jason:

Design Engineering Portfolio

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My engineering philosophy: **Whatever Works**

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Jason Joshua

B.S Mechanical Engineering

University of California, San Diego

Coffee Machine for “Microbubble”

Diagnologix, LLC.

A Biotech startup that utilizes MicroBubble (MB), an innovative cell isolation technology, on developing innovative tools and products for unmet medical needs. Awarded with multiple Phase II SBIR Grants, totaling more than USD $1MM.

Skills Developed

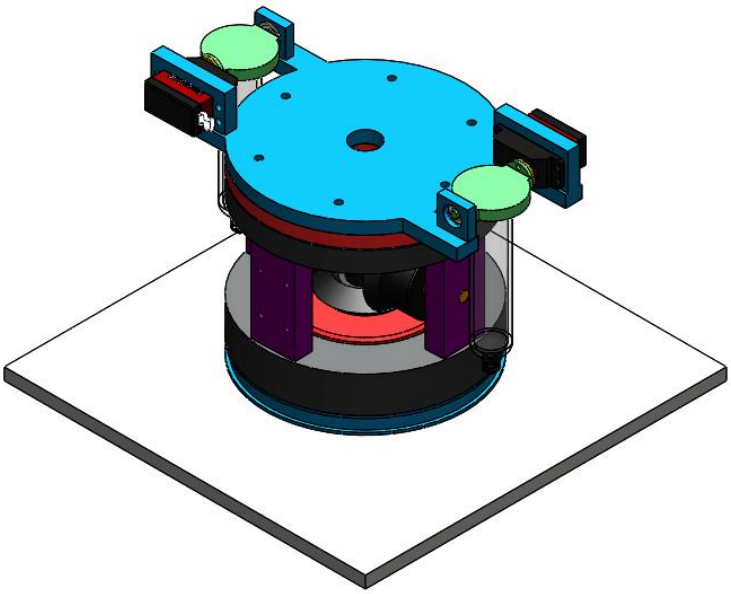
- Develop 3D CAD model using Solidworks, and Autodesk Inventor
- Rapid prototyping using 3D printed SLA, SLS Printer, Laser Cut, Fabrication tools, stock items in the market
- Be a liaison with 3rd party vendor for materials, and parts
- Motion Analysis using Solidworks
- Gear calculation including 4 bevel gear assembly, spur gears
- Develop automation using
    1. Processor: Arduino, PSoC (C language)
    2. Actuator: Linear actuator, NEMA Stepper Motor, Servo, DC Motor
- ASME CAD Models, GD&T ANSI standard

Problems

- Alignment issues with linear bearings due to not knowing the linear bearing rules
- 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 solving for rotation of tubes by developing 4 bevel gear system to prevent tubes tangling

Results

- **Phase II Grant announced in July 2019**



** Limited graphics due to disclosure agreement

Rack 'Em Up Robots

UC San Diego

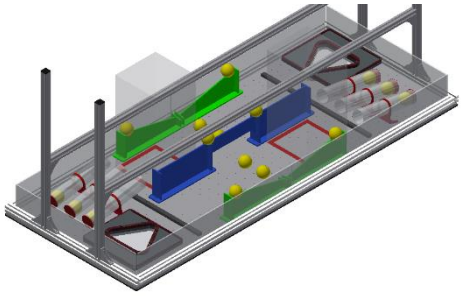
"Gotta Rack 'Em all" (For More Info)

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.

