

Ezzat Suhaime Project Portfolio

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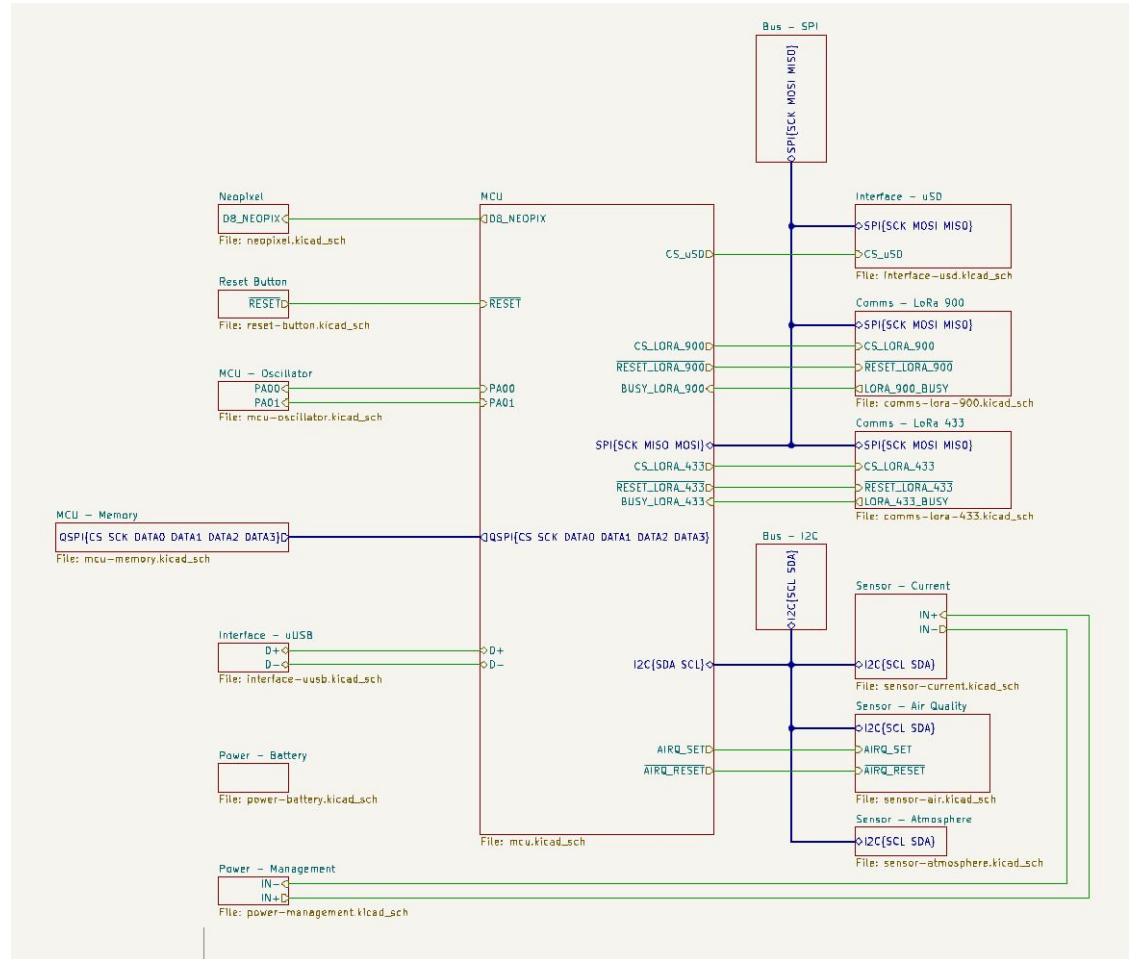
Hardware

