

jason:

Design Engineering Portfolio



“

My engineering philosophy: **Whatever Works**

”

Jason Joshua

B.S Mechanical Engineering
University of California, San Diego

Coffee Machine for “Microbubble”

Diagnologix

Diagnologix, LLC.

Ever wonder what a coffee machine looks like for a cell isolation? ASK ME! I developed automation device for a cell isolation process that utilizes MicroBubble (MB), a.k.a strainer to catch specific cells. Diagnologix focuses on developing innovative tools and products for unmet medical needs. We were awarded with multiple Phase II SBIR Grants totaling more than USD \$3MM.

Skills Developed

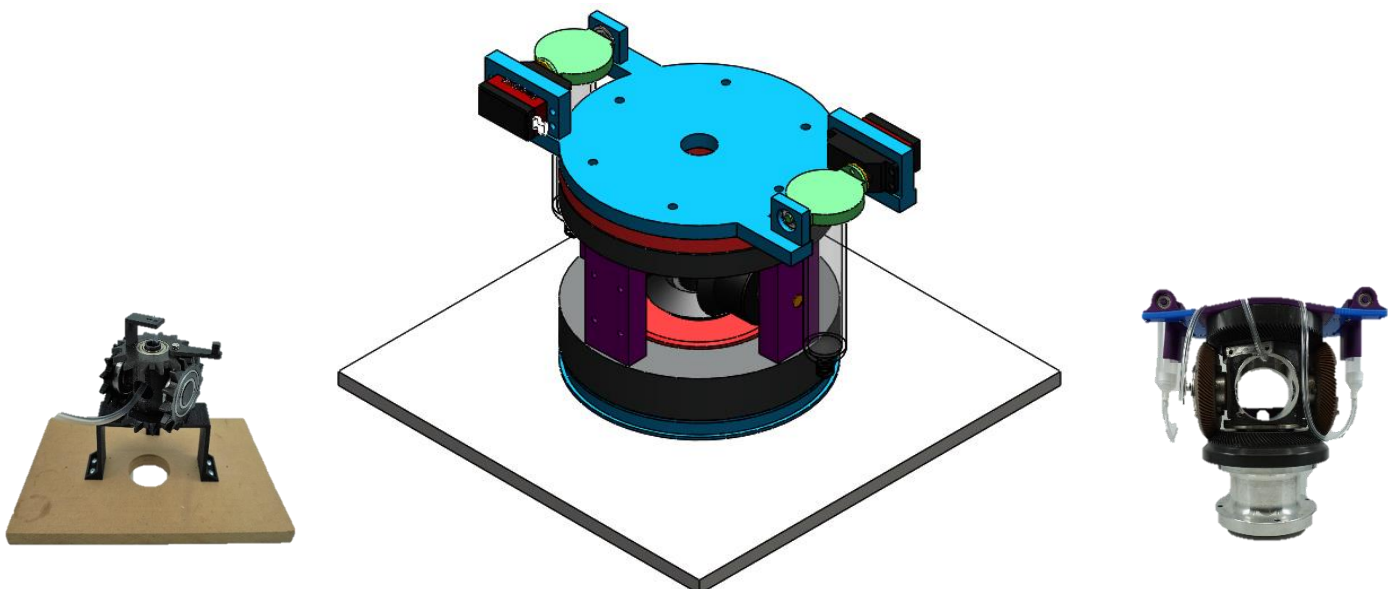
- Develop 3D CAD model using **Solidworks**
- Rapid prototyping using 3D printer (SLA/FDM), laser cut, machine shop tools, stock items in the market
- Be a liaison with 3rd party vendor for materials, and parts
- Motion Analysis using Solidworks
- Develop automation using
 - Processor: Arduino, PSoC (C language)
 - Actuator: Linear actuator, NEMA Stepper Motor, Servo, DC Motor
- ASME CAD Models, GD&T ANSI standard

Problems

- Difficulty in finding correct required specs part for the device as a result, attending multiple expos is best solution
- Expensive parts as a result, refurbishing from broken machines is the best option to proof the concepts
- Difficulty in coding with PSoC as it is new for the team
- Problem for rotation of tubes by developing 4 bevel gear system to prevent tubes tangling

