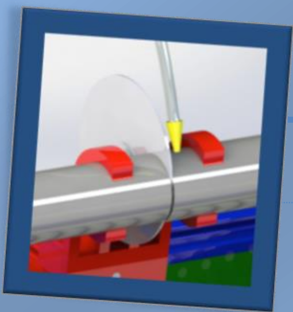
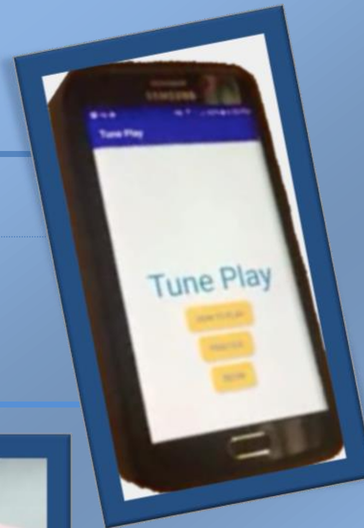
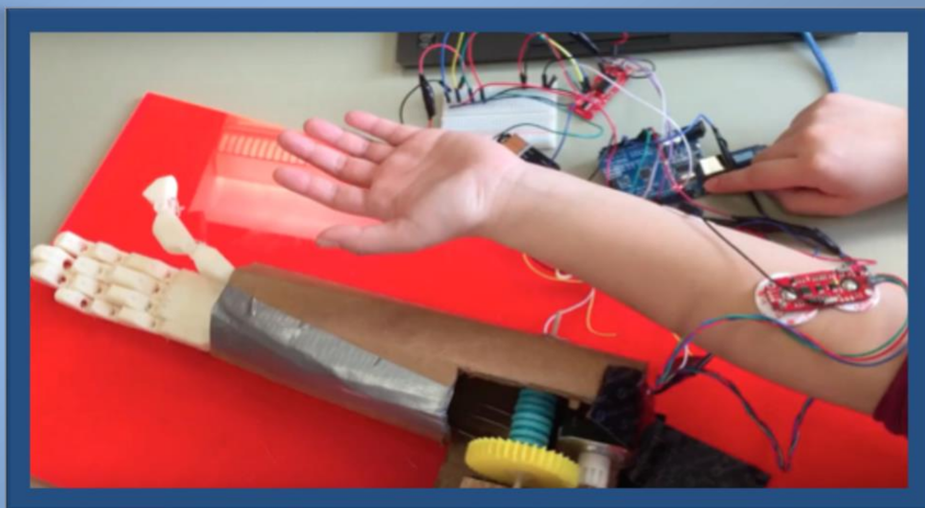
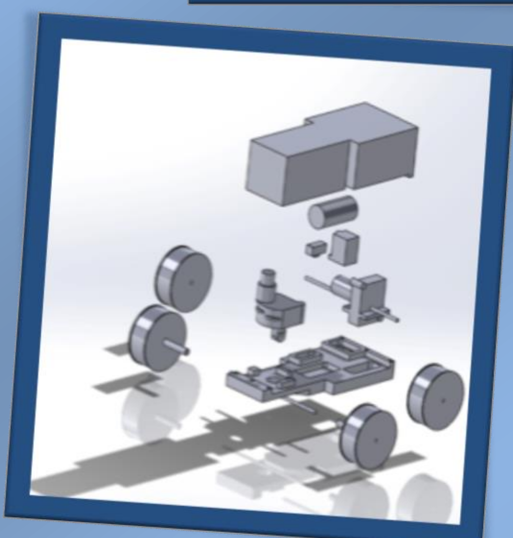


PROJECT PORTFOLIO

Kristof Fogarasi







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About Me

Kristof B. Fogarasi

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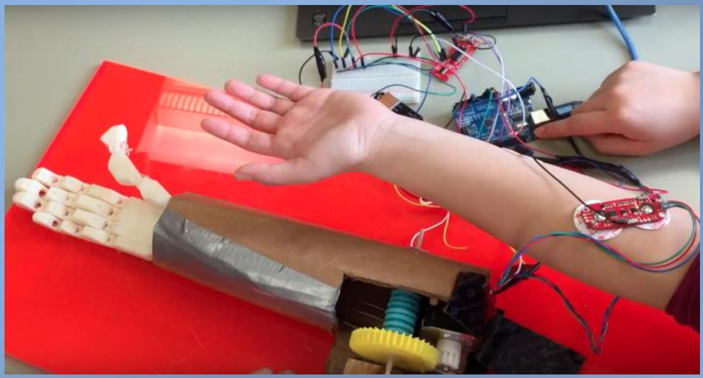
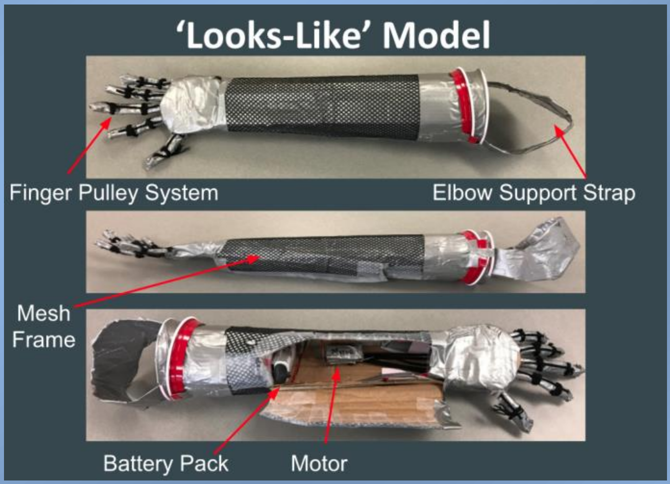
Following my passion for solving problems and helping people, I have always strived to maximize team effort to find the optimal solution and develop a quality product that meets the needs of the user. I am currently enrolled at Boston University, pursuing a Masters of Engineering in Mechanical Engineering, with a focus on Engineering Management. I am seeking employment as a Product Design or Manufacturing Engineer, and during the course of my career would like to move into Engineering Management. During my undergraduate career, I studied Biology at Boston College and Mechanical Engineering at Boston University, graduating Magna Cum Laude with a Bachelors in Mechanical Engineering in 2017. During the course of my studies I was awarded major academic honors, including Vice-Presidency in the Pi Tau Sigma Mechanical Engineering Honors Society, membership in the Tau Beta Pi Engineering Honors Society, and Dean's List Honors each semester. I have also served in Learning Assistant and Resident Assistant leadership roles. During my spare time, I lead a squadron of 35 Hungarian Scouts, ages 10-15, training them in survival skills and Hungarian culture. I thrive under pressure and welcome each new challenge as an opportunity to grow.

