jason:

DESIGN ENGINEERING PORTFOLIO

“

MY PHILOSPHY OF ENGINEERING: *WHATEVER WORKS*

”

JASON JOSHUA

B.S MECHANICAL ENGINEERING

UNIVERSITY OF CALIFORNIA, SAN DIEGO

1. **DIAGNOLOGIX LLC. SUMMER INTERNSHIP PROJECTS (on-going)**
    a. *Description*
        i. Develop an automated medical device for the company's technology called "Microbubble"
    b. *Skills Developed*
        i. Develop 3D CAD model using Solidworks, and Autodesk Inventor
        ii. Rapid prototyping using 3D printed SLA, SLS Printer, Laser Cut, Fabrication tools, stock items in the market
        iii. Be a liaison with 3rd party vendor for materials, and parts
        iv. Motion Analysis using Solidworks
        v. Gear calculation including 4 bevel gear assembly, spur gears
        vi. Develop automation using
            1. Processor: Arduino, PsOC (C language)
            2. Actuator: Linear actuator, NEMA Stepper Motor, Servo, DC Motor
        vii. ASME CAD Models, GD&T ANSI standard
    c. *Problems*
        i. Alignment issues with linear bearings due to not knowing the linear bearing rules
        ii. Difficulty in finding correct required specs part for the device as a result, attending multiple expos is best solution
        iii. Expensive parts as a result, refurbishing from broken machines is the best option to proof the concepts
        iv. Difficulty in coding with PSoC as it is new for the team
        v. Problem solving for rotation of tubes by developing 4 bevel gear system to prevent tubes tangling

Fig 1.1: 3D Printed 4 bevel gear arrangement

Fig 1.2: Refurbished bevel gear arrangement

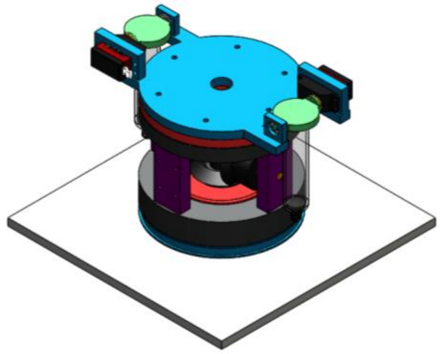

Fig 1.3: Refurbished bevel gear arrangement

*** Limited graphics due to disclosure agreement*

2. MAE 3 ROBOTIC COMPETITIONS (For More Info)

a. *Description*
   i. The competition objective is to score as many points as possible with the given obstacles in an arena for a period of time given. A team of students will design and build a machine for using DC motors, solenoids, and fabrication tools.

b. *Skills developed*
   i. Application to analysis to Mechanical Design
   ii. Creative Mechanical Design to solve problems
   iii. Dimensioning and tolerancing using ANSI standards
   iv. 2D and 3D AutoCAD
   v. Fabrication tools (Milling, Bandsaw, 3D printer, Laser cut, Soldering iron)
   vi. Calculating gear ratio, power of motor to effectively choose right motor
   vii. Project management (Gantt charts, etc)

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

d. *Results*
   i. Quarter finalist out of 48 teams (Top 8)
   ii. Winner of best presentation awards

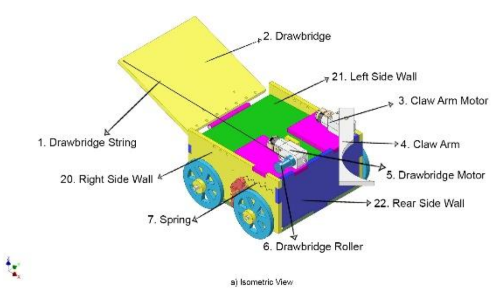

Fig 2.1: Isometric View CAD Model

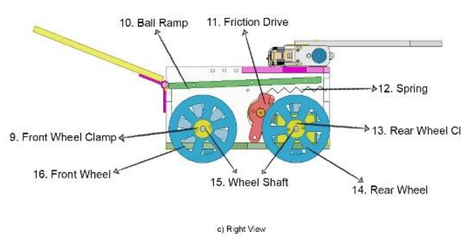

Fig 2.2: Right View CAD Model

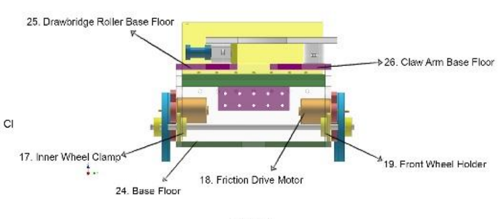

Fig 2.3: Front View CAD Model

Fig 2.4: Actual Built Model

3. MAE 150 MECHANICAL TWO-CAM MECHANISMS

a. Description

i. Design CAM shapes that can draw the initial of our names by integrating MATLAB script and Solidworks.

