Project Portfolio

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MECHANICAL ENGINEER

Autonomous EV Charging for Robo-Taxis

Problem

For my 4th year capstone project, I worked with six other students to tackle an engineering problem from the ground up. We identified there is currently a need to charge electric vehicles autonomously for the emerging robo-taxi industry. Existing charging methods are either too slow, too expensive or not modular.

Solution

An autonomous charging solution was designed and prototyped, using an open-source robotic arm (AR3), which was modified and equipped with a custom end-effector and perception system to locate the charge port. The charge port and connector are modeled after the Chevrolet Bolt and EVgo DC Fast Charger, respectively.

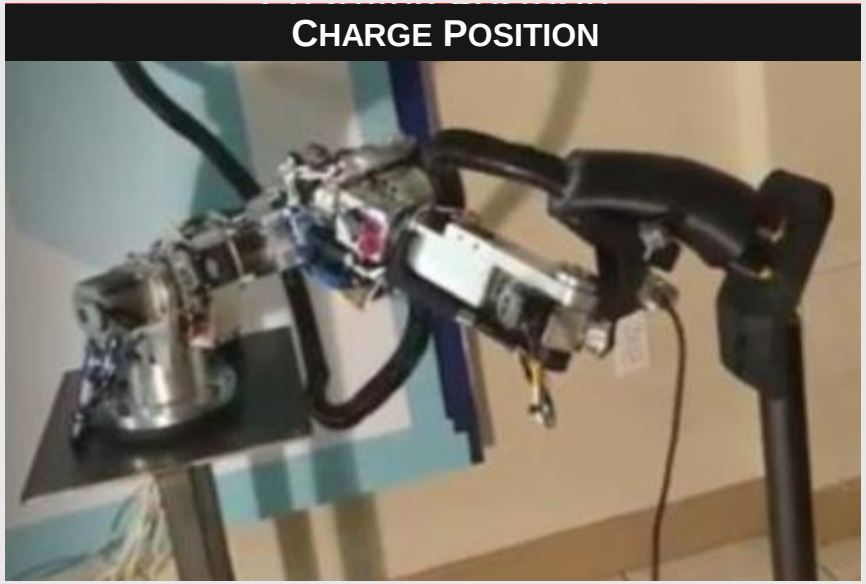
Result

- Awarded $4000 in funding to develop a functioning prototype
- General Motors Innovation Award
- ASME Northern Alberta Design Challenge Award
- University of Waterloo Engineer of the Future Fund
- Classmates' Choice Award (for best project that year)