Myoelectric Transradial Prosthetic Arm


Basic set-up of works-like prototype with open hand

Project Description

Designed and 3-D printed a prototype prosthetic arm that receives an EMG signal from the stump of a transradial amputee and moves the corresponding robotic fingers.



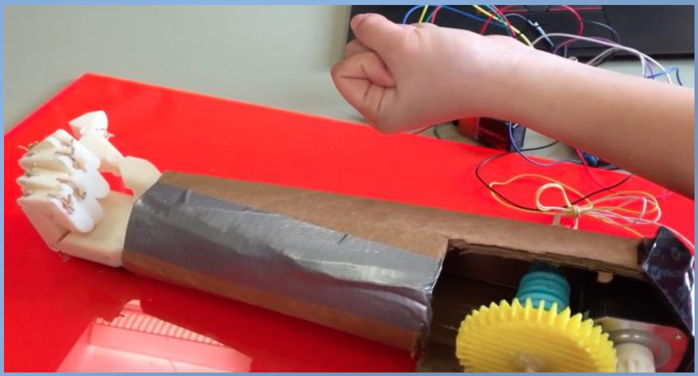
Prototype Looks-Like Model

Solution Methods

- Solidworks and OnShape CAD
- 3-D printed, ABS snap-together fingers
- Myoelectric sensors integrate EMG signal from stump to trigger finger movement
- Stepper motor powers pulley system to move fingers

Results

- Semi-functional looks-like prototype
- Functional works-like prototype
- Video: http://bit.ly/MyoelectricArm


Works-Like prototype with closed fist configuration

Renderings of hand CAD model

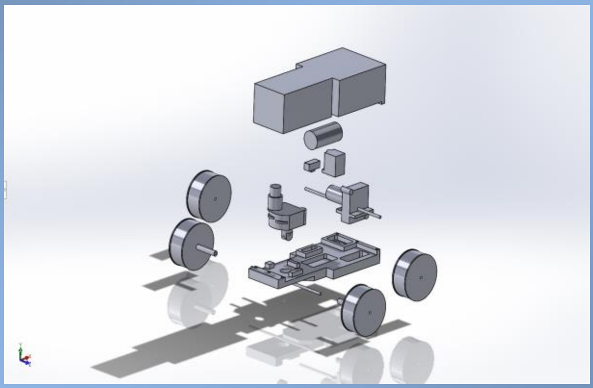
Automated Remote-Control Race Car Manufacturing

Manufactured Race Car Prototype

Programmed Robot loading stock into CNC Mill

Project Description

Programmed and operated three Universal Robots 6-axis collaborative robots in conjunction with CNC mills and a CNC lathe to automate the manufacture of remote-controlled race cars.



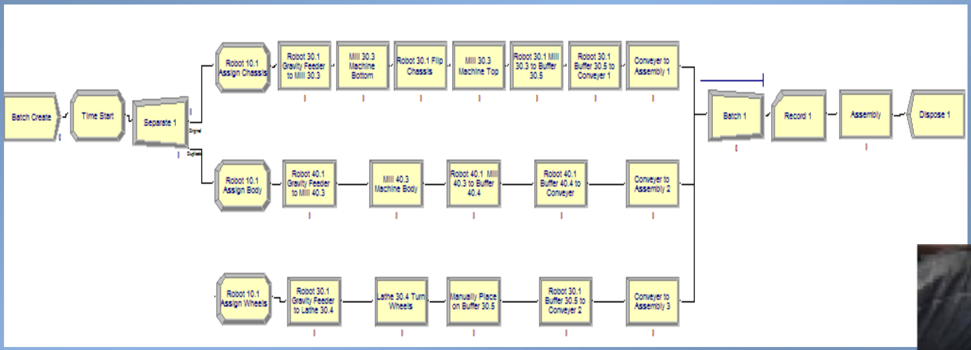
Exploded View of CAD Model

Solution Methods

- SolidWorks CAD
- Programmed CNC lathe & CNC mill for wheel, chassis, & body manufacture
- Programmed Universal Robots 6-axis collaborative robots with conveyer belt for loading/unloading & transfer
- Gravity feeders for stock inventory
- Rockwell Arena Simulation for process planning

