SJSU SAN JOSÉ STATE UNIVERSITY

Department of Mechanical Engineering
College of Engineering

Senior Design Project Presentations

8:30 AM – 4:00 PM
Friday, May 8, 2026

Rooms 331, 337, and 341, Engineering Building

ME195B Section 02 Faculty Supervisor: Dr. Amir Armani

8:30-11:30 AM, Room E331, Engineering Building

Time	Project Title	Team Members
8:30-8:59	PEEK Interference Screw Sponsor: Stryker	Ethan Bellah (Lead) Lucas Peregrino Josue Antonio Luis Cristina Pineda Carranza
9:00-9:29	Affordable Smart Wheelchair With Obstacle Avoidance Detection and Avoidance Sponsor: Dr. Mojtaba Sharifi	Hasan Chharawalla (Lead) Odin Bruyere Keshav Sreedharan Cesar Garcia Perez Joaquin Aguilera Aguilera Javier Gomez
9:30-9:59	CXI In-Vacuum Interaction Point: Mini Characterization Station Sponsor: SLAC National Accelerator Laboratory	Charmaine Lui (Lead) Tobey Chan William Dailey Jeren Navarro
10:00-10:29	Portable Automatic Belay Braking System (PABBS) Sponsor: ME Department	Alec Lefteroff (Lead) Kenneth Luu Nathan Yoakum Akul Verma
10:30-10:59	Security Swarm Robots Sponsor: ME Department	Nelson Cortez (Lead) Kylar Lee Redge Tolentino Michael D'amore Jacob Miguel Maulino
11:00-11:29	Rubik's Cube Solver Sponsor: ME Department	Thomas Wong (Lead) Braxton Mendoza Kevin Tran Victor Wong Aung Kyi Min Andrew Bravo

ME195B Section 03 Faculty Supervisor: Dr. Winncy Du

8:30-11:30 AM, Room E341, Engineering Building

Time	Project Title	Team Members
8:30-8:59	Shoulder Rehabilitation with Seven-Axis Robotic Arm Sponsor: ME Department	Caroline Glaser (Lead) Leonardo Calle Loor Gerardo Saldivar
9:00-9:29	IoT-Enabled Modular Housing Unit Sponsors: DevCon Construction; Berkeley Nucleonics Corp., Pine Cone Lumber, Low's.	Lucca Aldana (Lead) Keely Brown Christian Eric Balakid

		Troy Buenaventura Paul De Leon Vincent Vu
9:30- 9:59	Solar-Powered Thermal Management System for Modular Housing Sponsors: Monterey Mechanical Co.; Quantum Composer; Home Depot	Jeanine Renoblas (Lead) Nhat-Lan Nguyen Hirofumi Sato Dylan Tuazon
10:00- 10:29	Assembly Fixtures for the Handheld Discectomy and Endplate Preparation System Sponsor: Vista Robotics	Landon Krivanec (Lead) Jordan Iversen Kevin Li Thao Nguyen Weston Uyekawa
10:30- 10:59	Variable Neck-Pressure & Neck-Suction (NPNS) Chamber Collar Collaborator: Prof. Areum Jensen with an NIH Grant	Victor Baird (Lead) James Do Derrick Fong E T Horton Christopher Xiong
11:00- 11:29	Air Quality Sensor Data Compensation Model and Housing Redesign Sponsor: Interlink Electronics	Jake Holtz (Lead) Khanh Nguyen Tayven Nguyen Gabriel Mendoza Hernan Mondragon-Becerra Will Watcha

ME195B Section 04 Faculty Supervisor: Dr. S.H. Zaidi

10:30 AM-4:00 PM, Room ENG 337 or 341, Engineering Building

Time	Project Title	Team Members
10:30- 11:00 (E337)	3D Printing of Soft Materials/Soft Robotic Sponsor: ME Department	Rylan Wong, Andrey Blinkov, Philip Wollman, & Jacob Steffen-Brune
11:00 – 11:30 (E337)	Asymmetrical Quadcopter with Off-Center Rotors Sponsor: ME Department	Edrick Corona Hernandez, Andrew Le, Gustav Wagner, Azeneth Muñoz, & Nolan Hujardo
11:30- 12:00	Characterization of Direct-to-Chip Liquid Cooling Cold Plates Sponsor: Jabil	Kevin Lam, Jashan Keith (Mech Engineering)
12:00- 12:30	Feasibility of Pre-Activating Jet Dispensed UV-Activated Cationic Adhesives Sponsor: Jabil	Jason Sanstrom, Mason Lock, (Mechanical Engineering)
2:00- 2:30 (E341)	Waterway Trash-Collecting Robot Sponsor: ME Department	Tam Bao Luong, Son Nguyen, HoangVu Ho, Christopher Kintner

2:30-3:00 (E341)	Solar-Powered Tiny House Sponsor: ME Department	Ayane Gomi, Krish Patel, Andy Luu, Boutuivi Sanvee , Max Li, Luis Fernando Perez, May Chih
3:00-3:30 (E341	UV/Ozone Plastic-to-Plastic Bonding of PMMA Sponsor: Jabil	Antony Matei, Nasheeb Rana
3:30-4:00 (E341)	Ultra Compact Mechanical Scooter Sponsor: ME Department	ROY BAEK, KYLE MIZUKURA, PHILLIP TRAN, YUKI YAMAMOTO

ME195B Section 01 Faculty Supervisor: Raghu Agarwal

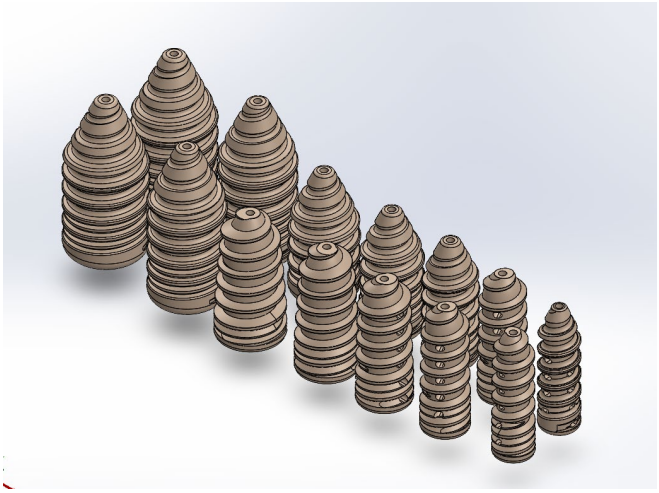
1:30 PM – 4:00 PM; Room E331, Engineering Building