b. Skills developed

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

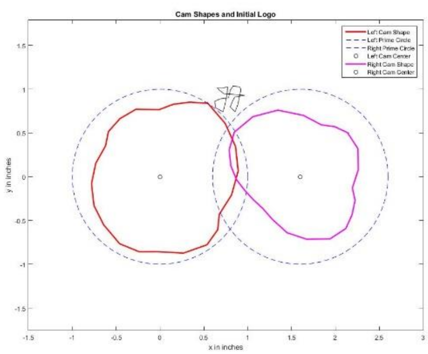

Fig 3.1: MATLAB Generated CAM Shapes

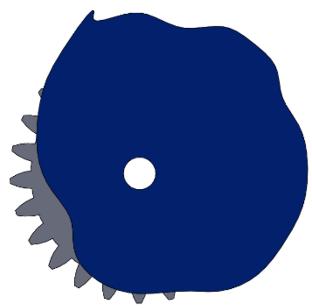

Fig 3.2: Left CAM Shapes

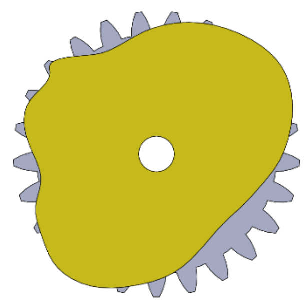

Fig 3.3: Right CAM Shapes

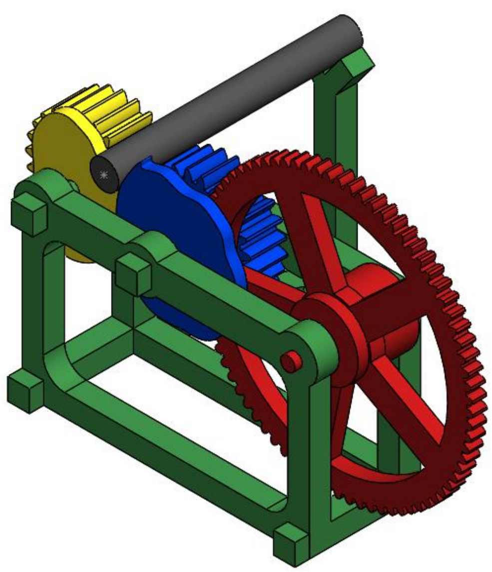

Fig 3.4: Laser Assembly with generated CAM Shapes

4. MAE 150 DESIGN COMPETITION

a. Description

i. To design the lightest material to hold 10kg for the 3 Pillars configuration given using 3D printed PLA material

b. Skills Developed

i. 3D CAD using Solidworks

ii. FEA Analysis and optimization to reduce weight using Solidworks and ANSYS

iii. Application of knowledge on materials stress and strains into Solidworks and ANSYS

c. Result

i. Top 10 out of 25 students (9th place)