Results

- Operational automated manufacturing process
- Functional prototype
- Won class competition for fastest racecar
- Video: http://bit.ly/RCAutoMfg



Operations Process Plan for parallel processes created with Rockwell Arena Simulation

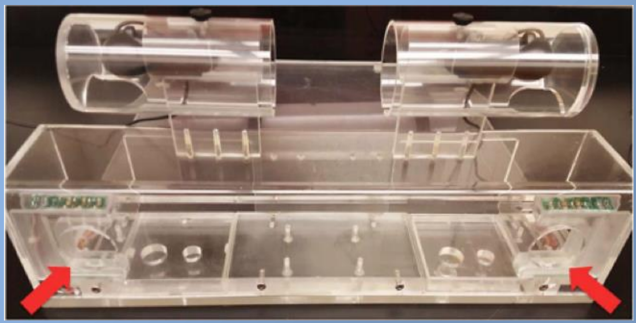
Winning lap on the track during class competion

Grip Strength Measuring Device for Monkeys

Macaque Monkey

Project Description

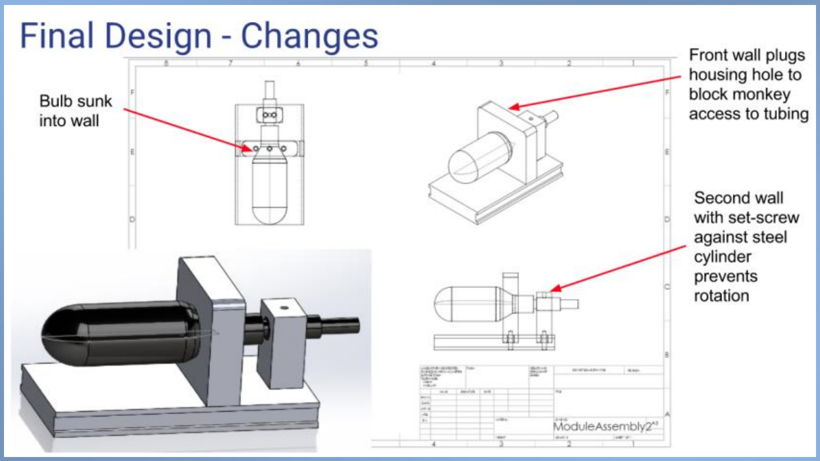
Designed, prototyped, and tested a pneumatic system to test the grip strength of post-stroke macaque monkeys for stroke research at Boston University Medical School.



Research lab's existing housing used for multiple tests. Test monkey reaches in at red arrows. Our module slides into the back

Results

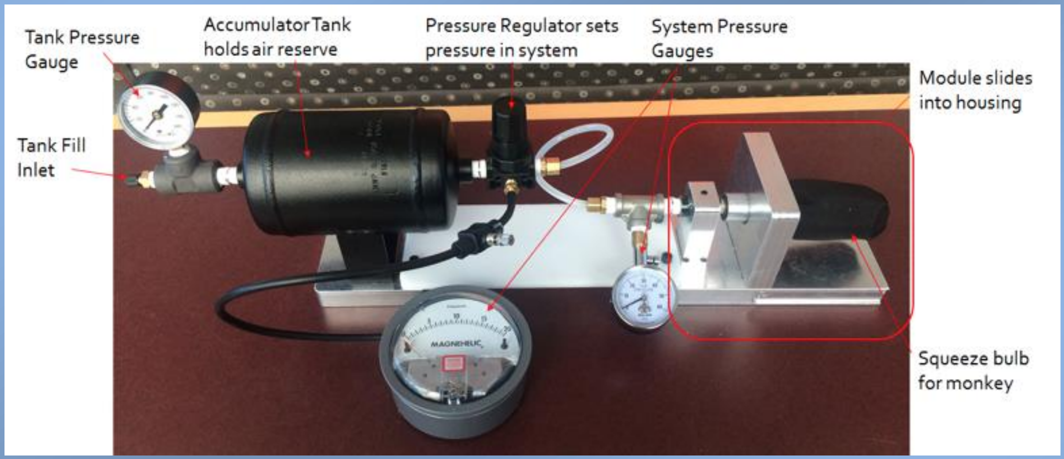
- Functional prototype
- Modified version still used in research lab today
- Senior design presentation: http://bit.ly/461Grip