Results

- **Phase II Grant announced in July 2019 (Updates: Received US\$ 2MM)**



** Limited graphics
due to disclosure

Airpods, but...hearing aids



EARGO Design Challenge

The design challenge was to design a cableless solution for the "Airpods" type of case. Given the design constraints:

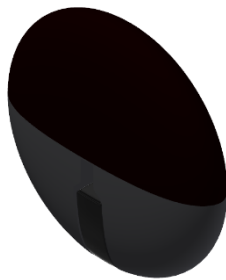
- Charging case form factor must remain the same as the current "pebble" shape
- USB-A male connector must be centered in the bottom enclosure outer perimeter
- USB-A male connector must be protected when not in use, and exposed when plugged in
 - There must be easy-to-execute "input event" from the user (i.e. push, pull, slide, etc.)

Skills Developed

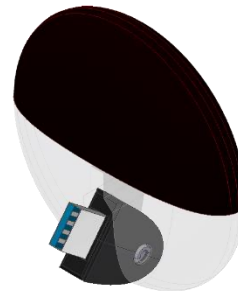
- Develop 3D CAD model using **Solidworks**
- Brainstorm and generate innovative ideas that never been created
- Created presentation for Director of Engineering, Senior VP, and CTO to present product
- Describing thought process using words and images

Presentation:

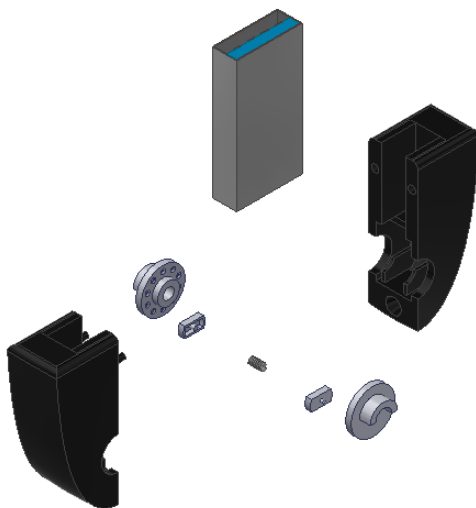
<https://jasonjoshua.com/eargodesignchallenge.pdf>



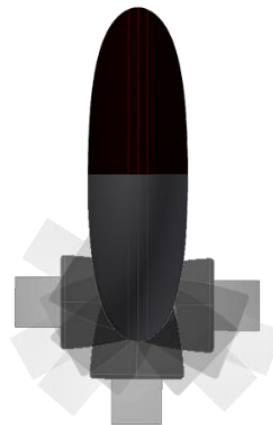
Hidden USB-A connector



Exposed USB-A connector



Exploded View of Mechanism



10 Different Angle Configuration

Grabbing a Candy? Snacks?

Top-Shelf Fixtures

If you go to grocery store or a department store, I'm sure that you are going to see what I'm talking about! Yes, I designed and modelled those shelves to display candies, snacks and foods to ensure you can grab your snacks in the most convenient way and most important safely!