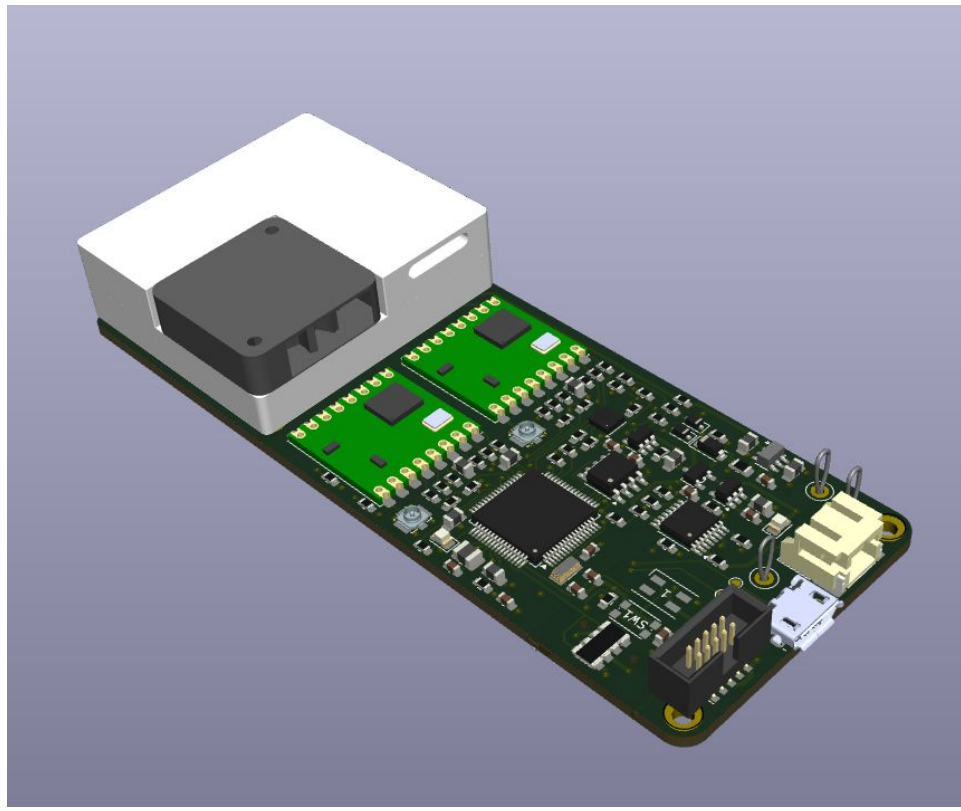
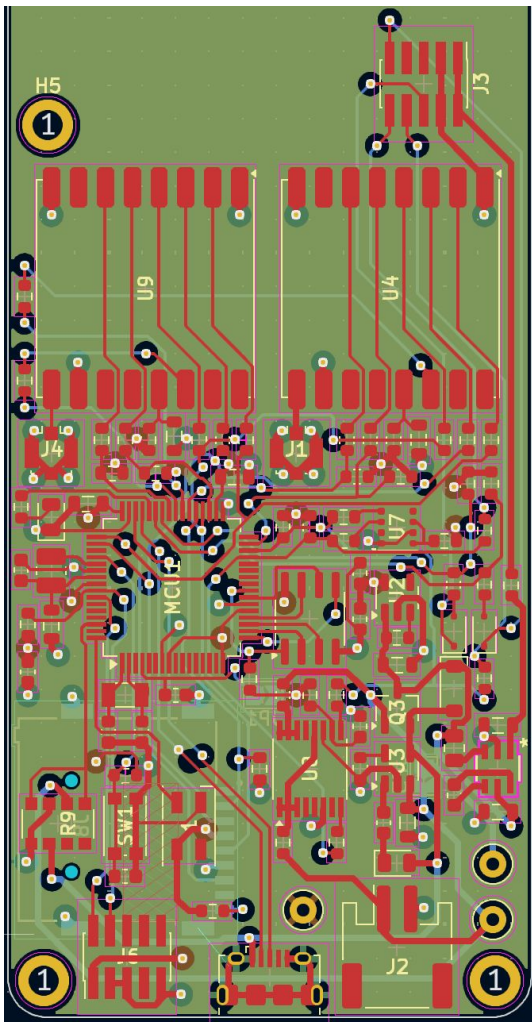
Roamer

Designing a custom PCB with ATSAMD51J19A MCU, integrating LoRa mesh networking, air quality sensor, atmosphere sensor, and power sensor.

Will be used by the Stanford Radio Club for their SNode wildfire meshed sensor project.

Skills: PCB design, microcontroller programming, low-power systems.