Module Design limitting monkey interaction to squeeze bulb

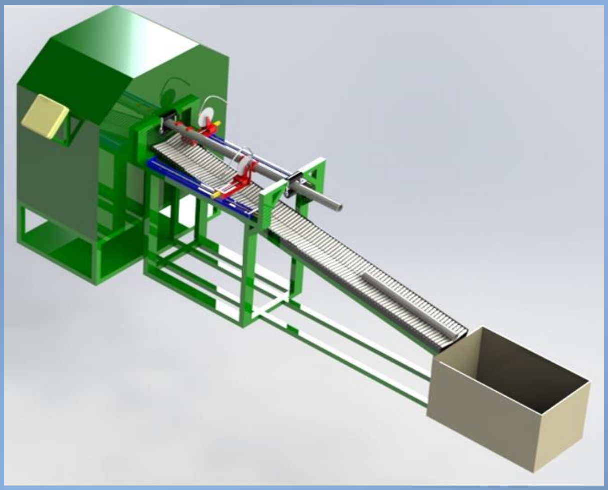
Solution Methods

- Pneumatic system constructed with ballistic nylon squeeze bulb for durability
- Base pressure could be set from an accumulator tank and compared to pressure monkey could squeeze
- Retro-fit into lab's test housing, aluminum wall prevents monkey from interfering with system
- Solidworks for CAD, GibbsCAM for CAM



Functional prototype of full pneumatic system

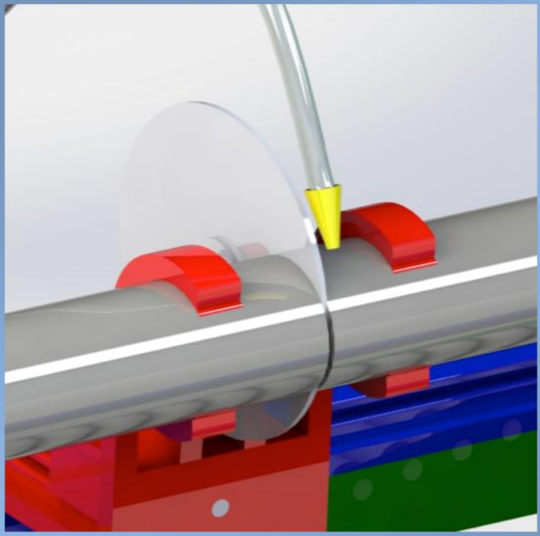
Automated Flying Cutoff Saw



CAD Model Rendering of Full Design

Project Description

Design flying cutoff saw system for continuously extruded aluminum pipe, adjustable for length (3-5ft) and diameter (1-3 inches), and automatically package pipes.



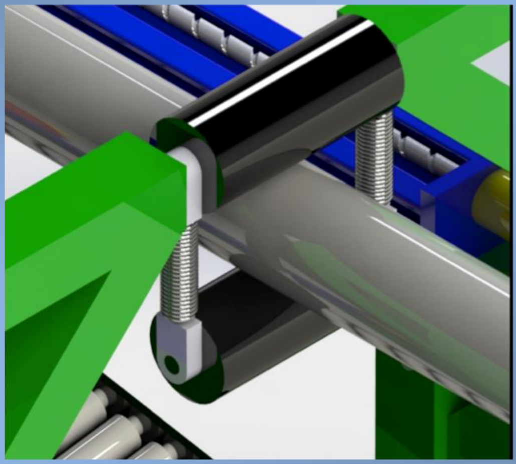
CAD Rendering of Circular Saw with Lubricant

Solution Methods

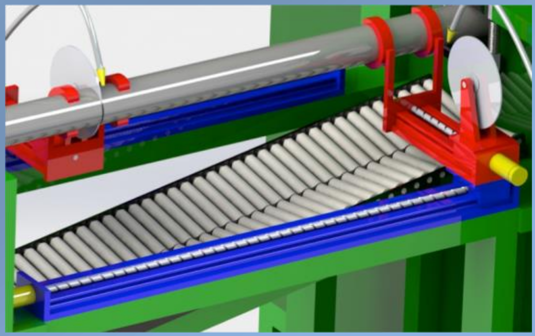
- Solidworks CAD
- Double saw approach used to be able to cut one piece while the other saw is travelling back to start point
- Circular saw travels along linear drive at same speed as pipe, cuts into pipe moved by second, perpendicular linear drive
- Pipe moved continuously with friction drives
- Pipe drops onto gravity rollers & delivered into box, which is shaken to arrange pipes

Results

- CAD model design
- Praised by instructor for high efficiency of double saw approach
- Presentation: http://bit.ly/FlyingSaw



CAD Renderings of Friction Drive, Linear Drive System, and Gravity Rollers



Nanomedicine Cancer Therapy Research Review

Project Description

Research review of light-based nanomedicine cancer therapy treatments, comparing Photothermal and Photodynamic therapy.