Skills Developed

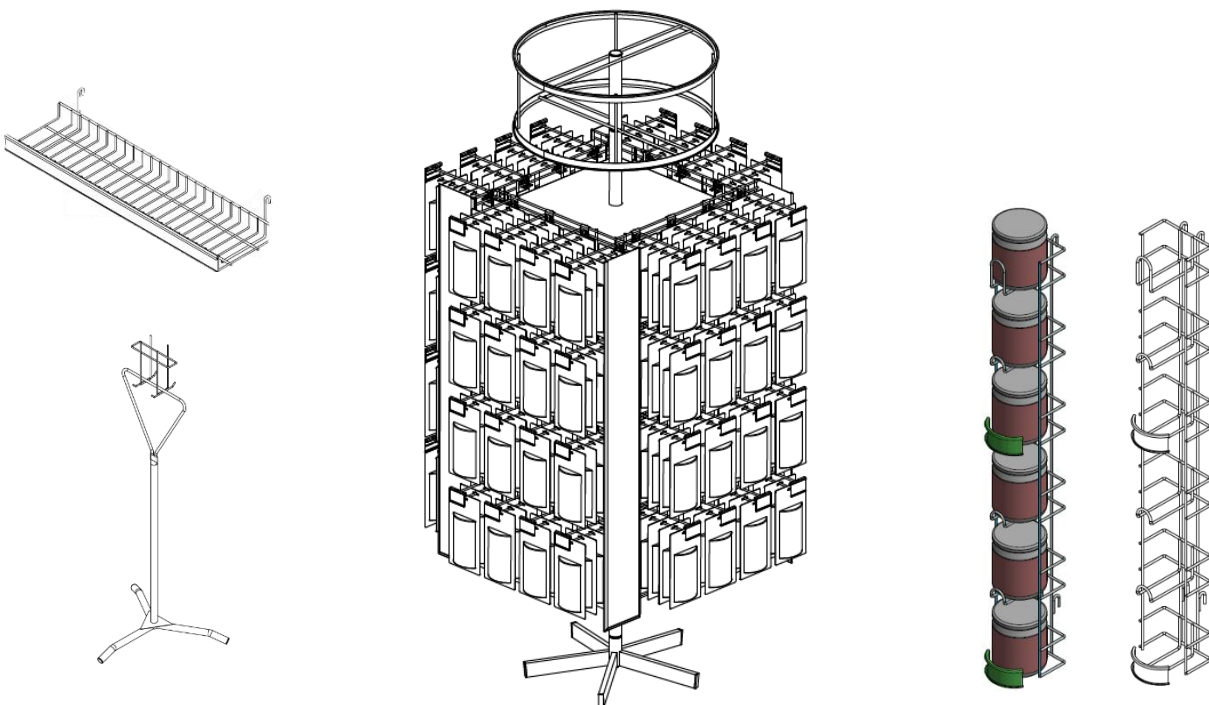
- Develop 3D CAD model using **Autodesk Inventor**
- Restructure product data management vault to ensure files are organized
- Coordinated with business sides, manufacturing, engineering to revise and updating models based on clients need
- Assisted design engineers to brainstorm and develop models based on client's needs by utilizing sketches, 3D CAD Models, prototypes
- Generate complex BOMs (Bill of Material) for production
- Redesigned assembly parameters to allow modular designs without the need to re-constraint assembly manually
- ANSI Drawing standards

Problems

- Old models and base parts are not designed correctly, as a result, many parts were not modular and inefficient to use
- Company's culture are not ambitious and not willing to grow

Results

- **Managed to learn the company's system and make impact within a week of work**
- **Ability to adapt fast and as a result being tasked in advanced yet challenging 3D models within a week of work**



Automated Surfboard Rental Station



SurfUp San Diego

Bird scooter? Lyft scooter? Isn't it the most amazing invention in this era? All you gotta do is just scan that barcode and there you go! How convenient is that? Pioneering the first ever automated surfboard rental station.

SurfUp is a San Diego startup-based company that is focused on creating a convenient way of renting surfboards just like Bird or Lyft scooter. The team of 4 is focused on building a station for surfboard that will automatically allow users to rent surfboards on the beach.

Skills Developed

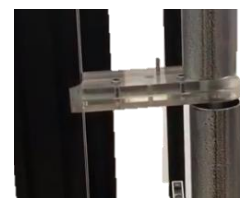
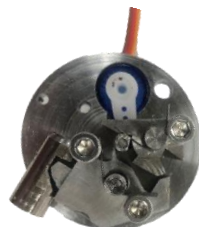
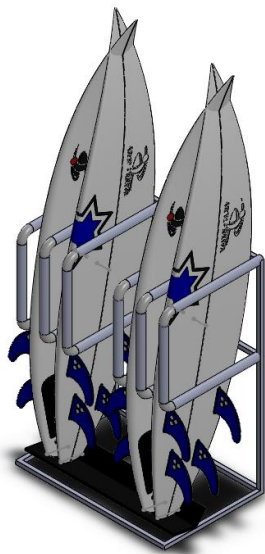
- Rapid Prototyping, Solidworks 3D CAD Model
- Fabrication tools such as CNC Machine, Lathe, Milling, Bandsaw
- Creative mechanical design (locking mechanism)
- Mechatronics (Arduino, RFID, Servo)
- Project Management (Budgeting, Gantt Chart generation)