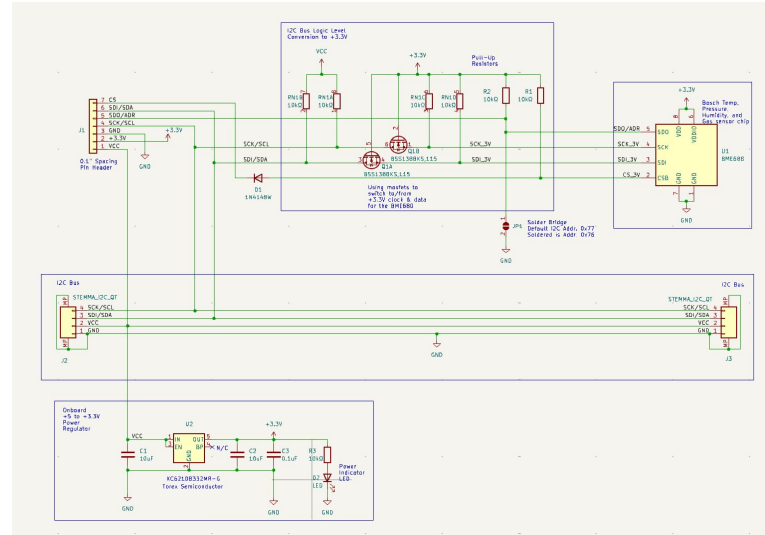
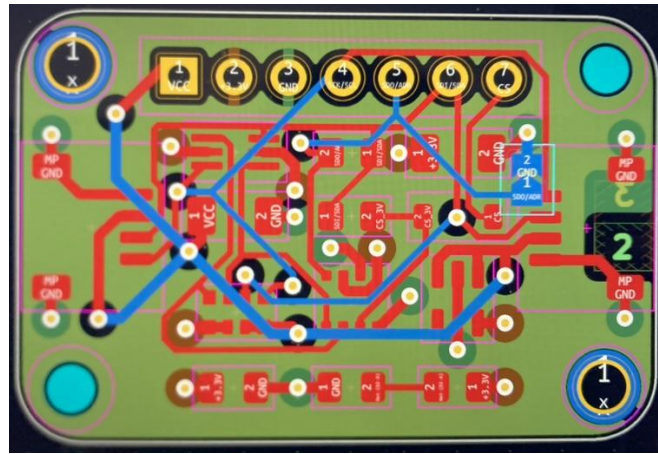


BME688 Breakout

Designed a breakout board for Bosch BME688 sensor, enabling temperature, humidity, pressure, and gas measurements.

Developed in KiCad with I2C/SPI interfaces, logic level shifters, and voltage regulation.

Added address selection and LED indicator for configurable, stable sensor operation.



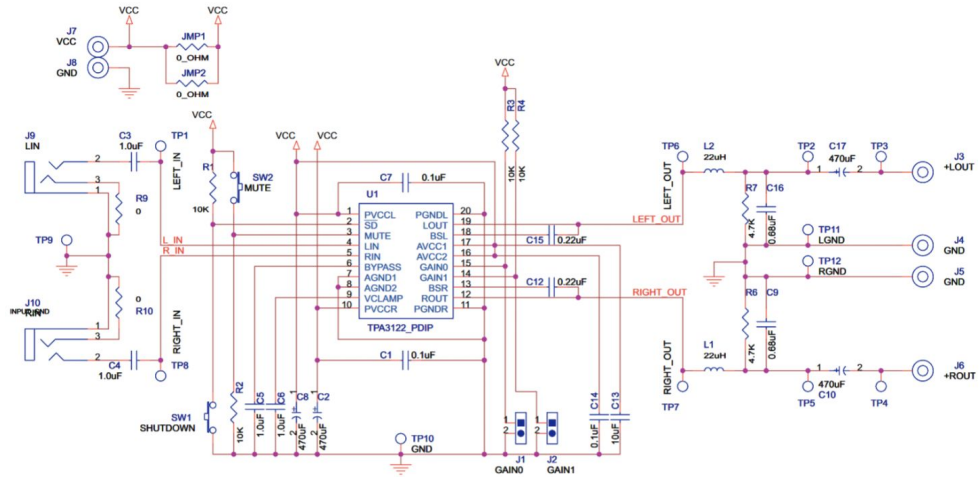
Class D Amplifier

Description: Constructed a Class D audio amplifier based on the TPA3122D2 IC.