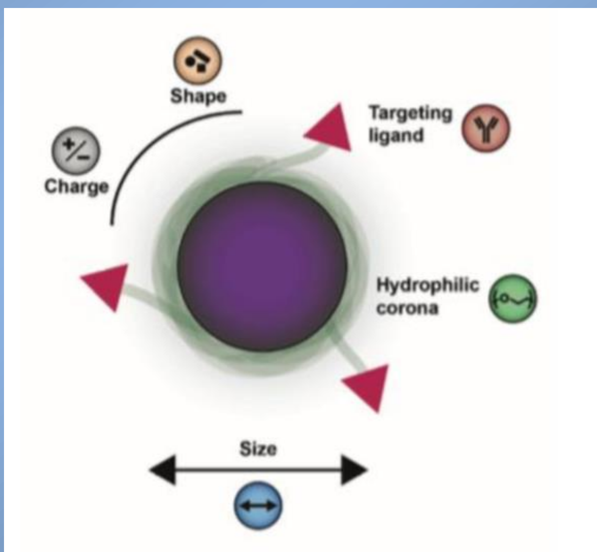
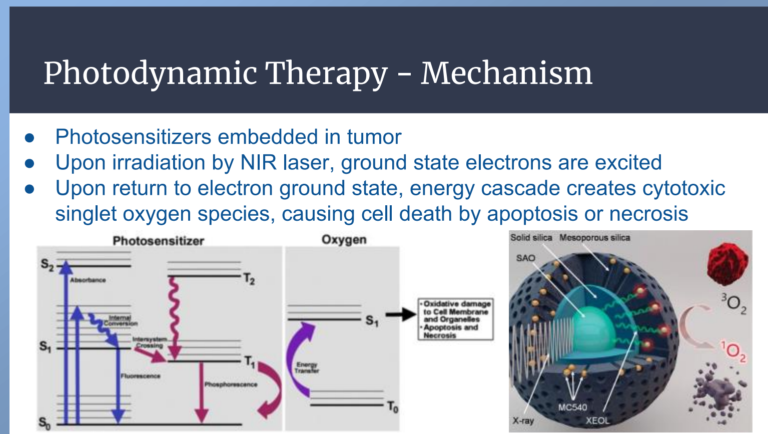


Figure 3. Efficacy of nanoparticle accumulation in tumor cells is impacted by nanoparticle size, shape, surface charge, corona composition, and surface targeting ligands. From p. 4 in [3].

*Figure from Report detailing factors in nanoparticle uptake [3]**

Results

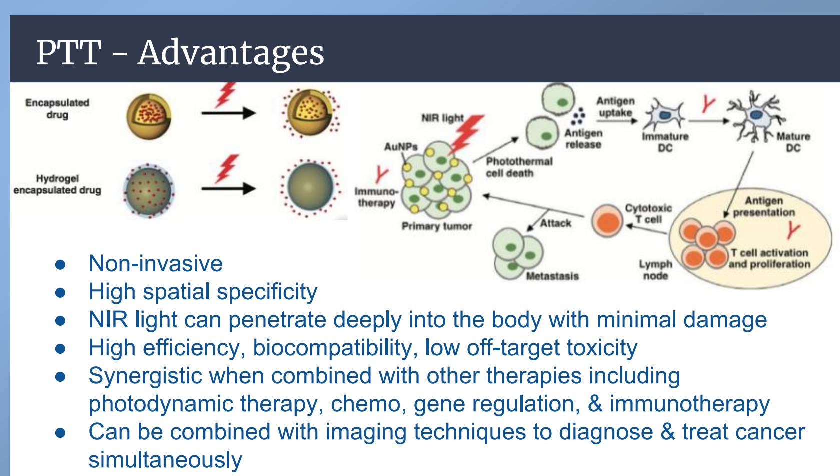
- Final presentation before peers: http://bit.ly/NanoCancerTherapy
- 15-Page Report: http://bit.ly/NanoReport
- Praised as best presentation in the class by course instructor.



*Slide from Presentation detailing Photodynamic Therapy [1][2]**

Solution Methods

- Comprehensive research of Photothermal and Photodynamic Cancer therapy - 22 articles reviewed
- Review of manufacturability and future prospects of these therapies, along with methods to improve their effectiveness.



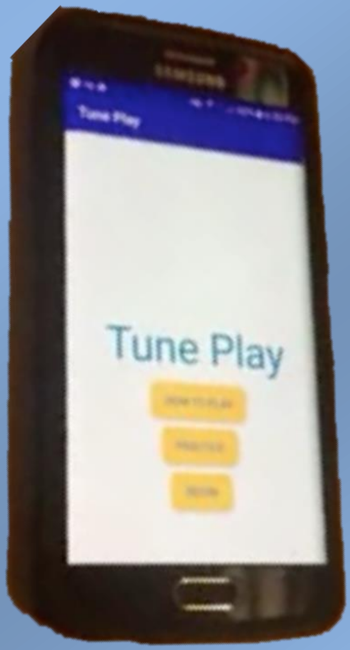
*Slide from Presentation detailing Photothermal Therapy [4]**

**Images taken from research articles reviewed. Please see back of portfolio for proper references*

TunePlay Smartphone App

Project Description

Designed a smartphone music-memory game app that tested a user's ability to play back a tune that the app played for them.