Time	Project Title	Team Members
1:30-1:59	Net Deployment with Synchronous Drones (4 Students) Sponsor: None	Muzzio, Ethan Leporini, Austin Ng,Joshua, Daniel Sun, Caleb James
2:00-2:29	Redundant Electronic Throttle & Brake Assist for Amputee Driver (6 Students) Sponsor: None	Shah, Muhammed Alexander, Raymond Chen, Yuhao De La Cruz, Darion King, John Salom, Davis Michael
2:30-2:59	Powered Zipline Carrier Sponsor: None	Garcia, Escovedo, Eduardo Borg, Nicholas Joseph De Luna, Raiden Maloney, Dylan Patel, Ahan Schreurs, Milan
3:00-3:29	Trash Catching Vacuum Robot (5 Students) Sponsor: None	Wong, Patrick Hau Ledezma, Ornelas Gustavo Cedeno,Alejandro Do,Kristopher Anh Kiet Tran,Branden Tan
3:30-3:59	Electric Therapeutic Wheelchair (5 Students) Sponsor: None	Hernandez, Josmar Vega Gil, Victor Manuel Jimenez Lopez, Ely L. Nguyen, Benjamin Xu Savellani, Arjay

PEEK Interference Screw

Student Team Members:
Ethan Bellah
Lucas Peregrino
Cristina Pineda Carranza
Josue Antonio Luis

Faculty Advisor:
Professor Amir Armani



Project Scope and Objectives:
Design, prototype, and mechanically evaluate a full line of PEEK interference screws and compatible driver systems for ACL reconstruction procedures

1. Develop a line of 21 PEEK interference screw designs that provides reliable graft fixation during ACL reconstruction
2. Conduct repeatable mechanical testing to evaluate screw fixation strength, insertion behavior, torque-to-strip performance, torque-to-break performance, and cyclic failure resistance.
3. Design a compatible universal driver system capable of transmitting torque effectively while minimizing screw-driver disengagement, stripping, or slippage during insertion.
4. Use mechanical testing data and sponsor feedback to refine the screw geometry, driver interface, tolerances, and testing procedures before final design validation.

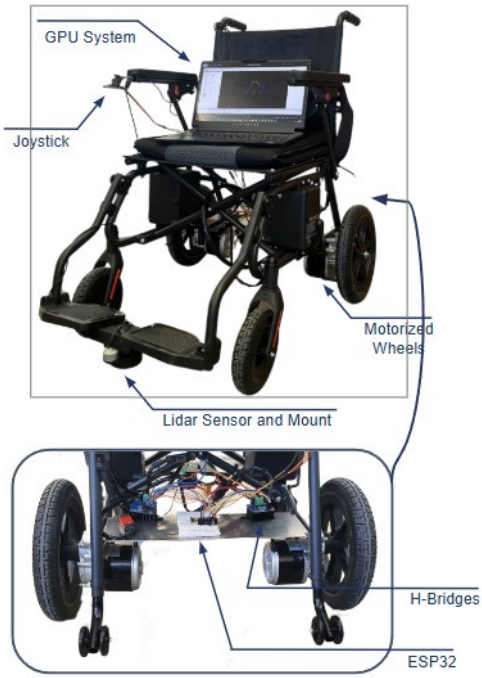
Project Results:

1. Developed a screw concept using a tapered geometry, single-lead thread design, cortical thread features, and venting considerations to improve fixation performance
2. Created CAD models, technical drawings, and prototype driver concepts, including torx, trilobe, square, and star driver profiles, to compare engagement strength and torque transmission.
3. Conducted FEA and design review work to evaluate driver stress, screw wall thickness, and torque limits, which helped guide later driver geometry changes
4. Completed preliminary validation testing using Stryker Biosteon and titanium interference screws

Sponsor:
Stryker

Affordable Smart Wheelchair With Obstacle Avoidance

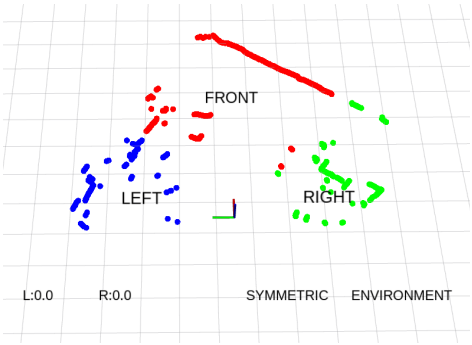
Student Team Members:
Hasan Chharawalla
Keshav Sreedharan
Odin Bruyere
Javier Gomez
Joaquín Aguilera Aguilera
Cesar Garcia Perez



Faculty Advisor:
Dr. Amir Armani

Project Scope and Objectives:

1. Design a low-cost electric wheelchair with real-time obstacle detection through LiDAR Integration.
2. Real-time, accurate environment mapping.
3. Use 2D-LiDAR mapping data to assist in obstacle detection and avoidance.
4. User feedback, including haptics and audio, as a warning system for obstacle proximity detection



Project Results:

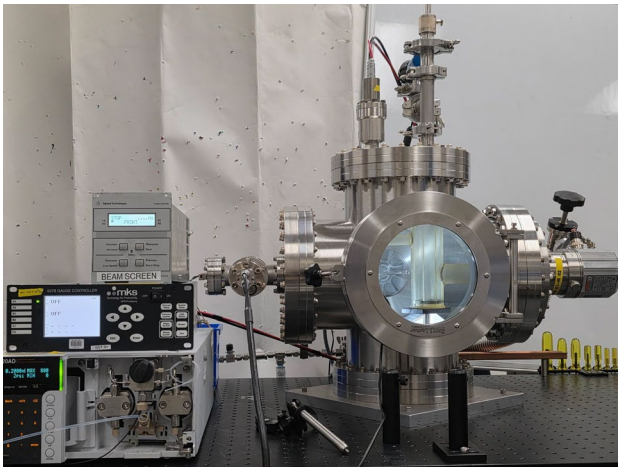
1. Bypassed the manufacturer's control system and implemented our custom system for the integration of new sensors and better system understanding
2. Allows for real-time user control with two safety layers implemented to prevent critical collisions, enhancing user trust by allowing full autonomy in most cases
3. Smooth speed scaling based upon distance to objects and wheelchair deviation in critical scenarios where the wheelchair gets too close to an obstacle
4. 100% success rate for various trial runs considering different scenarios (No Collisions)
5. Kept under $250 cost for additional sensors & materials

Project Sponsor:
Assistive Robotics and Medical Systems Lab (SJSU)
Dr. Mojtaba Sharifi

CXI In-Vacuum Interaction Point: Mini Characterization Station

Student Team Members:
Tobey Chan
William Dailey
Charmaine Lui
Jeren Navarro

Faculty Advisor: Dr. Amir Armani



Project Scope and Objectives:

Design and assembly of a table-sized differential vacuum system for characterization and commissioning purposes related to CXI, with emphasis on improved visual access and pressure measurement functionality from precedent

1. Design and assemble a scaled-down differential vacuum system capable of holding vacuum of 10^{-7} Torr when pumped down using two turbomolecular pumps, with controlled fluid injection capability
2. Design and fabricate an optically translucent shroud-catcher module
3. Implement simultaneous pressure measurement of the pressure within a 6” radial region about the shroud orifice and the pressure at the outer wall of the system
4. Demonstrate characterization station functionality by observing the effectiveness of an ice mitigation solution for liquid jet injection of water into the system chamber

Project Results:

1. Achievement of 10^{-6} Torr high-vacuum conditions in the final assembled test system for clean conditions (i.e. when fluid injection functionality is not in use)
2. Shroud-catcher module fabricated via stereolithography printing, with machine-polished viewing panels for transparent, low-distortion visual access
3. Simultaneous measurement of differential pressures between the shroud-catcher module and system outer chamber demonstrated for ~12 mg/min gas injection
4. Timelapse image comparison of liquid jetting ice formation rates in the shroud-catcher module, with and without a motorized ‘weed whacker’ base

Sponsor:

SLAC National Acceleratory Laboratory (Sample Environment & Delivery group)

Portable Automatic Belay Braking System (PABBS)

Student Team Members:
Alec Lefteroff
Kenneth Luu
Akul Verma
Nathan Yoakum

Faculty Advisor: Dr. Amir Armani

Project Scope and Objectives:

Creating a mechanical and portable safety device for climbing, with automatic braking in the event of a fall.

