Other laser colors
 - Sound

End results

Techno Tron is <\$650

Competitors are \$1500-3500



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Special Thanks

Jacob Potter

Dr. Ruben Gamboa

Q&A