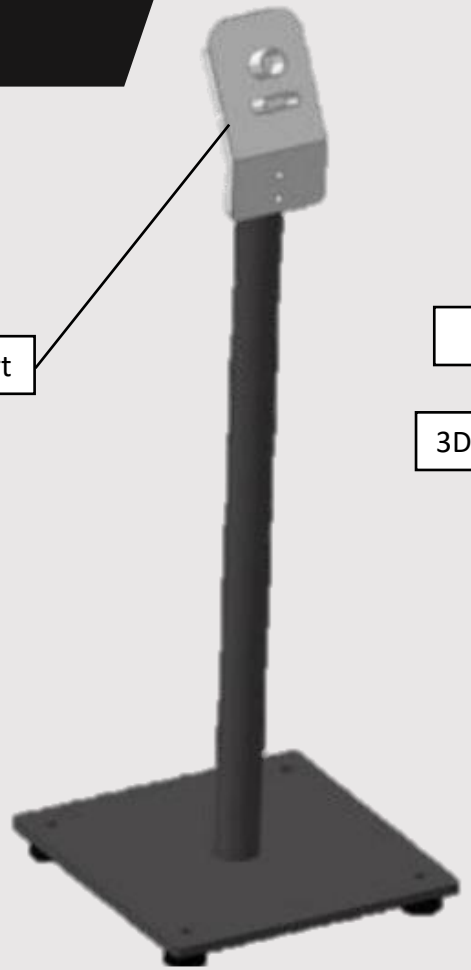
WATCH DEMO

Home Position

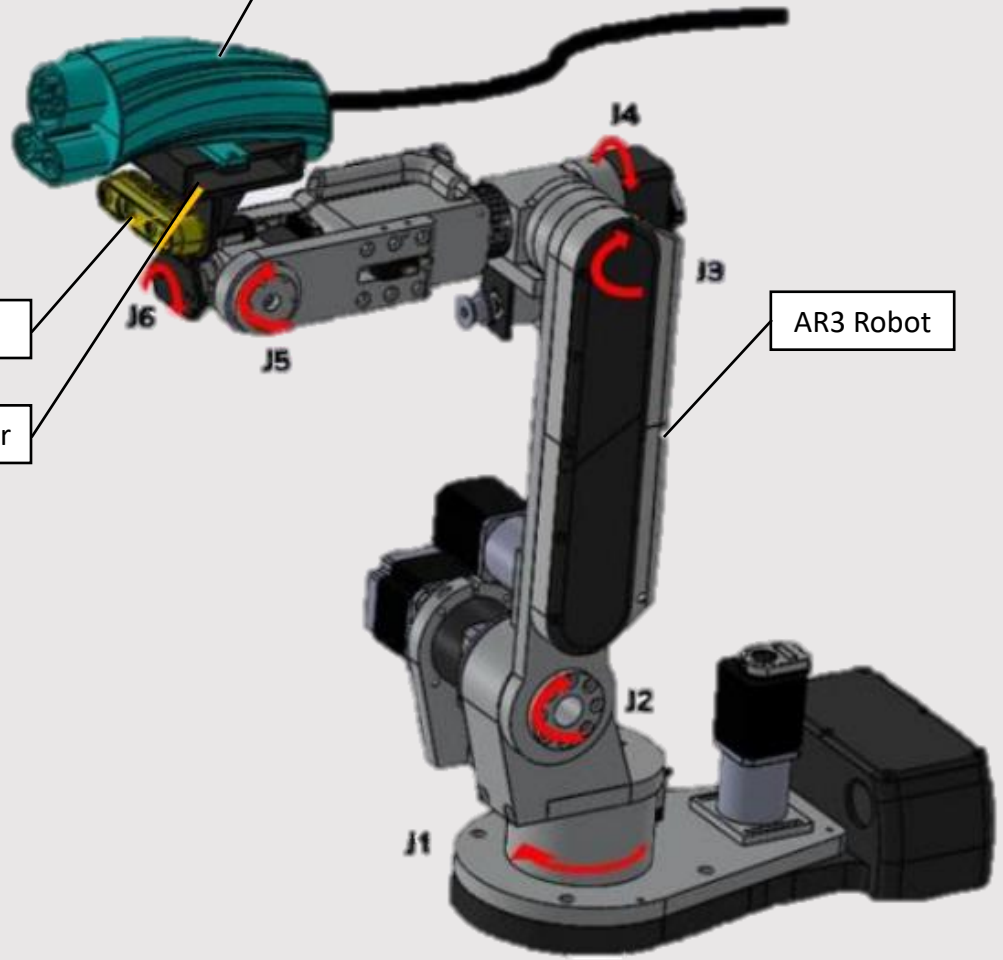
Charge Position



PROTOTYPED CAD MODEL



Chevrolet Bolt Vehicle Charge Port



THC Wafer Card Test Fixture + PCB

Problem

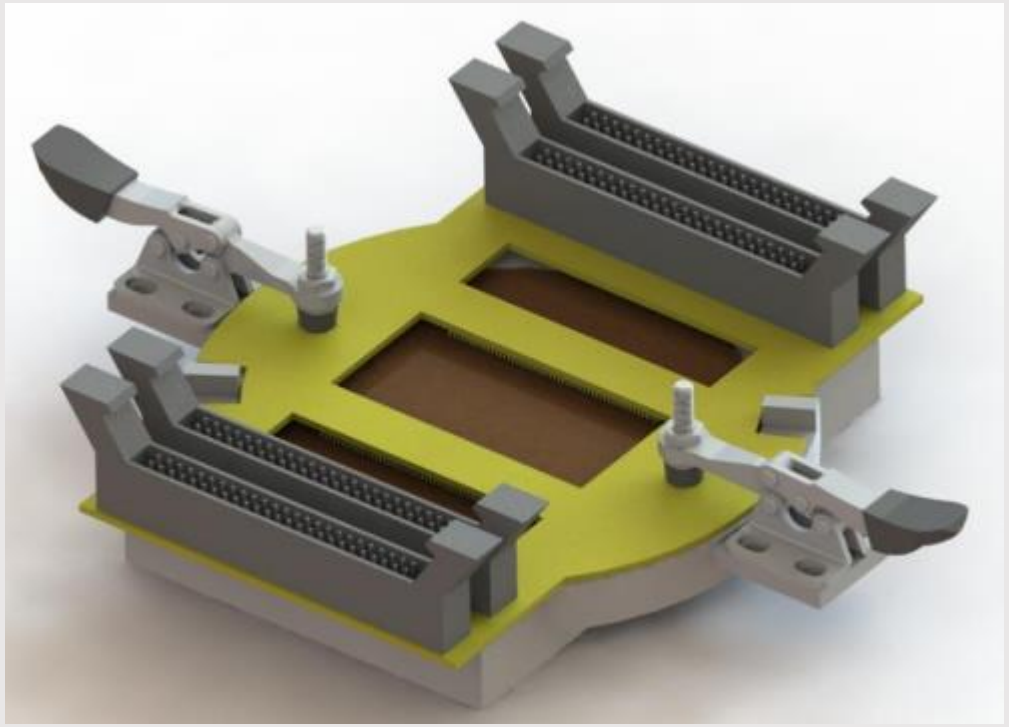
At Voyage Labs, a liquid handling robot was implemented to automate testing for THC sensors. Due to this, there was a need to constrain the THC wafer in the robot work cell, with a PCB interfacing between the wafer and a potentiometer for reading sensor data.