1. Build a fall detection system to activate the device and apply braking force without human input.
2. Rapidly prototype and test device using known weights, with controlled drops simulating a real fall event.
3. Ensure a minimum stopping distance, minimum braking force on climbers, and robust weight capacity.

Project Results:

1. Successfully designed multiple prototypes capable of braking a test weight within a limited distance.
2. Conducted many drop tests at various intensities over an extended period.
3. Acquired data on the braking force experienced by the climber and material strength of the device through drop testing with a load cell.
4. Passed a modified belay competency drop test with a reduced weight, ensuring device reliability and safety for the climber.

Sponsor:
SJSU ME Department

Security Swarm Robots

Student Team Members:
Nelson Cortez
Michael D'amore
Kylar Lee
Jacob Maulino
Redge Tolentino

Faculty Advisor: Dr. Amir Armani

Project Scope and Objectives:

Design a swarm security robotic system that's affordable, capable of autonomous surveillance and threat detection.

1. Develop three robotic units that are capable of communicating with each other, mapping surroundings and obstacle avoidance via sensors and wifi
2. Design a versatile drive system that allows for maneuverability under varied terrain conditions
3. Enable direct user access to robots and coordination processes using ROS2
4. Optimize design for low-cost manufacturing, hardware support and ease of serviceability

Project Results:

1. Established a low-cost physical body that allows for ease of internal access and part serviceability
2. Successfully integrated thermal cameras with human detection cameras to minimize faulty threat detection
3. Performed successful, real-world tests for clearance through moderate terrain changes
4. Created a network that allows for user analysis of robot communications

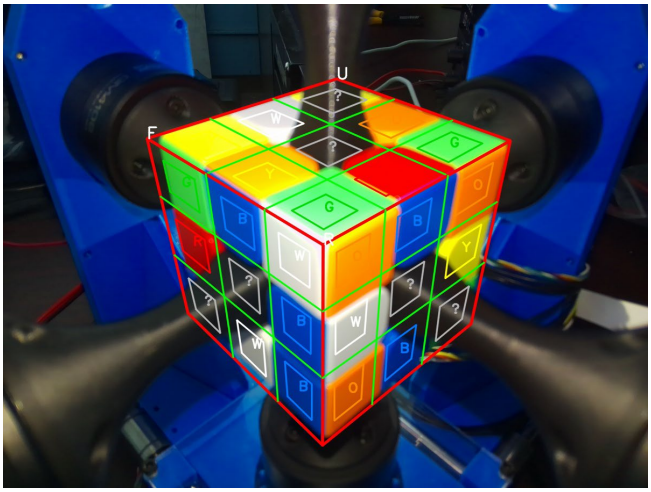
Sponsor:

San Jose State University, Mechanical Engineering Department

Rubik’s Cube Solver

Student Team Members:
Thomas Wong (Team Lead)
Braxton Mendoza
Kevin Tran
Victor Wong
Aung Kyi Min
Andrew Bravo

Faculty Advisor: Dr. Amir Armani



Project Scope and Objectives:
Design, build, and test a robotic system capable of solving a 3x3 Rubik’s Cube. The system includes electrical, mechanical, and software components that hold the cube firmly. This includes motor-driven stimulation, computer vision for cube detection, and algorithm-based solving implemented through a microcontroller system.

1. Create a robotic mechanism that can hold the cube securely and autonomously solve a 3x3 Rubik’s Cube.
2. The robot should reliably solve the cube from any of the 43 quintillion possible scrambled states within 3 seconds.
3. Develop a computer vision system to detect colors in order to solve the cube while working with the Raspberry Pi system.
4. Display a user-friendly interface through an LCD screen.

Project Results:
1. Designed a chassis that allows for seamless removal and input of the Rubik’s Cube.
2. Developed a solving program on a Raspberry Pi 5 using OpenCV to detect the cube’s different colors and Kociemba’s algorithm to compute a solving sequence.
3. Created a system that allows for the rapid individual movement of six BLDC motors via ESP32 and Field Oriented Control using SimpleFOC.
4. SPI sensors allow for smoother motor movements.

Sponsor:
SJSU Mechanical Engineering Department
American Society of Mechanical Engineers at SJSU

Shoulder Rehabilitation with Seven-Axis Robotic Arm

Student Team Members:
Caroline Glaser (Lead)
Gerardo Saldivar
Leonardo Calle Loor

Faculty Advisor: Dr. Winncy Du

Project Scope and Objectives:
Design and develop a robotically assisted rehabilitation mechanism for shoulder motion and rehabilitation.

1. Create a lightweight end-effector elbow brace that connects the user's arm to the seven-axis robotic arm in a safe manner.
2. Develop a system programmed with Python that allows for precise customization of motion profiles for both internal and external rotation.
3. Integrated safety features of impedance control and force/torque limits that ensure maximum safety and comfort for the user.

Project Results:

1. Successfully created an adjustable mechanical brace through the combination of 3D printed components and inexpensive materials.
2. Created a control program that utilizes user inputs to produce repeatable and customizable motions for internal and external rotation.
3. Demonstrated high repeatability, with angular displacement varying by less than ±1° and cycle time variation under ±0.1 seconds across multiple trials.
4. Effectively demonstrated the success of the project through the satisfaction of all design criteria required to create safe and reliable rehabilitation motions.

Sponsor: Department of Mechanical Engineering at San Jose State University

IoT-Enabled Modular Housing Unit

Student Team Members:
Lucca Aldana (Lead)
Keely Brown
Christian Eric Balakid
Troy Buenaventura
Paul De Leon
Vincent Vu

Faculty Advisor: Dr. Winncy Du

Project Scope and Objectives:

1. Design and construct a proof-of-concept modular housing prototype focused on affordability, portability, and sustainability.
2. Develop structural, thermal, and electrical systems to simulate real-world residential functionality.
3. Evaluate materials, insulation, ventilation, and solar integration for energy-efficient operation.
4. Explore how modular construction methods can improve scalability, construction speed, and housing accessibility.