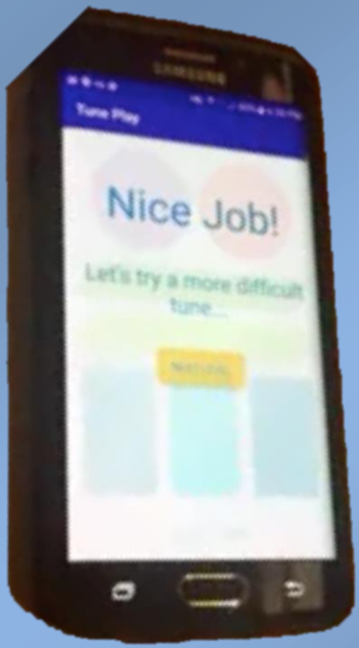


Start Screen

Play Screen

Solution Methods

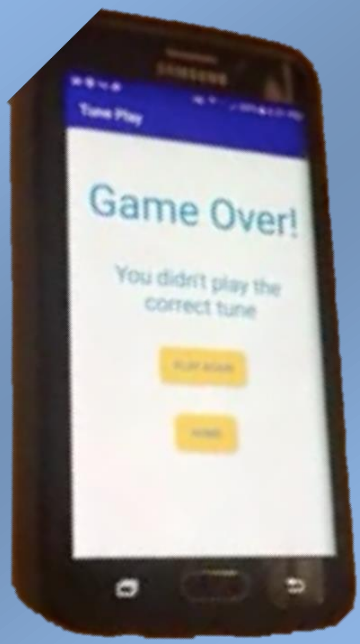
- Coded in Java using Android Studio
- Object Oriented Programming utilized
- Each button corresponds to a musical note (piano, guitar, or drums)
- Player hears tune, needs to play it back correctly to move on



Level-Passed Screen

Results

- Successful working Android app
- 10 different levels
- Easy-to-use user interface
- Included instructions
- How-to-Play Video: http://bit.ly/TunePlay



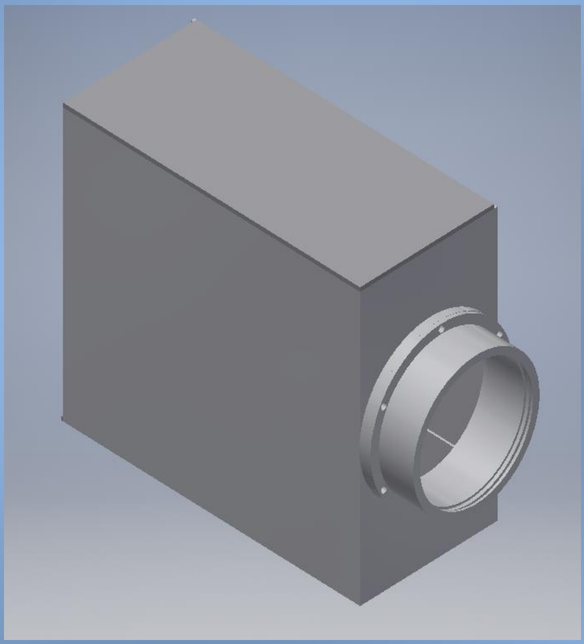
Game Over Screen

Smartphone Projector

Project Description

Designed, machined & assembled a prototype of a projector for a smartphone.

Photograph of completed, functional smartphone projector



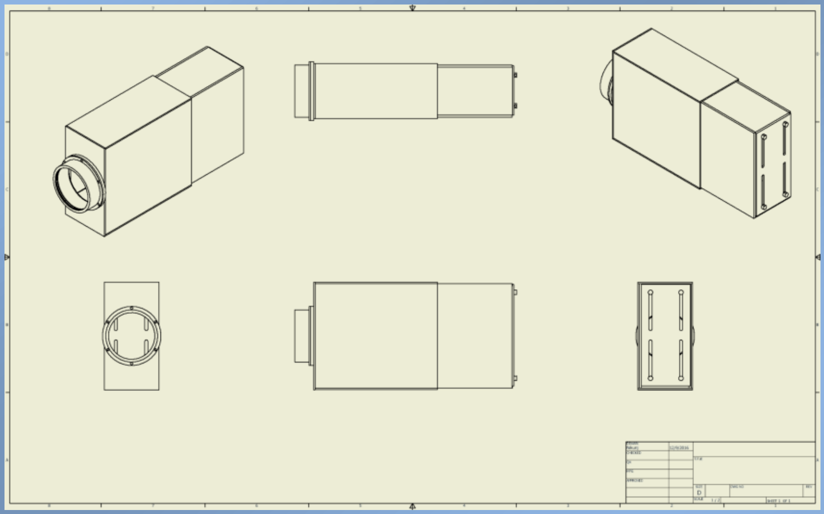
CAD model in AutoDesk Inventor

Solution Methods

- Sliding drawer inside box adjusts distance between smartphone and magnifying lens to focus image
- Screen flipped on phone for correct image orientation
- Machined using CNC Mill & Lathe
- AutoDesk Inventor for CAD
- GibbsCAM for CAM

Results

- Successful working prototype
- Ability to clearly view episode of favorite show in darkened room

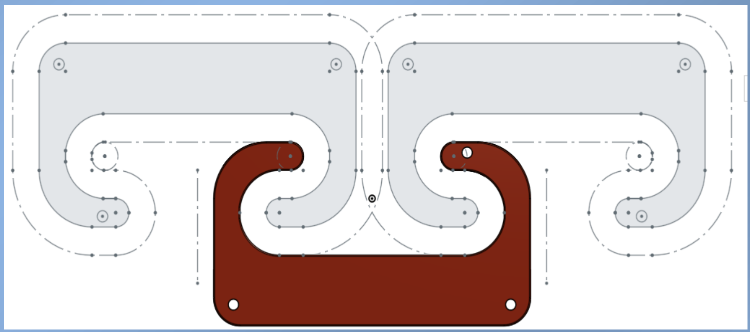


Drawings of Smartphone Projector, demonstrating sliding drawer design to focus image