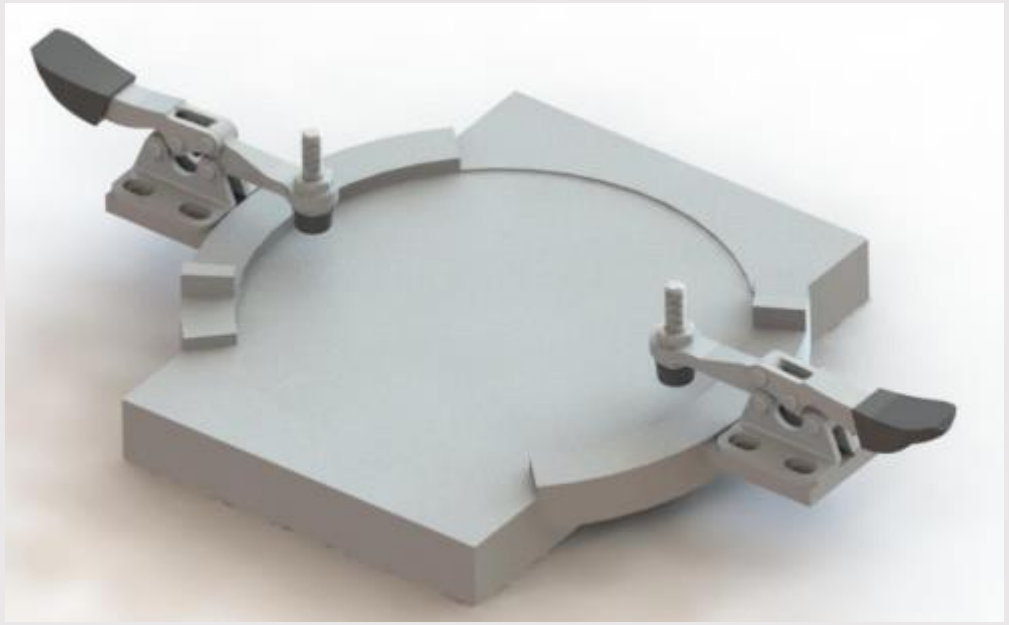
Solution

A custom 3D printed fixture was designed with locating features for both the wafer card and PCBA. Two toggle clamps are used in this design to secure the assembly in position.