Project Results:

1. Successfully constructed a functional prototype house with integrated lighting and structural systems in compliance with applicable codes and safety standards
2. Designed modular panels and connectors
3. Performed various load calculations and analysis
4. Implemented insulation, ventilation, and solar-powered design concepts to improve energy efficiency.
5. Evaluated material selection and layout strategies to balance durability, weight, and constructability.
6. Integrated the IoT technology into modular residential unit and tested it.
7. Demonstrated the feasibility of modular housing concepts as a scalable and cost-effective housing solution.

Sponsor: DevCon Construction, Pine Cone Lumber, Berkeley Nucleonics Corporation, Quantum Composers, Monterey Mechanical, Home Depot, Lowe's, Interlink Electronics.

Solar-Powered, Thermal Management, and Smart System for Modular Housing

Student Team Members:
Jeanine Renoblas (Lead)
Nhat-Lan Nguyen,
Hirofumi Sato,
Dylan Tuazon

Faculty Advisor: Dr. Winncy Du

Project Scope and Objectives:

Design and build a solar-powered, thermal management, and smart feature solution for modular housing to provide cost-effective power, indoor climate control, and a safer living environment

1. Design an 960W solar power system to meet daily needs of modular housing.
    a. Test power generation throughout the day to characterize system performance under different weather conditions.
    b. Design electric circuit that meets National Electric Code, sizing protective devices 125% of the total load to prevent overheating.
    c. Size supporting components to safely manage generated power, using ampacity charts.
2. Design an automatic ventilation system to turn on a fan when high toxic gas level is detected
    a. Display various room conditions (humidity, temperature, pressure, air quality).
    b. Test various air environments to figure out the threshold needed for a toxic gas sensor.
3. Implement door sensors and window sensors that trigger an alert when open is detected. keypad interface allows homeowners to arm and disarm the security system using a passcode.

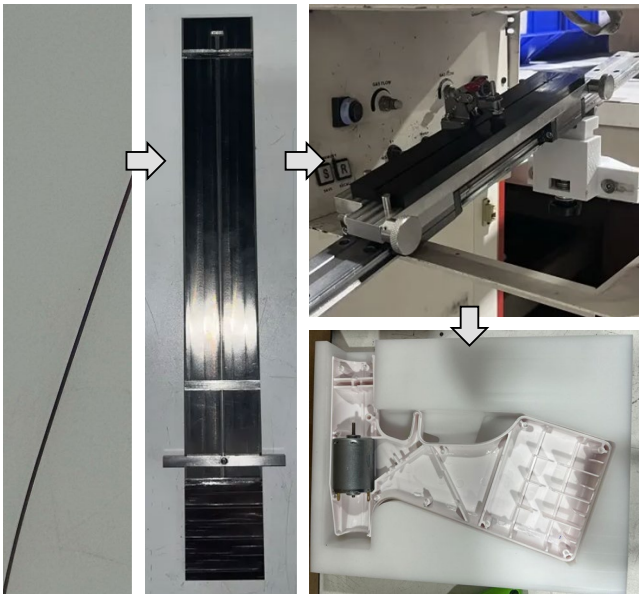
Project Results:

1. Successfully programmed an automated ventilation system to monitor and maintain safe indoor air quality levels, safe and comfort living conditions.
2. Integrated door and window sensors to provide real-time entry alerts.
3. Successfully constructed and simulated a rooftop portable solar panel mounting system with an optimized tilt for best efficiency (~24%).

Sponsor:

Sponsor: DevCon Construction, Pine Cone Lumber, Berkeley Nucleonics Corporation, Quantum Composers, Monterey Mechanical, Home Depot, Lowe's, Interlink Electronics.

Assembly Fixtures for the Handheld Discectomy and Endplate Preparation System



Student Team Members:
Landon Krivanec (lead)
Thao Nguyen
Jordan Iversen
Weston Uyekawa
Kevin Li

Faculty Advisor: Dr. Winncy Du

Project Scope and Objectives:
This project focuses on the assembly of Vista Robotics' 29-component discectomy tool, with a specific emphasis on 11 critical parts.

1. To design and fabricate fixtures to decrease assembly time from approximately 8 hours to less than 30 minutes per device.
2. Increase precision and repeatability in critical assembly steps, such as laser welding, cutting material to measure, adhesive application, and small-diameter threading.
3. Employ design for manufacturing (DFM) and tolerance analysis to ensure compliance with FDA medical device manufacturing requirements.

Project Results:

1. Developed and implemented several manufacturing and assembly fixtures, which include a laser welding platform, measurement and cutting fixture, adhesive bonding fixture, and a nitinol lasso fixture.
2. The project was able to achieve substantial reductions in cycle time and tolerance improvements across key assembly steps. Here is some data collected:
    a. The lasso fixture decreased Kevlar threading time from approximately 2129 seconds to 24 seconds (99% improvement).
    b. The measurement fixture reduced time from 32 seconds to 7.45 seconds for several components required preparation (77% improvement).
    c. The laser welding fixture prevented distortion and decreased time from 135 to 121 seconds for 3 assemblies (10.37% improvement).
3. Enhanced assembly measurement repeatability to ±0.009" for 3σ deviation, weld alignment accuracy to ±0.008", and reduced dependence on skilled labor.
4. Demonstrated that low-cost fixture solutions, with a total cost of ~$2000, can dramatically increase assembly efficiency and facilitate production scalability.

Sponsor: Vista Robotics

Variable Neck-Pressure & Neck-Suction (NPNS) Chamber Collar

Student Team Members:
Victor Baird (Lead)
E T Horton
James Do
Derrick Fong
Christopher Xiong

Faculty Advisor: Dr. Winncy Du

Project Scope and Objectives:
Develop an adjustable neck collar with a wide internal chamber that can be used for Neck Pressure Neck Suction (NPNS) clinical trials for autism spectrum disorder (ASD) studies.

1. Design a medical grade collar that seals properly around the patient's neck under intended pressure and suction
2. Interface NPNS prototype with the Technavance compressor machine
3. Test collar and compare to prior the Technavance collar (Function, Cost, Comfortability, Adjustability)

Project Results:

1. Successfully designed an adjustable collar with a 16 cm wide and 9 cm tall internal chamber, with frame flexibility allowing for neck circumferences between 30 and 45 cm.
2. Conducted analysis of several collar components and materials in prototype testing to determine the optimal solutions (3D printed PETG frame, Neoprene foam, 3M Spray Adhesive, Velcro straps, etc.).
3. Compared the prototype to the Technavance collar with positive results in several assessment criteria categories (2x neck length coverage, more flexible foam, better design for manufacturability).

Sponsor:
Dr. Areum Jensen

Air Quality Sensor Data Compensation Model and Housing Redesign

Student Team Members:
Jake Holtz (Team Lead)
Khanh Nguyen
Tayven Nguyen
Gabriel Mendoza
Hernan Mondragon-Becerra
Will Watcha

Faculty Advisor: Dr. Winncy Du

Project Scope and Objectives:
Establish a data compensation system to mitigate gas sensor drift under varying environmental conditions using the Interlink AQ sensor module.