Carabiner Pocket Knife

Project Description

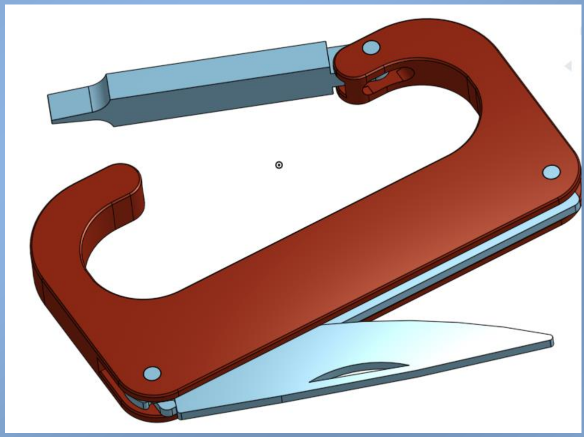
Design simple, yet unique product & carry through all testing phases (EVT, DVT, PVT), design for manufacture, & optimize so ready for mass production scale, at < $10/unit at final production cost. We made a combination of a carabiner and a pocket knife, with a fold-out knife blade and screwdriver.



Carabiner base designed for manufacture – several pieces could be milled with same toolpath

Results

- Functional Prototype passed EVT testing
- Currently in Design Validation Testing



Trimetric view of carabiner pocket knife

Solution Methods

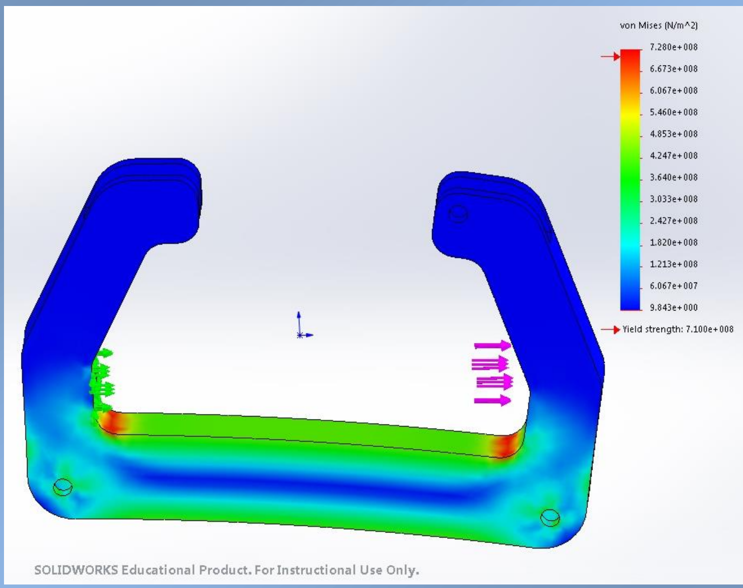
- Liner lock to lock knife in place
- Combination of slot screw driver as part of carabiner clip, held in place by a magnet.
- Optimized shape of carabiner for ease of manufacturing in high volumes on CNC mill
- Liner lock cut using wire EDM
- Optional laser etching and pad printing for future improvements
- CAD in OnShape, CAM in GibbsCAM, FEA in SolidWorks (see next page)

Carabiner prototype in closed and open state

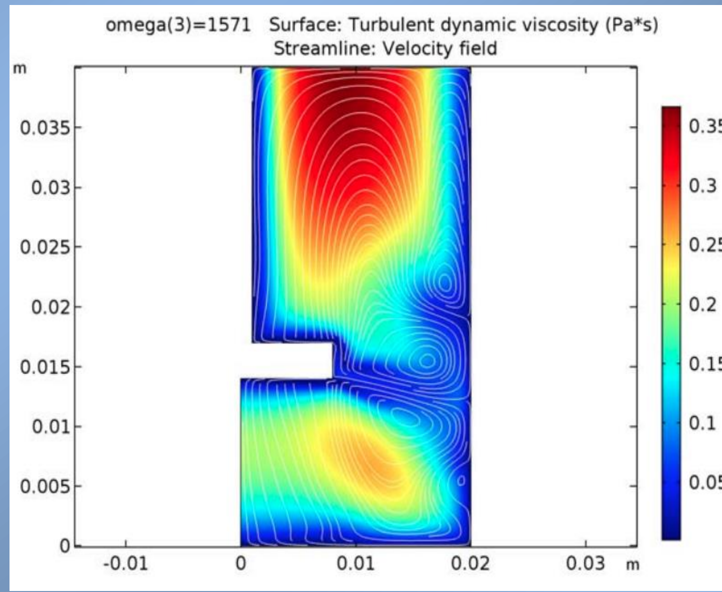
Screwdriver slides into slot to prevent excessive torque on pin

Liner lock snaps into place to keep knife open (L) and holds against blade with friction to keep it closed (R)