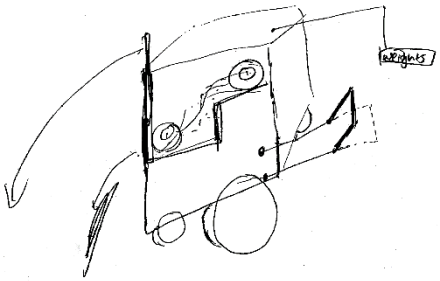
Design Iterations

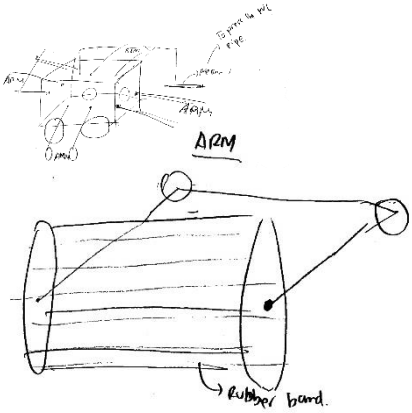
A finalized product always starts with brainstorming design concept that follows the functional requirement of the product. Several functional requirements of our team's design include:

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

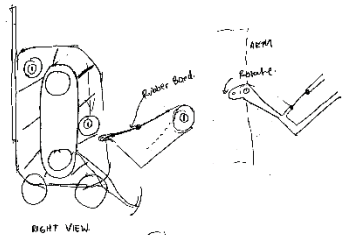


The first design is a cart with shovel on the front and bridge at the rear. This enables the robot to shove balls from the floor and carry it into the scoring area. Moreover, there is a weight on top of the cart that will be used to drop balls from the walls of the map.

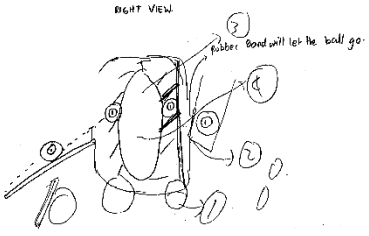




The second design was inspired by a tennis ball collector, the barrel is free to rotate. Moreover, the material used is rubber bands, this allow the balls to get trapped by the barrel. The cart also involves a weight that is dropped down to allow the balls from the wall to fall to the ground.



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

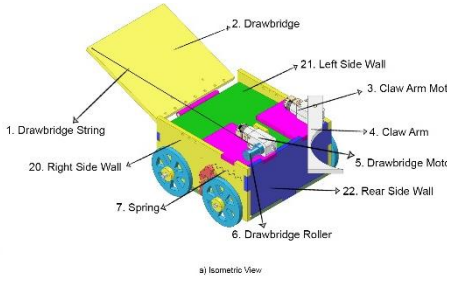
- Application to analysis to Mechanical Design
- Creative Mechanical Design to solve problems
- Dimensioning and tolerancing using ANSI standards
- 2D and 3D AutoCAD
- Fabrication tools (Milling, Bandsaw, 3D printer, Laser cut, Soldering iron)
- Calculating gear ratio, power of motor to effectively choose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

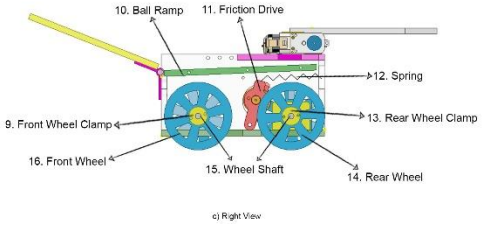
Problems

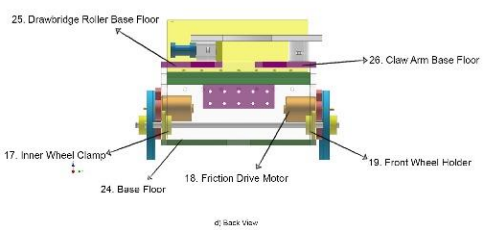
- Team work ethics
- Design are not DFM, hence, multiple designs with same functional requirements are generated due to problems with manufacturing
- Acrylics are not a good solution for building a final prototype, however, it is a good and rapid way to proof design concepts