1. Develop machine learning compensation models to correct drift in CO, O_3, SO_2, and NO_2 sensors caused by environmental factors.
2. Redesign the main enclosure to be compact and compatible with injection molding while securely integrating all internal components.
3. Implement compensation models on a microcontroller for real-time gas data correction and monitoring.

Project Results:

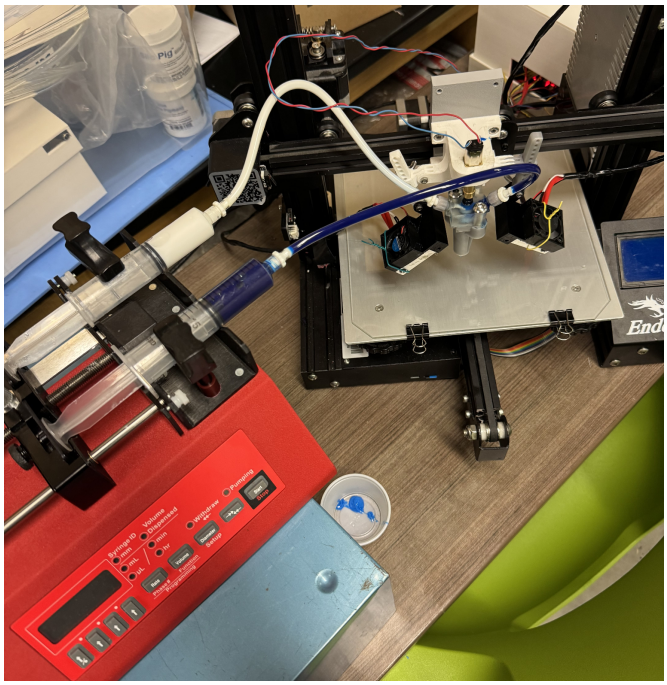
1. Deployed nine sensors across the SJSU campus, collecting real-world gas data to validate machine learning models against Interlink test chamber data.
2. Developed and implemented random forest and multilayer perceptron (MLP) compensation models on deployed sensor modules using the Losant interface.
3. Models achieved precision levels of ±200 ppb (CO_2), ±25 ppb (O_3), ±50 ppb (SO_2), and ±50 ppb (NO_2) relative to a zero-concentration controlled environment baseline.
4. Reduced the overall height of the sensor enclosure by 40% and redesigned the battery mounting system for compatibility with mass-production injection molding.

Sponsor:
Interlink Electronics

3D Printing of Soft Materials/Soft Robotics

Student Team Members:
Andrey Blinkov
Jacob Steffen-Brune
Philip Wollman
Rylan Wong

Faculty Advisors: Professor Syed Zaidi and Dr. Lin Jiang



Project Scope and Objectives:

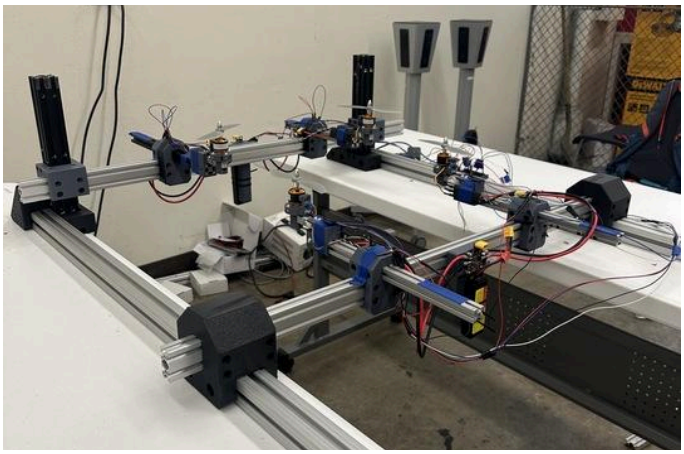
Modify and improve a 3D printer to reliably print silicone for medical applications

1. Improve consistency of silicone extrusion and ensure precise control of the curing process.
2. Redesign and fabricate structural components using stronger materials to address cracking and leaking.
3. Develop a repeatable printing procedure to produce reliable, airtight parts across various geometries.
4. Test printed parts under pneumatic loading to measure durability, flexibility, and cycle life.

Project Results:

1. Redesigned and integrated six key extruder components using SLA resins for improved rigidity and overall optimization.
2. Improved silicone flow by modifying silicone delivery components.
3. Conducted testing of silicone thickening agent at 0.1%, 0.25%, and 0.5% concentrations to optimize strength and structure.
4. Created a documented, low-cost system for future teams to produce soft actuators, prosthetics, and rehabilitative devices.

Asymmetrical Quadcopter with Off-Center Rotors



Student Team Members:
Edrick Corona Hernandez
Andrew Le
Gustav Wagner
Azeneth Muñoz
Nolan Hujardo

Faculty Advisor: Dr. Syed Zaidi

Project Scope and Objectives:

1. Design and build a test stand capable of adjusting to various configurations for four motors simulating an asymmetrical quadcopter.
2. Calibrate test stand systems to produce results comparable to CFD simulations conducted in Ansys.
3. Create a durable and easily replicated testing stand and software to allow for further testing for future asymmetrical quadcopter development.

Project Results:

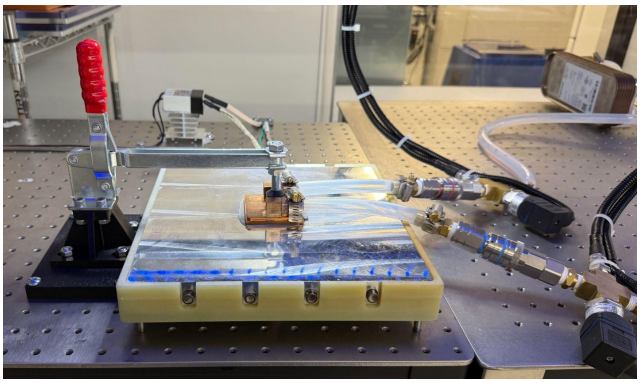
1. Successfully designed and manufactured a low cost and robust test stand for easy replication for further development
2. Working area of 40” by 33” by 10.5” to allow various motor configurations to be tested.
3. Simulate various configurations of test stand in Ansys to determine limits of optimal performing layouts for a given propeller design
4. Verify simulation results to physical test stand hardware.

Sponsor:
Personal Resources and San Jose State University Mechanical Engineering Department

Characterization of Direct-to-Chip Liquid Cooling Cold Plates

Student Team Members:
Kevin Lam (Mechanical Engineer)
Jashan Keith (Mechanical Engineer)
Omar Masmoudi (Electrical Engineer)
Kashif Majid (Industrial Engineer)

Faculty Advisor: Professor Syed Zaidi
Jabil Advisor: Ismet Gurleroglu



Project Scope and Objectives:
Build a test platform that simulates liquid cooling using direct-to-chip microchannel cold plates

1. Characterize cold plates of different fabrication techniques, geometries, suppliers, and materials
2. Create a liquid cooling loop to simulate a chip/workload, to accurately benchmark cold plates
3. Create an adjustable heat source to accommodate cold plates from 10 x 10 mm to 250 x 250 mm, simulating a CPU/GPU
4. Log data on cold plates, temperature difference, pressure difference, and flow rate

Project Results:

1. Analyze logged data on cold plate performance and create graphs to represent observed behaviors caused by various factors
2. Created a universal system for Jabil and its customers to use for benchmarking the performance of DtC liquid cooling cold plates
3. Created a data logging system that can track all six sensors' readings and store them as .csv files for plotting
4. Documented our system schematic and workings for future engineers to troubleshoot

Sponsor:
Jabil Inc.