Problems

- Design are not DFM, need to manufacture in order to design
- Double lock mechanism makes double work
- Many design regenerations due to budget constraints, design feasibility

Results

- **Prototype will be tested in June 1, 2019 in La Jolla Shores**
- **Able to qualify in many startup accelerators programs**



Two-Cam Laser Toy

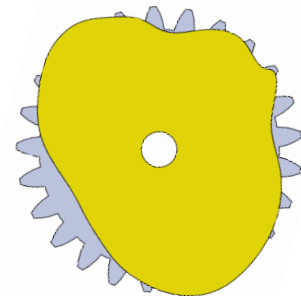
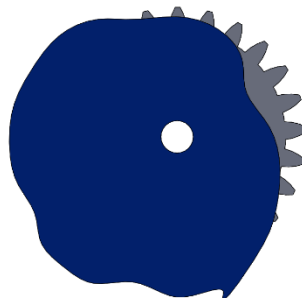
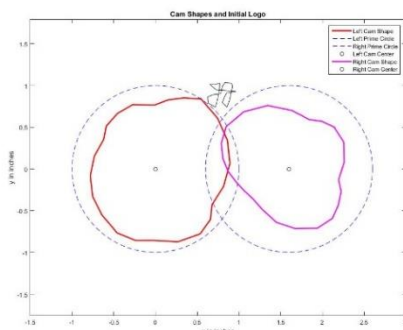
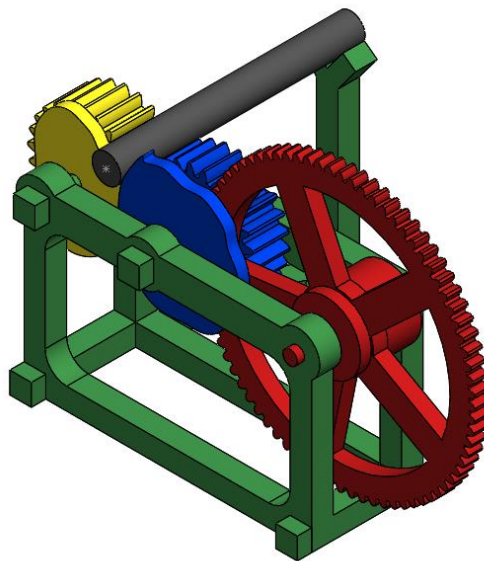
MAE 150 Matlab-CAD Shape Generation

Lite Brite, Lite Brite, turn on the magical laser light. I created a toy that utilizes Matlab to generate CAM Shapes of anyone's initial based on user input. Then, these inputs are converted to Solidworks where it will generate 3D CAD Models. By creating a script that allows the user to draw their initials, we can generate coordinates in order to be formed by the two-CAM.

The figures below are the final generated CAM Shapes of the initials "J-J".

Skills Developed

- Developed and generated coordinates of desired CAM shapes using MATLAB
- Integrating and utilizing MATLAB generated calculation and transferring it to Solidworks
- Kinetic Relationship between Left and Right CAM
- Motion analysis using Solidworks to confirm transformed traced curve of laser path
- 3D printed Solidworks assembly
- Motion analysis with Solidworks



Rack 'Em Up Robots

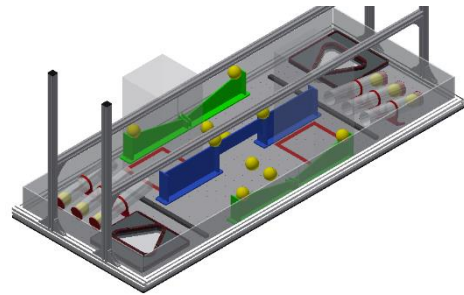
"Gotta Rack 'Em all" ([For More Info](#))

ABRACADABRA! REVEALING THE "NEWTONS" ROBOT!! <Evil Laugh>. I made a robot for a competition. The competition objective is to score as many points as possible with the given obstacles in an arena for a period given. A team of students will design and build a machine for using DC motors, solenoids, and fabrication tools.