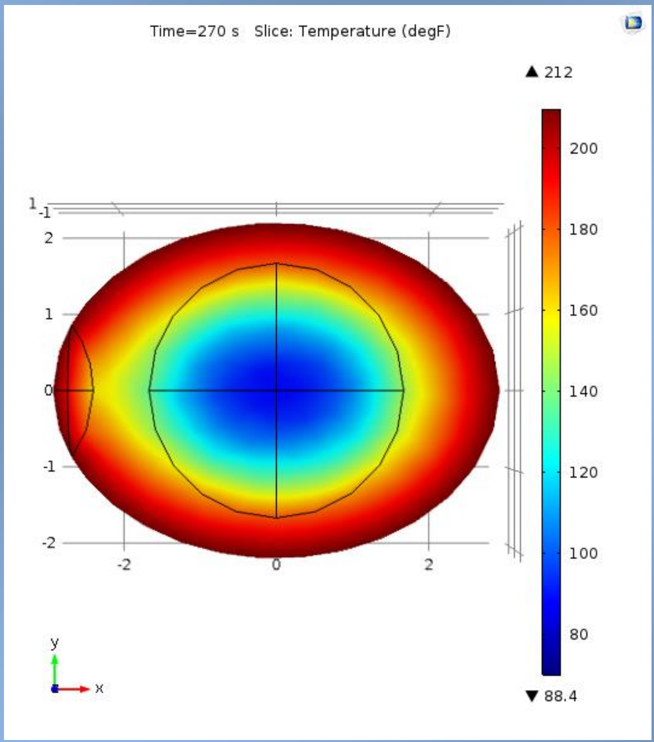
Simulations



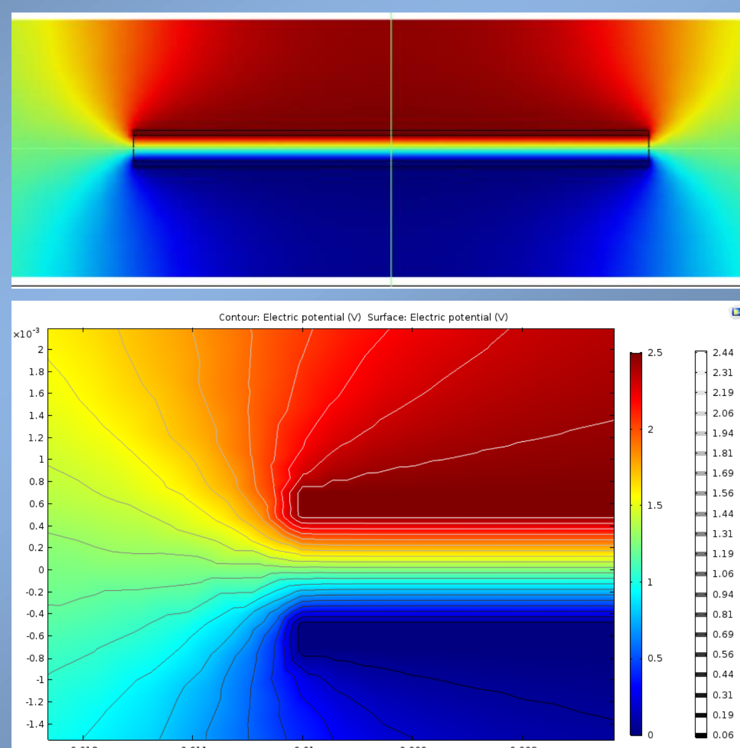
SolidWorks FEA depicting stress and deformation in the body of a carabiner with applied axial load



COMSOL Fluid Dynamics simulation of a disk rotating in a tank, depicting turbulent viscosity and velocity field plots



COMSOL Thermal simulation of boiling egg



COMSOL Electrostatic simulation of a capacitor and the air in its surroundings. The bottom image highlights the fringing electric field effects.

References

The below references are to acknowledge the sources of images used in the Nanomedicine Cancer Therapy Research Review project. Full report and presentation can be viewed here:
Presentation: http://bit.ly/NanoCancerTherapy Report: http://bit.ly/NanoReport

[1] Alyssa Master, Megan Livingston and Anirban Sen Gupta, "Photodynamic nanomedicine in the treatment of solid tumors: perspectives and challenges," *Journal of Controlled Release : Official Journal of the Controlled Release Society,* vol. 168, *(1),* pp. 88-102, May 28, 2013.

[2] J. Hu *et al*, "Nanocomposite-Based Photodynamic Therapy Strategies for Deep Tumor Treatment," *Small,* vol. 11, *(44),* pp. 5860-5887, 2015. Available: http://onlinelibrary.wiley.com/doi/10.1002/smll.201501923/abstract. DOI: 10.1002/smll.201501923.

[3] D. de Melo-Diogo *et al*, "Strategies to Improve Cancer Photothermal Therapy Mediated by Nanomaterials," *Advanced Healthcare Materials,* vol. 6, *(10),* pp. 1-20, 2017. Available: http://onlinelibrary.wiley.com/doi/10.1002/adhm.201700073/abstract. DOI: 10.1002/adhm.201700073.

[4] Rachel S. Riley and Emily S. Day, "Gold nanoparticle-mediated photothermal therapy: applications and opportunities for multimodal cancer treatment," *WIREs Nanomed Nanobiotechnol,* vol. 9, pp. 1-16, 2017. DOI: 10.1002/wnan.1449