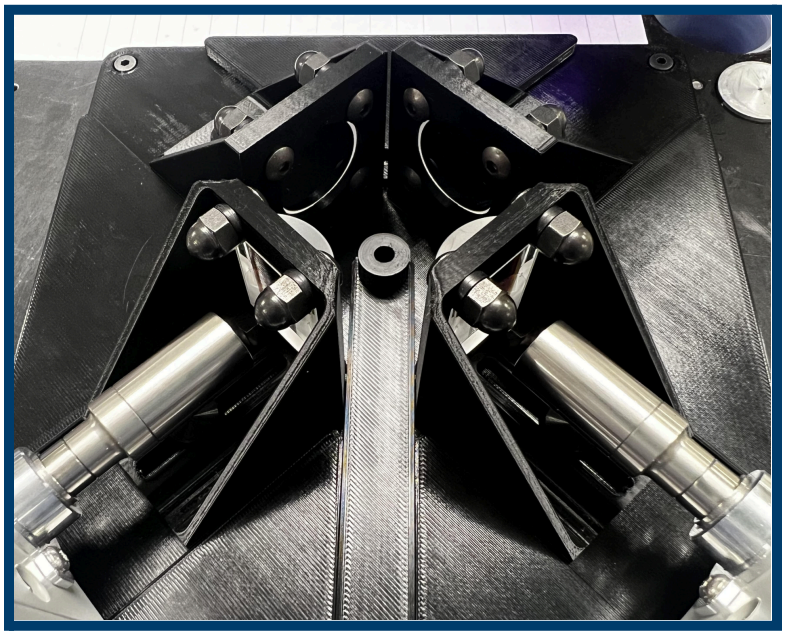
Feasibility of Pre-Activating Jet Dispensed UV-Activated Cationic Adhesives

Student Team Members:
Mason Lock
Douglas Mccluer
Jasmine Nguyen
Jason Sanstrom

SJSU Faculty Advisor:
Dr. Syed Zaidi

Industry Sponsor:
Jabil Inc.

Jabil Advisor:
Ivan Beltran



Project Scope and Objectives:
Create and determine the feasibility of a novel pre-activation method for jet-dispensed UV-activated cationic adhesives

1. Design and manufacture fixtures for optical setup to focus UV lights into adhesives mid-dispense.
2. Ensure cohesion between jet dispensing parameters and optics layout for consistent results.
3. Design experiments to determine the level of pre-activation in adhesive test samples.

Project Results:

1. Successfully designed and built an optical assembly that delivers sufficient UV dosage to pre-activate adhesive droplets in flight.
2. Created MATLAB scripts to model the optical system and simulate UV dosage delivered to adhesive droplets, validated against measured irradiance data.
3. Achieved consistent low-velocity jet dispensing with minimal sputtering across three adhesives.
4. Demonstrated partial pre-activation of one adhesive via DSC testing and identified next steps for improving consistency across other adhesives.

Waterway Trash-Collecting Robot

Student Team Members:

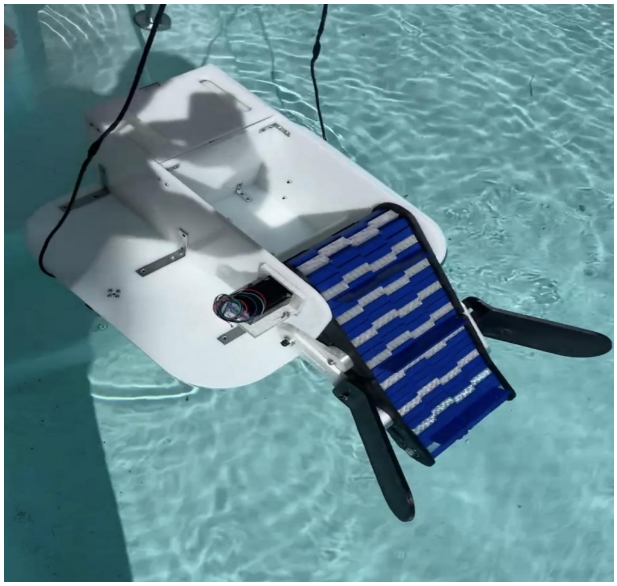
HoangVu Ho

Tam Bao Luong

Christopher Kintner

Son Nguyen

Faculty Advisor: Dr. Syed H. Zaidi



Project Scope and Objectives:

1. **Main Goal and Budget:** Design a remote-controlled robot for under $500 budget limit to collect floating plastic waste from water.
2. **Smart Camera System:** Use a small computer (Raspberry Pi) and a smart camera so the robot can easily spot plastic bottles.
3. **Mechanical and Power Setup:** Develop a motorized conveyor belt on a stable PVC frame to lift surface trash, using solar power, and driven by dual T200 thrusters for reliable aquatic propulsion.

Project Results:

1. **Mechanical Design & Prototyping:** Transitioned the initial conveyor concept from a heavy, complex chain to a highly customizable, lightweight 3D-printed design. Successfully completing a small-scale physical test of the tread mechanism.
2. **Structural CAD Modeling:** Completed the full 3D model in SolidWorks, setting the exact sizes for the main frame and walls so the PVC structure can support stable buoyancy for all the onboard systems.
3. **Electronic Hardware Integration**: wired the main control system, connecting the Raspberry Pi 4B+ to the T200 thrusters, ESCs, the IMU, and the 8-channel relay board for power control.
4. **AI Vision System Initialization:** Interfaced the USB camera module with the Pi, train the camera system to spot plastic waste.

Sponsor:
Personal sources and SJSU.

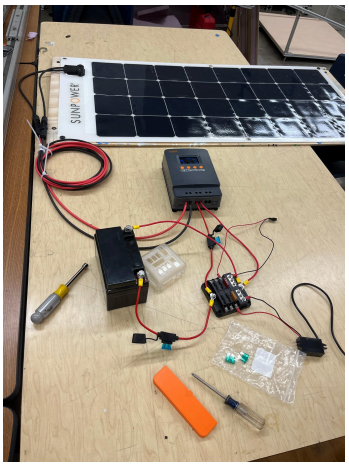
Solar-Powered Tiny House

Student team member

Ayane Gomi
Krish Patel
Andy Luu
Boutuivi Sanvee
Max Li
Luis Fernando Perez
May Chih

Faculty advisor

Dr. Zaidi



Project Target

- Disaster relief, homelessness programs (state/federal)
- Build sustainable, renewable energy, modular tiny home

Technical Objectives

- Build a modular house that can be easily assembled and disassembled.
- Build the off-grid capabilities to supply energy to solar-powered accessories - LED, Heating, Fan.
- Minimize heat loss from walls, roofs, and floors with insulation materials, and maintain a comfortable temperature with proper circulation and ventilation.