Designed an RLC filter for noise reduction and smooth PWM signal conversion to analog.

Optimized for low distortion; validated audio clarity and stability at different power levels.

Skills: Analog circuit design, signal filtering, audio testing.



Still clipping !:(

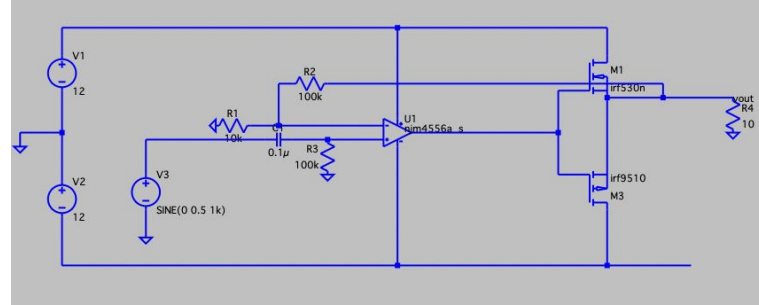
Class AB Driver

Built a Class AB output driver with 4556 operational amplifier and MOSFETs for robust signal handling.

Addressed distortion issues by adding decoupling capacitors at VDD and GND.

Implemented negative feedback for signal stabilization and minimized waveform clipping.

Skills: Signal amplification, MOSFETs, distortion mitigation, feedback systems.



W/o negative feedback



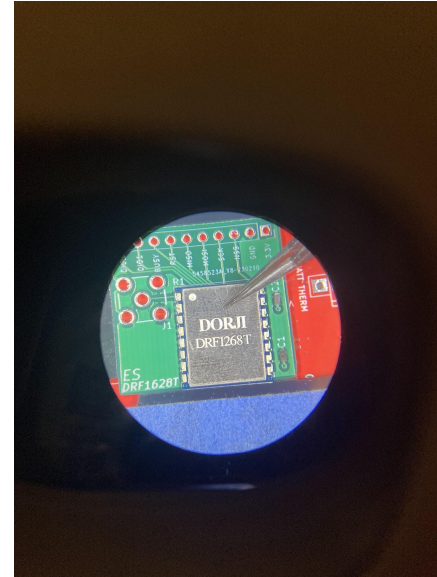
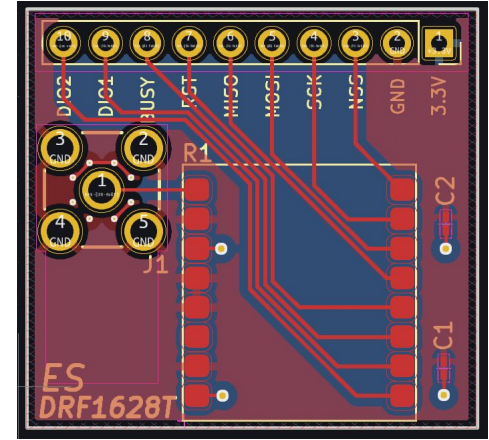
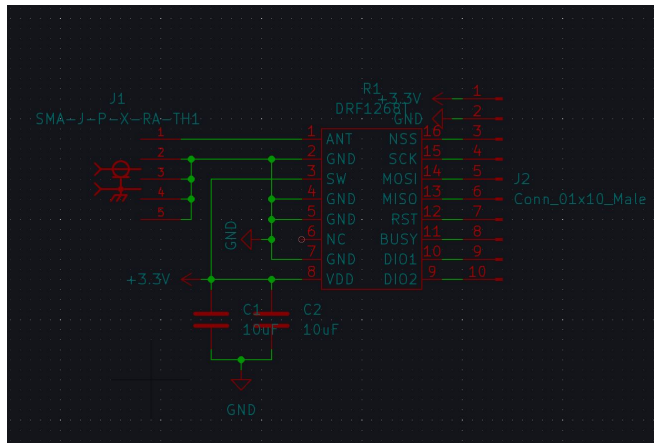
W/ negative feedback!