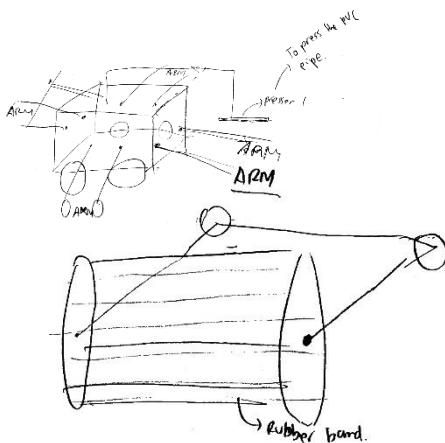
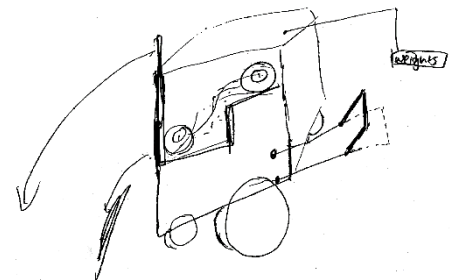
Design Iterations

A finalized product always starts with brainstorming design concept that follows the functional requirement of the product. Several functional requirements of our team's design include:

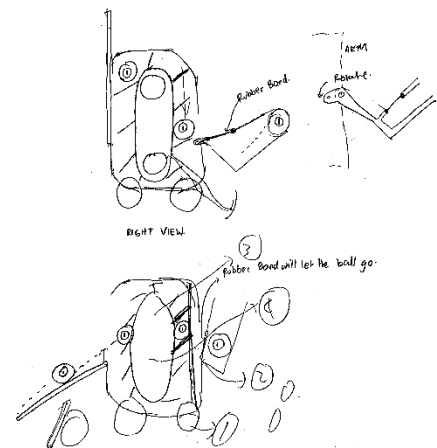
- ability to push the ball from point A to point B
- take balls from walls to drop it in points area



The first design is a cart with shovel on the front and bridge at the rear. This enables the robot to shove balls from the floor and carry it into the scoring area. Moreover, there is a weight on top of the cart that will be used to drop balls from the walls of the map.



The second design was inspired by a tennis ball collector, the barrel is free to rotate. Moreover, the material used is rubber bands, this allows the ball to get trapped by the barrel. The cart also involves a weight that is dropped down to allows the ball from the wall to fall to the ground.



The third design allows the cart to take the balls from the ground by using a shovel. The rotating mechanism inside the cart allows the team to carry balls around the map and dropping it into the scoring area.

Skills Developed

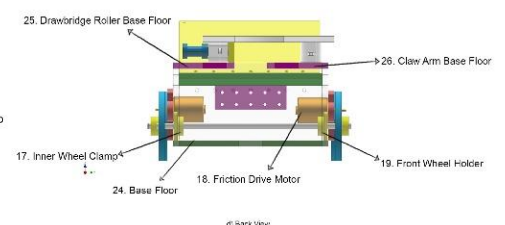
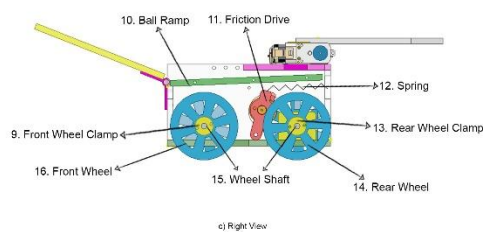
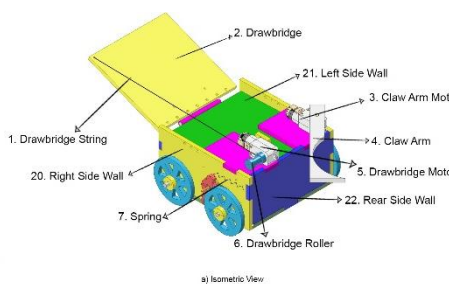
- Application to analysis to Mechanical Design
- Creative Mechanical Design to solve problems
- Dimensioning and tolerancing using ANSI standards
- 2D and 3D AutoCAD
- Fabrication tools (Milling, Bandsaw, 3D printer, Laser cut, Soldering iron)
- Calculating gear ratio, power of motor to effectively choose right motor
- Project management (Gantt charts, etc)

Problems

- Team work ethics
- Design are not DFM, hence, multiple designs with same functional requirements are generated due to problems with manufacturing
- Acrylics are not a good solution for building a final prototype, however, it is a good and rapid way to proof design concepts

Results

- **Quarter finalist out of 48 teams (Top 8)**
- **Winner of best presentation awards**



Lightest PLA Material Structure

MAE 150 Design Competition

Do you know that an ant can carry 50 times their own weight? In this project, I design the lightest material to hold 10kg for the 3 Pillars configuration given using 3D printed PLA material.