Project Results

- Successfully fabricated the house based on the CAD design, with all of the design parameters met.
- The electrical system with the solar panel and components worked safely; however, the energy generation and storage are insufficient to power all components simultaneously.
- The proper insulation thickness is 1.5 inches for walls, roofs, and floors to balance heat loss across the entire house with the inside temperature of 20 degrees Celsius.

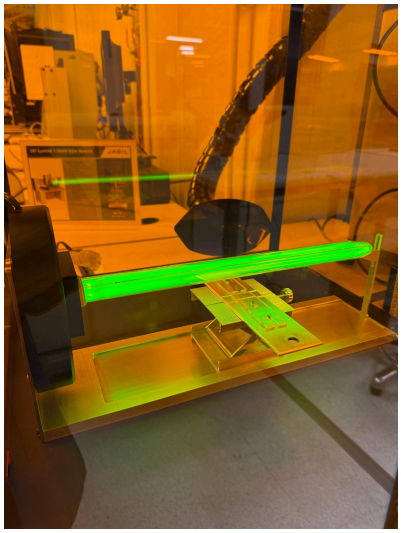
Sponsor

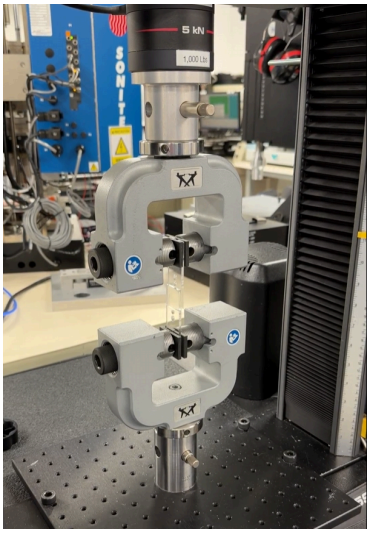
Mechanical Engineering Department

UV/Ozone Plastic-to-Plastic Bonding of PMMA

Student Team Members
Antony Matei
Nasheeb Rana
Trang Tran
Mercedes Capillo

Faculty Advisor
Dr. Syed Zaidi





Project Scope and Objectives

Develop and evaluate an adhesive-free plastic-to-plastic bonding process using UV/ozone surface activation and sub-Tg thermal pressing.

1. Design experiments and fixtures for controlled coupon alignment, repeatable surface contact, and consistent pressure during bonding.
2. Prepare PMMA samples for UV/ozone exposure, thermal pressing, and post-bond lap shear testing.
3. Document experimental results to compare bonding performance for 10-minute and 20-minute UV processing conditions.

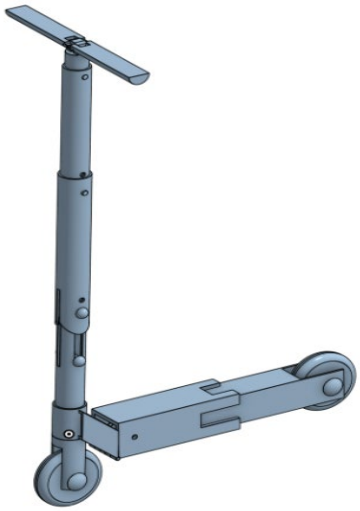
Project Results

1. Designed fixture concepts to align plastic coupons repeatably during UV activation and thermal pressing.
2. Developed a testing approach for adhesive-free bonding of PMMA, PC, and COC using surface activation followed by controlled sub-Tg pressing.
3. Collected data on how UV/ozone exposure and thermal pressing conditions affect bond formation and mechanical strength.
4. Created a structured method for comparing bonding parameters so the process can be refined for microfluidic, optical, or plastic assembly applications.

Sponsor

Jabil Inc.

Ultra Compact Scooter



Student Team Members:
Roy Baek
Kyle Mizukura
Phillip Tran
Yuki Yamamoto

Faculty Advisor:
Dr. Syed Zaidi

Project Scope and Objectives:
Provide a reliable transportation solution for the first/last mile problem to improve accessibility to public transportation and convenience.

1. Design a compact scooter that has relatively the footprint of a water bottle (approx. 12in long)
2. Design mechanism that minimizes folded size and weight
3. Design so that the scooter is easy to fold/unfold

Project Result:

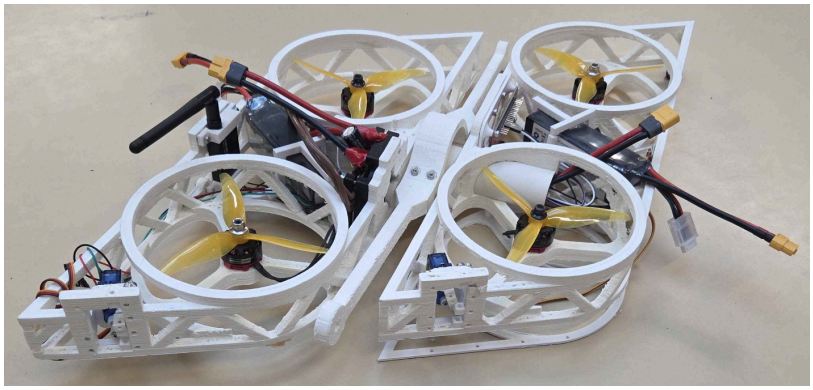
1. Successfully designed a functioning compact scooter that has a similar footprint to a water bottle
2. Designed a complex mechanism that is lightweight and easy to fold/unfold under repeated use and loading conditions
3. Reduced materials costs by using as many off shelf parts

Sponsor:
San Jose State Mechanical Engineering Department

Net Deployment with Synchronous Drones

Student Team Members:
Ethan Muzzio
Austin Leporini
Joshua Ng
Caleb Sun

Faculty Advisor: Dr. Raghu Agarwal



Project Scope and Objectives:
The team will work on designing and creating a working model of a multi-drone system which will use a net to capture flying targets.

1.Create and construct a drone system which will divide into three synchronized drones that carry a netting system.
2.Program communication and control systems that allow pilots to navigate through PC systems while controlling the flight behavior of drones.
3.Establish wireless communication systems which use telemetry data to improve real-time control performance through reduced latency.
4.Assess drone performance through flight tests which evaluate payload capacity, hover capability and system stability.
5.Develop control methods which enable drones to maintain a triangular formation towards a specific target

Project Results:

1. Successfully built a communication network through SiK telemetry radios which enabled PC operators to remotely control drones.
2. CAD modeled and 3D printed a working prototype drone frame that housed all electronic components.
3. Experimented with a unique lightweight foaming filament to create a lightweight drone frame.
4. Proved motor operation and hover throttle function at 1700 and basic flight capability through controlled experiments.
5. Conducted initial payload tests which showed their ability to transport weights reaching 850 grams during their first tests.
6. Developed flight algorithms compatible with Betaflight to hold the drone system in a triangular formation.