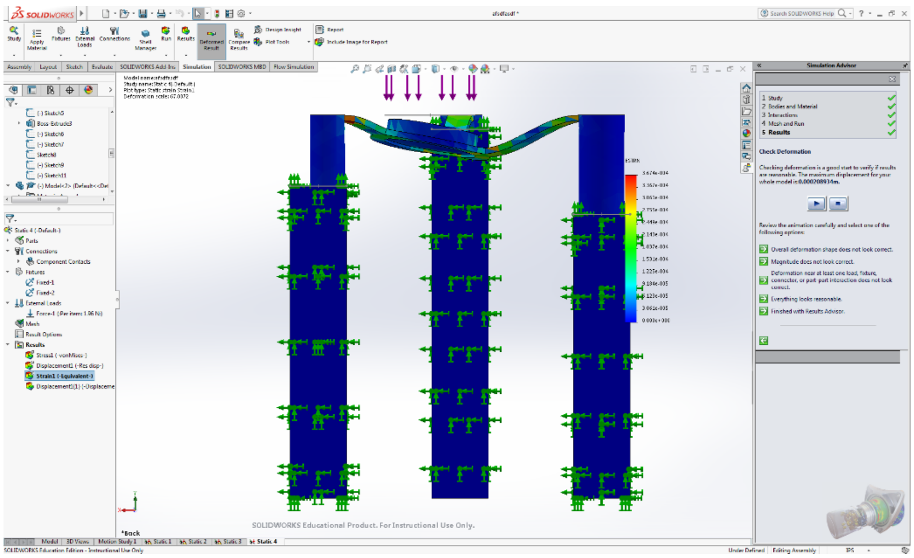

Fig 4.1: FEA Front View Showing that Design Does Not Touch Pillars

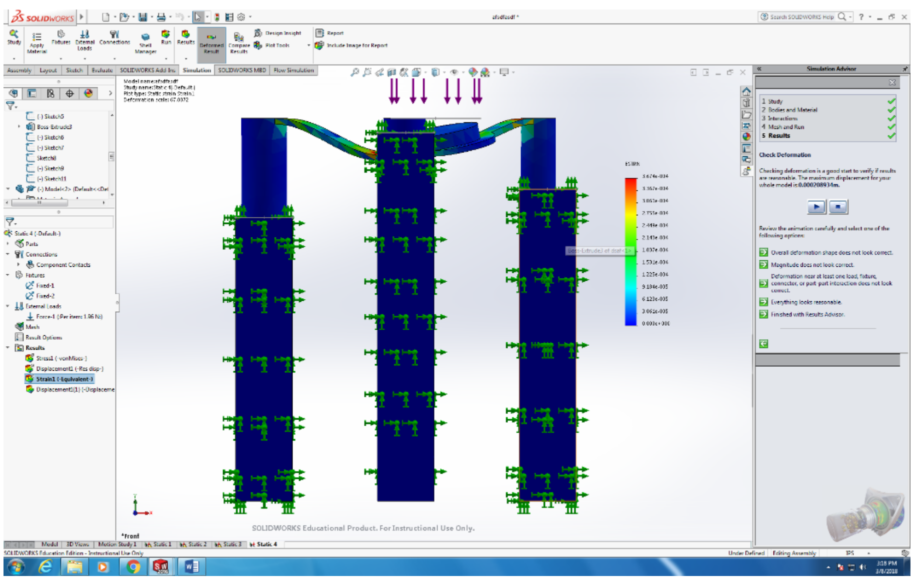

Fig 4.2: FEA Right View Showing that Design Does Not Touch Pillars

5. **SURFUP Startup (MAE 156B Senior Design: On-Going)**
    a. *Description*
        i. 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
    b. *Skills Developed*
        i. Solidworks 3D CAD Model
        ii. Fabrication tools such as CNC Machine, Lathe, Milling, Bandsaw
        iii. Rapid prototyping
        iv. Creative mechanical design (locking mechanism)
        v. Mechatronics (Arduino, RFID, Servo)

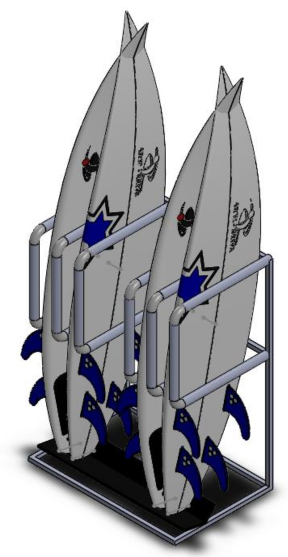

Fig 5.1: CAD Model of Surfboard Station

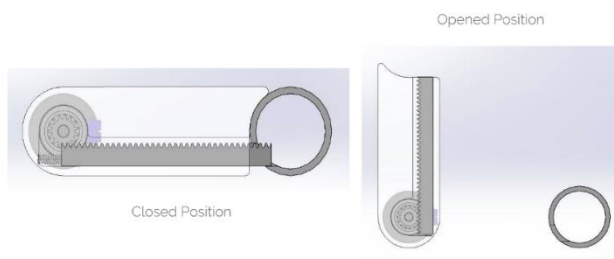

Fig 5.2: Linear Locking Mechanism Closed (left) and Opened position (right)

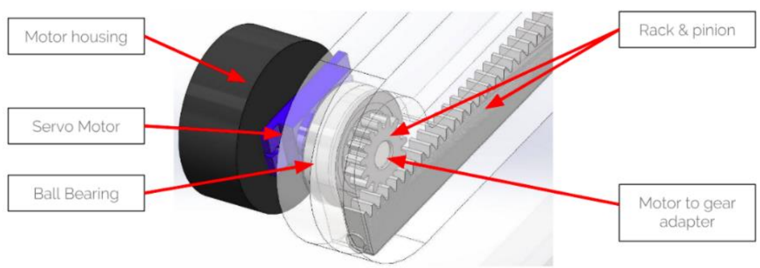

Fig 5.3: Linear Locking Mechanism Components

Fig 5.4: Latch Locking Mechanism Locked position

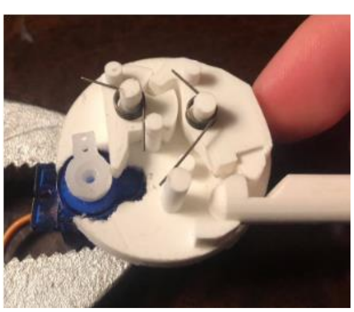

Fig 5.5: Latch Locking Mechanism Unlocked position

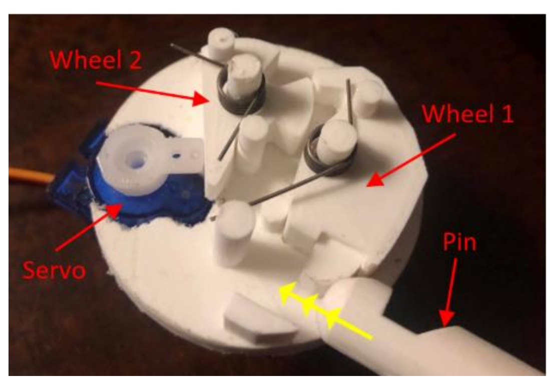

Fig 5.6: Latch Locking Mechanism

WHATEVER WORKS