Results

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







Two-Cam Laser Mechanisms

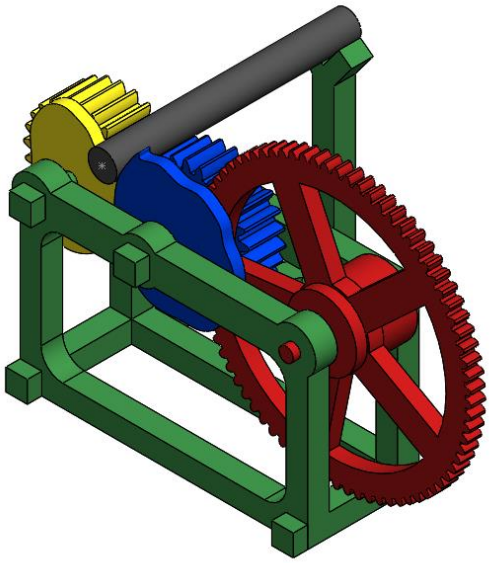
UC San Diego

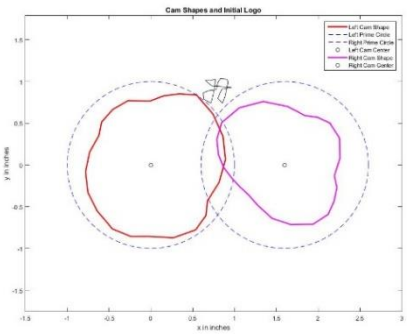
MAE 150 Matlab-CAD Shape Generation

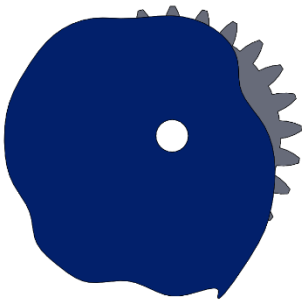
Design CAM shapes that can draw the initial of our names by integrating MATLAB script and Solidworks. By creating a script that allows the user to draw their initials, we can generate coordinates in order to be formed by the two-CAM. The figures below are the final generated CAM Shapes of the initals “J-J”.

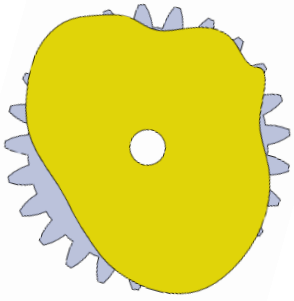
Skills Developed

- 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









Lightest PLA Material Structure

UC San Diego

MAE 150 Design Competition

Computer-Aided Design Class Competition to design the lightest material to hold 10kg for the 3 Pillars configuration given using 3D printed PLA material