Acknowledgements:
A special thanks to Austin’s mom and her friends, along with the Mechanical Engineering Department for funding our project.

Redundant Electronic Throttle & Brake Assist for Paraplegic Drivers

Student Team Members:
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Darion de la Cruz
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John King
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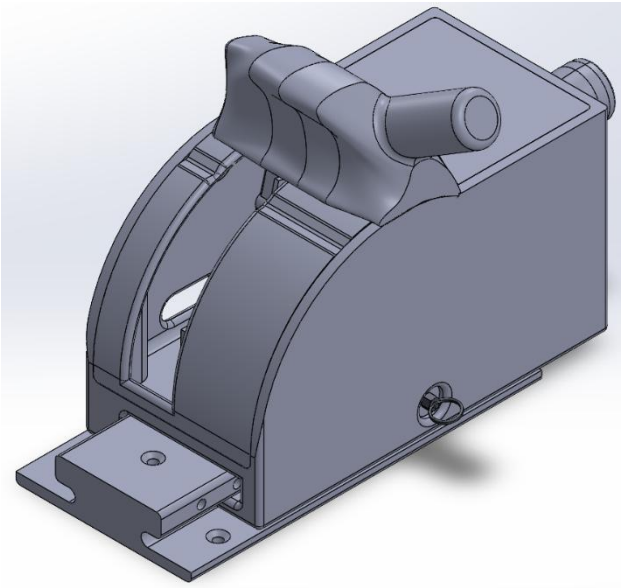
Sponsor/Technical Advisor:
Haisstronica



Project Scope and Objectives:

Development of a redundant electronic throttle and brake system retrofit for a 2002 Honda Insight that enables hand control of throttle and brake while preserving OEM pedal override.

1. Design a user-friendly single-axis lever interface with mappable control zones
2. Integrate electronic throttle actuation through a parallel cruise-control cable system that does not disable the stock pedal.
3. Integrate a Bosch iBooster brake subsystem using adapter plates, pressure sensing, and mechanical override capability.
4. Validate the system as a stationary, wheels-off demonstrator with CAN communication, an emergency stop, and safe-state fault response.

Project Results:

1. Completed the custom throttle cable and barrel attachments for the throttle body and cruise-control module.
2. Designed and Assembled the UI control housing, slider handle, and mounting bed design for installation beside the driver seat
3. Designed and prototyped the final iBooster adapter plate; FEA supported reducing thickness from 30 mm to 20 mm while maintaining structural integrity.
4. Verified adapter-plate fitment with the brake booster and mounting geometry, then identified final-material manufacturing needs.
5. Calibrated two brake-pressure sensors using LabVIEW and confirmed repeatable pressure response under continuous and step inputs.

Powered Zipline Carrier

Student Team Members:
Eduardo Garcia
Milan Schreurs
Dylan Maloney
Raiden De Luna
Nicholas Borg
Ahan Patel

Faculty Advisor:
Dr. Raghu Agarwal

Project Scope and Objectives:

Design and manufacture a prototype for an electric zipline trolley to enhance user travel.

1. Travel vertically on free ropes and horizontally on fixed ropes.
2. Transport heavy loads at a sufficient speed.
3. Include wireless control, giving users the flexibility to control the device from a distance.

Project Results:

1. Demonstrated a practical dual-mode rope traversal concept that improves accessibility and reduces operator effort.
2. Utilized a traction strategy that combines capstan friction and rope compression to improve grip and optimize pulley geometry for smooth transition between both modes.
3. Achieved a design that meets performance expectations with a 250 lb load capacity at a climbing speed of approximately 0.3 m/s.
4. Improved frame geometry and better component alignment for each subsystem will allow for better fitment and reliable operation.

Trash Catching Vacuum Robot

Student Team Members:
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Gustavo Ornelas
Kristopher Do
Alejandro Cedeno

Faculty Advisor: Dr. Raghu Agarwal

Project Scope and Objectives:
Design and develop a multifunctional household robot that autonomously vacuums and catches thrown objects through integrated Navigation and AI Systems.

1. Design and build a sturdy compact body holding internal components capable of operating both modes (vacuuming and trash catching).
2. Model main body, bin, and dust bin as separate components for accessibility.
3. Robot achieves sufficient speed and acceleration to intercept thrown objects.
4. Implement an efficient brush vacuum system with optimized air flow dustbin.
5. Develop an AI-based vision system for real-time detection/tracking of airborne objects.
6. Implement LiDAR SLAM navigation with Nav2 and depth-based obstacle detection.
7. Design a three-mode control system (NAV, TRASH_CATCH, IDLE) supporting autonomous operation and manual teleoperation via a PS5 controller.

Project Results:

1. Completed robot prototype assembly to hold and withstand internal components.
    a. Material: PLA, b. Dimensions: 14" x 14" x 5.85"
2. Structural validation on robot's chassis and bin is conducted through finite element analysis to ensure durability under loading (~ 15 lbf) and impact (~ 6 lbf).
3. Successfully deployed a real-time AI-based object detection and tracking system.
4. Achieved autonomous navigation using LiDAR SLAM mapping and Nav2 path planning.
5. Implemented a three-mode control system enabling both autonomous operation and manual teleoperation via a PS5 controller, with safety shutdown on communication loss.
6. Established ROS 2-Arduino communication for motor and encoder-based odometry.

Sponsor:
Raymond K. Yee, Charles W. Davidson College of Engineering at San Jose State University

Electric Therapeutic Wheelchair

Project Summary

Student Team Members:
Josmar Vega (Team Lead)
Ely Lopez
Benjamin Nguyen
Arjay SavellAno
RJ Villegas
Victor Jimenez

Faculty Advisor: Dr. Agarwal

Project Scope and Objectives:

Develop an electrically powered therapeutic wheelchair that combines mobility assistance with a powered leg therapy mechanism for elderly users and individuals with limited mobility.

1. Redesign a manual wheelchair into a fully powered system using two drive motors and one therapy motor.
2. Integrate a safe and user-friendly control system using a Raspberry Pi Pico, motor drivers, sensors, and an organized electronics box.
3. Design and fabricate structural improvements using Aluminum 6061-T6 to support mobility, stability, and therapy motion.
4. Test wheelchair performance for speed, control response, braking, therapy motion, and overall reliability.

Project Results:

1. Completed the revised design concept for the electric therapeutic wheelchair, including the mobility system and therapy mechanism.
2. Developed CAD models and design updates for the wheelchair frame, electronics box, motor mounting, and therapy linkage.
3. Selected major electrical components, including drive motors, therapy motor, battery system, motor controllers, and sensors.
4. Began fabrication and assembly planning for the powered wheelchair system, including wiring layout and component placement.
5. Established testing goals for motion, safety, user control, and overall system performance before final demonstration.

Sponsor:
San José State University Department of Mechanical Engineering
Metal Supply Service