LoRa Breakout

SSI DRF1268T LoRa Breakout Board

Built a LoRa transceiver breakout board with RF considerations for Stanford Student Space Initiative.

Skills: KiCad, RF circuit design, PCB prototyping.



FRC Robot

Project Overview: Led a robotics team in designing and building a competitive robot for the FIRST Robotics Competition, focusing on control systems, autonomous functionality, and CAD-based component design.

Key Contributions:

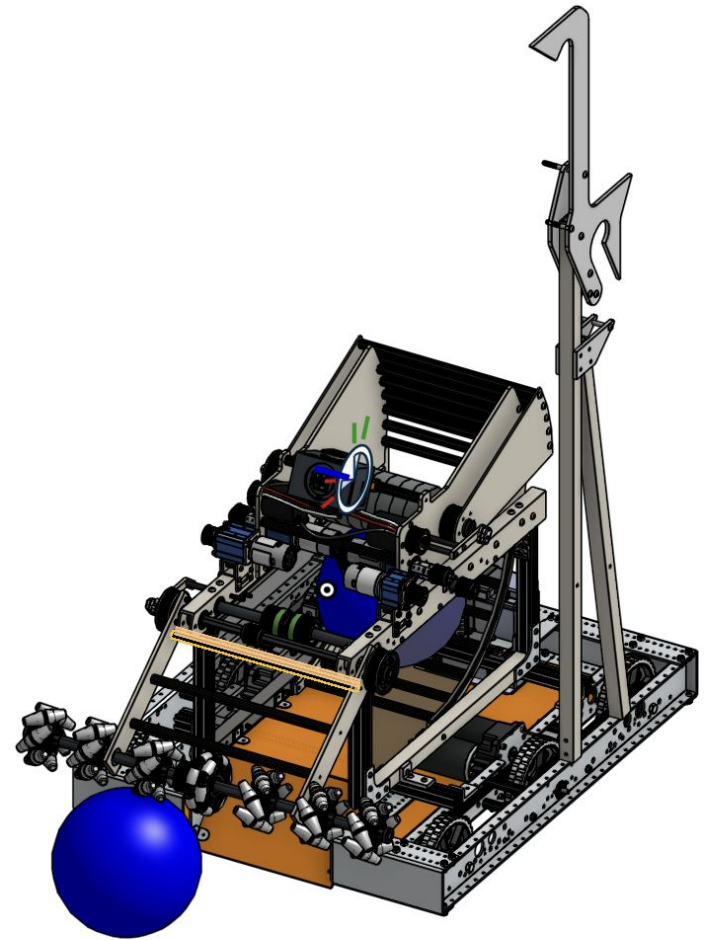
Developed a vision system with Raspberry Pi for real-time game piece tracking and integrated it with NetworkTables for seamless communication with the main robot controller.

Programmed and tuned PID controllers for precise motor control, enabling autonomous movement and optimized targeting.

Transitioned the team to CAD using Onshape for custom part design and coordinated manufacturing using CNC, Bridgeport, and bandsaw.

Established documentation standards and led team training sessions, fostering a collaborative and organized development environment.

Skills: Control systems, computer vision, embedded programming, CAD, team leadership, mechanical fabrication.



Fully modeled robot. The first in team history!