Background

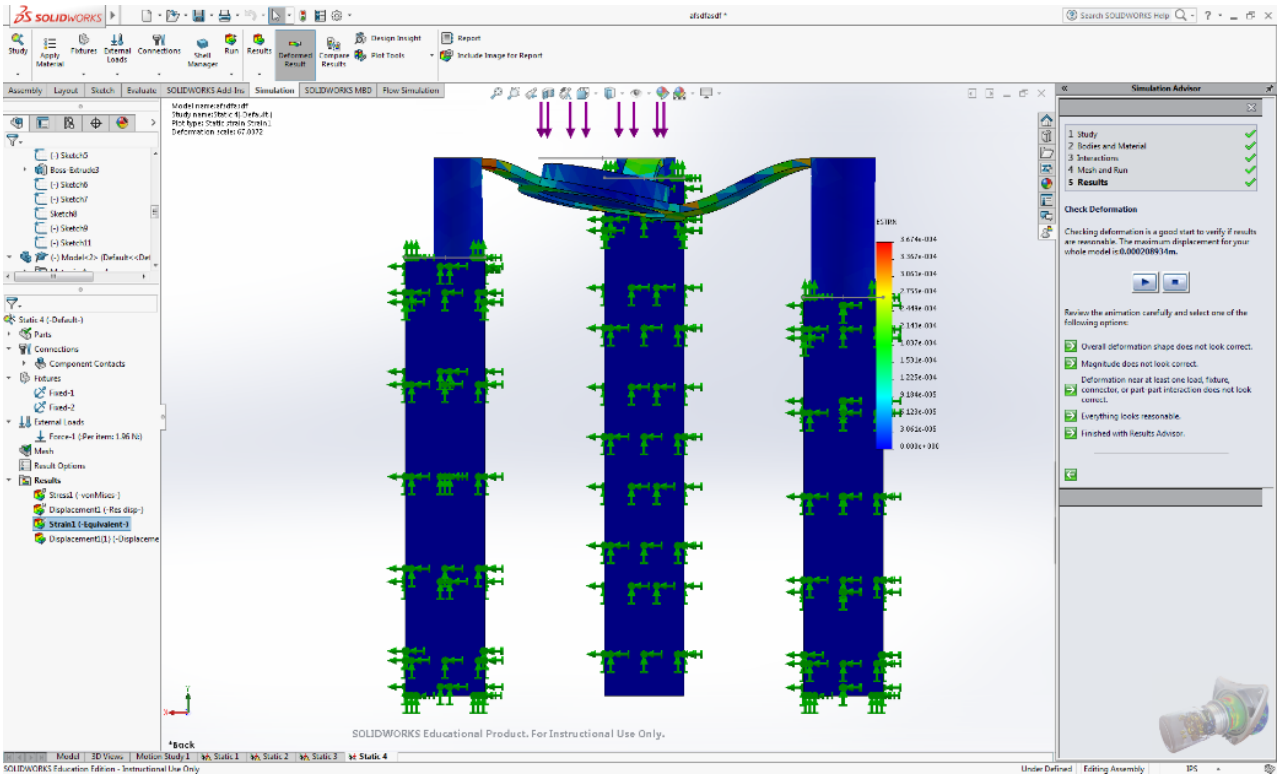
One of the design competition requirements is for the structure to have no contact against the 3 pillars after the 10 kg weight is placed. the design has utilized many design iterations using Ansys and also Solidworks to optimize the total weight of the structure. The picture below shows that the design 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)**



Automated Surfboard Rental Station

SurfUp San Diego

A San Diego startup-based company that is focused on automated surfboard rental station. 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

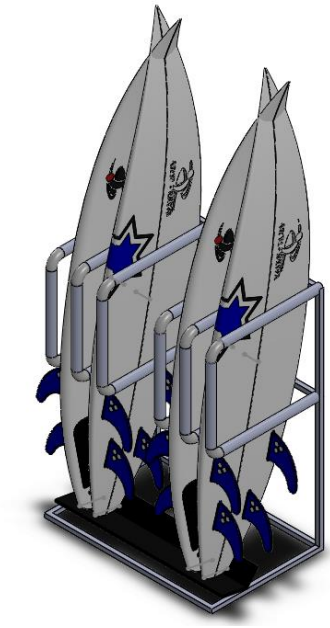
- Rapid Prototyping, Solidworks 3D CAD Model
- Fabrication tools such as CNC Machine, Lathe, Milling, Bandsaw
- Creative mechanical design (locking mechanism)
- Mechatronics (Arduino, RFID, Servo)
- Project Management (Budgeting, Gantt Chart generation)

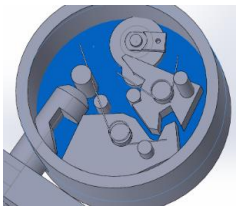
Problems

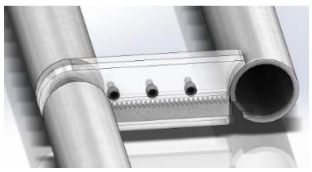
- Design are not DFM, need to manufacture in order to design
- Double lock mechanism makes double work
- Many design regenerations due to budget constraints, design feasibility

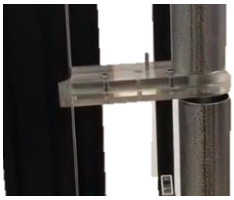
Results

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









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