Background

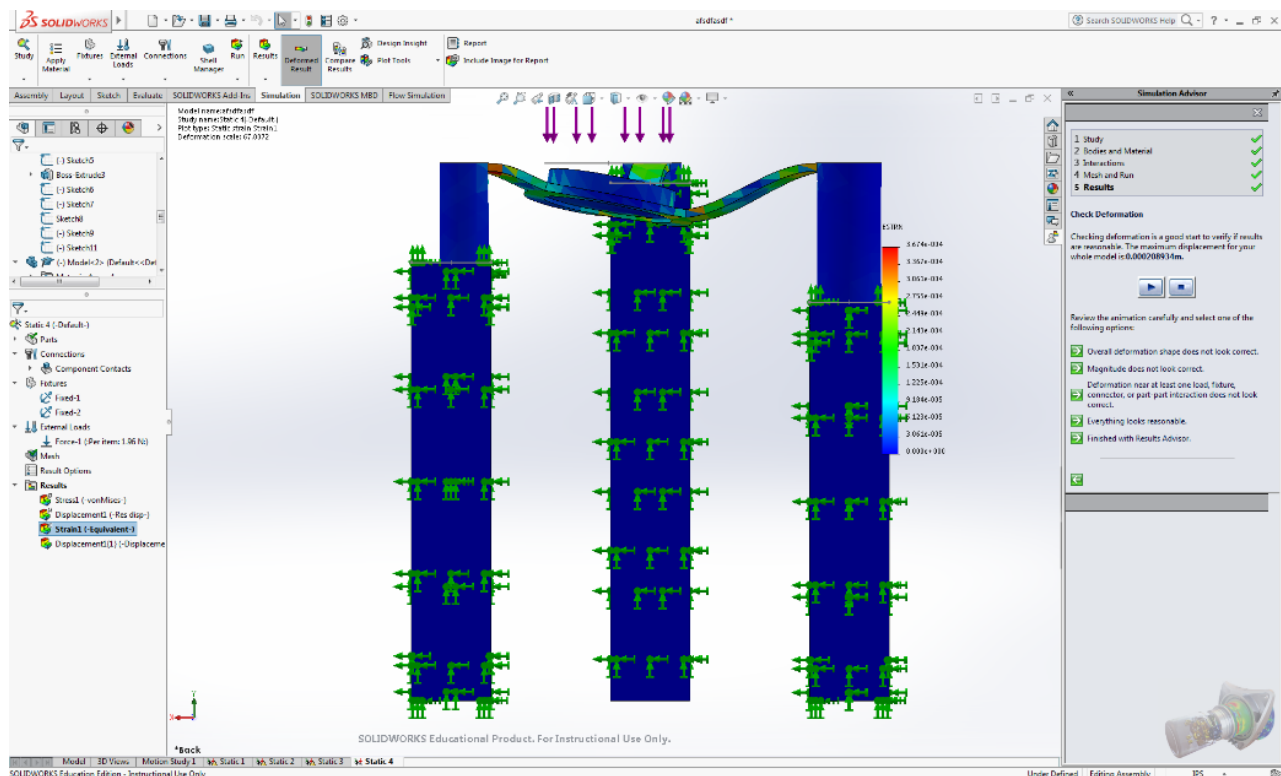
One of the design competition requirements is for the structure to have no contact against the 3 pillars after the 10 kg weight is placed. the design has utilized many design iterations using Ansys and Solidworks to optimize the total weight of the structure. The picture below shows that the design does not touch the 3 Pillars configuration given, and the Von Mises stress analysis in Solidworks shows that the material does not break although it is deflected.

Skills Developed

- 3D CAD using Solidworks
- FEA Analysis and optimization to reduce weight using Solidworks and ANSYS
- Application of knowledge on materials stress and strains into Solidworks and ANSYS

Results

- Top 10 out of 25 students (9th place)



jason: Whatever Works