Software

Orbit Propagator

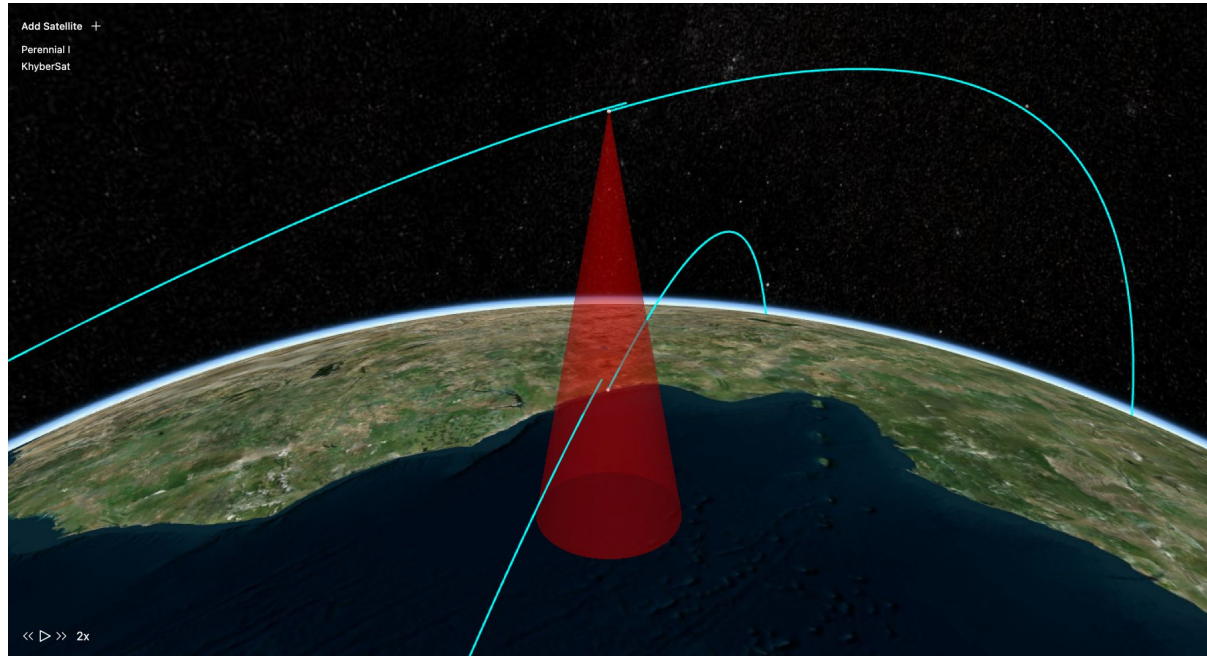
Developed a satellite orbit simulation tool with Cesium visualization, using Runge-Kutta and J2 perturbation methods.

Deployed on AWS. Built a user interface with Cesium.

Skills: Orbital mechanics, AWS deployment, 3D modeling.

Check it out!

commandant.virulentsky.com



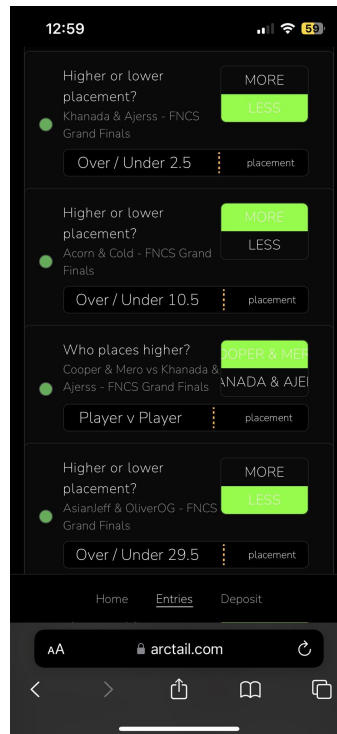
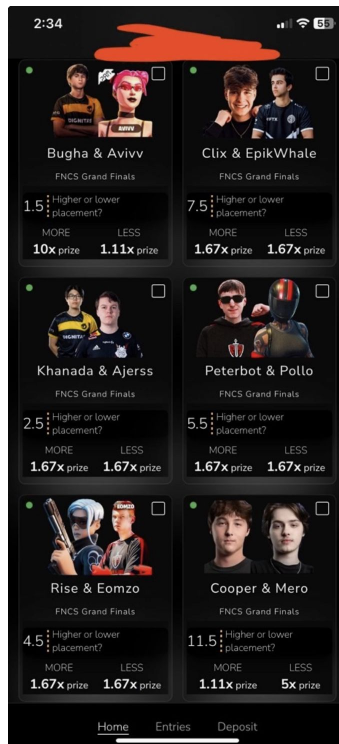
Arctail

Built a high-traffic Fortnite social sportsbook platform.

Built the entire backend and database functionality to manage users, their parlays, and balances. Integrated Authorize.net payments.

Built many UI components using React.

Skills: Full-stack, payment integration, cloud deployment.



Lots of funny X posts

Spade

Developed web page drawing & annotation extension with 4,000+ users; optimized user writing performance on heavy pages by 50%.

Given a \$1000 grant by the 1517 Fund to develop & support cloud costs.

Skills: Chrome extension, AWS deployment, data structures.

Check it out! <https://spade.tools/>

The conquest of Vietnam by France

The decision to invade Vietnam was made by Napoleon III in July 1857. It was the result not only of missionary propaganda but also, after 1850, of the upsurge of French capitalism, which generated the need for overseas markets and the desire for a larger French share of the Asian territories conquered by the West. The naval commander in East Asia, Rigault de Genouilly, long an advocate of French military action against Vietnam, was ordered to attack the harbour and city of Tourane (Da Nang) and to turn it into a French military base. Genouilly arrived at Tourane in August 1858 with 14 vessels and 2,500 men; the French stormed the harbour defenses on September 1 and occupied the town a day later. Genouilly soon recognized, however, that he could make no further progress around Tourane and decided to attack Saigon. Leaving a small garrison behind to hold Tourane, he sailed southward in February 1859 and seized Saigon two weeks later.

Vietnamese resistance prevented the French from advancing beyond Saigon, and it took French troops, under new command, until 1861 to occupy the three adjacent provinces. The Vietnamese, unable to mount effective resistance to the invaders and their advanced weapons, concluded a peace treaty in June 1862, which ceded the conquered territories to France. Five years later additional territories in the south

Autonomous Sailboat Simulation

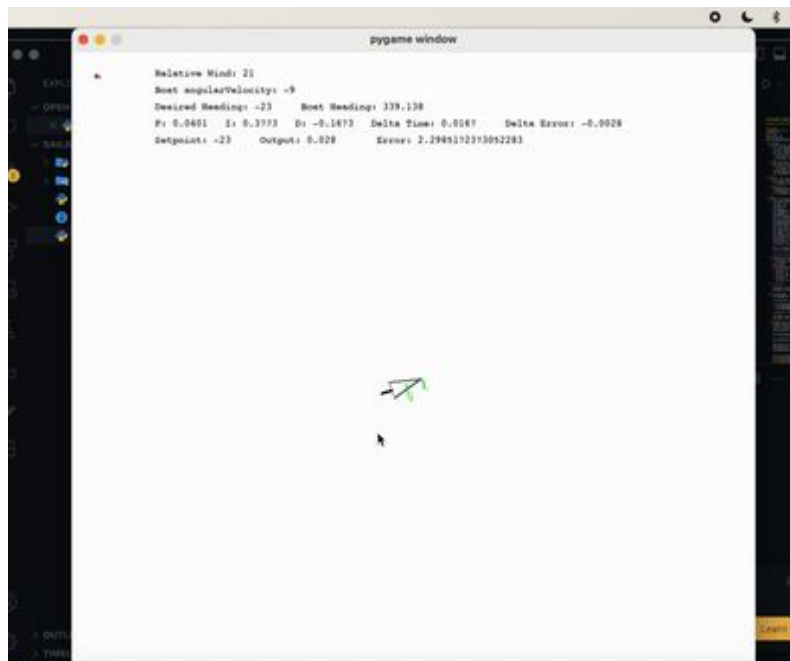
Description: Developed a Python-based simulation for an autonomous sailboat, integrating a custom PID controller for navigation.

Key Contributions:

Tuned PID parameters to adjust steering and sail position, enhancing stability in varying wind and water conditions.

Expanded the simulation to test scenarios with different environmental variables, creating a realistic model for autonomous behavior.

Skills: PID control, Python, simulation modeling, real-time feedback, autonomous systems.



The screenshot shows a Pygame window titled "pygame window" with a white background. At the top, there is a text area displaying simulation data:

```
Relative Wind: 23
Boat angularVelocity: -9
Desired Heading: -23   Boat Heading: 339.138
P: 0.0401   I: 0.3773   D: -0.1473   Delta Time: 0.0047   Delta Error: -0.0028
Setpoint: -23   Output: 0.028   Error: 2.298512313052283
```

Below the text, a small green sailboat icon is visible on the white background. The window is framed by a dark grey border with standard window controls (minimize, maximize, close) in the top right corner.