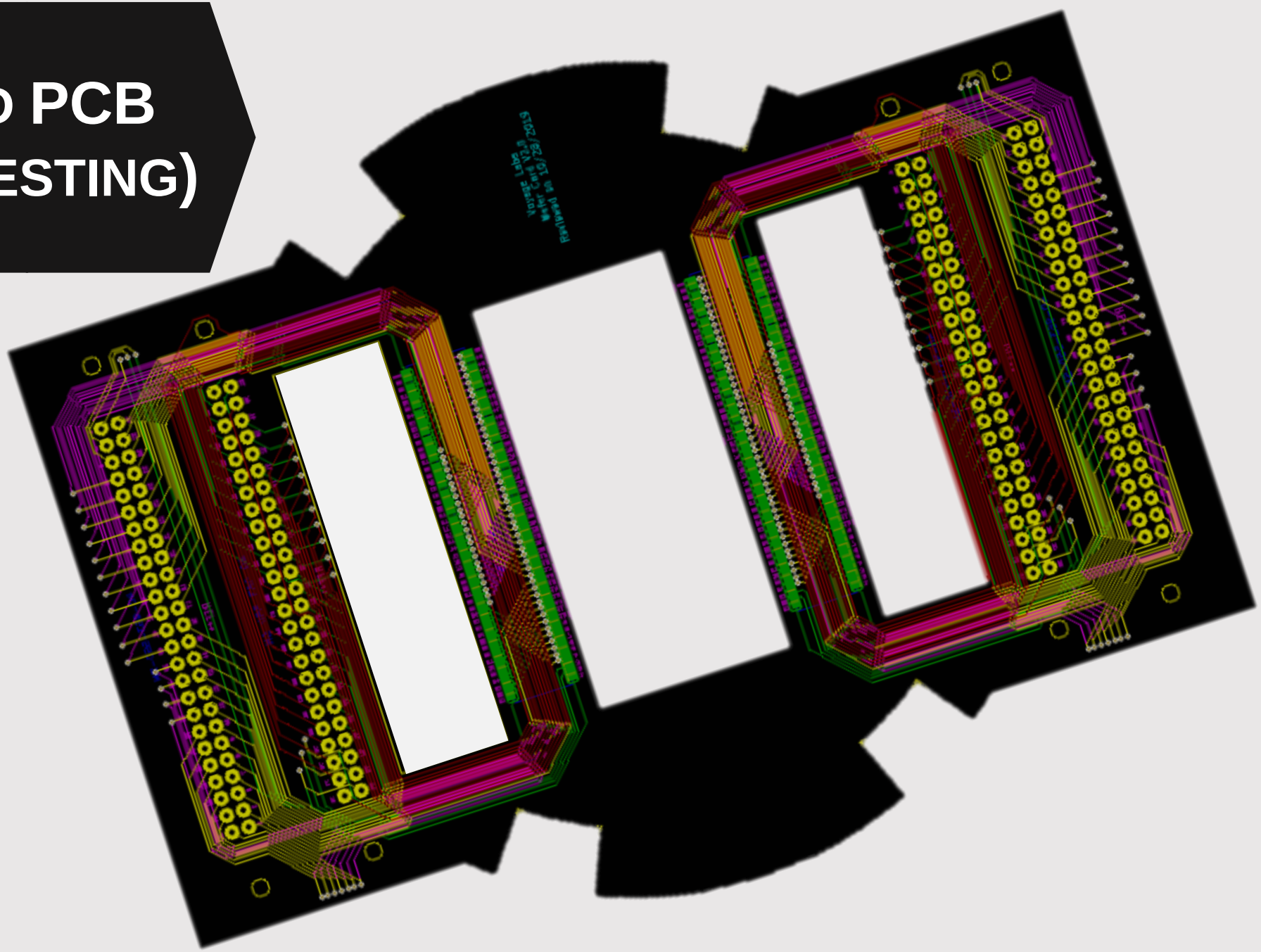
Result

- Automated testing process for THC sensors, led to 60% reduction in cycle time
- Able to collect clinical data points at a higher frequency and get the product to market faster

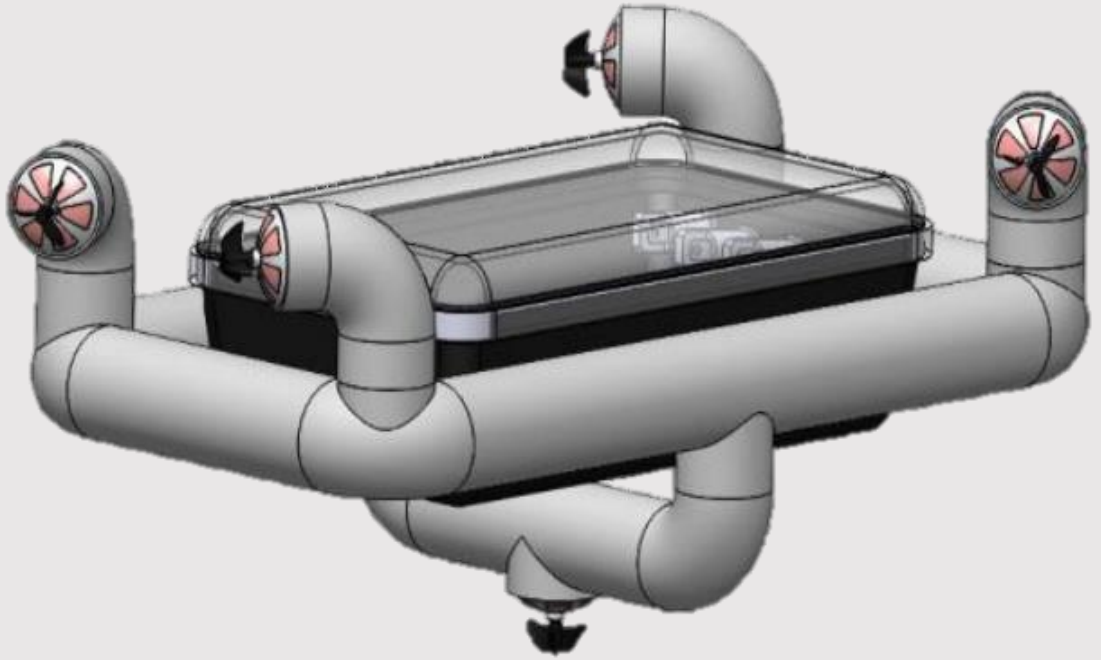




4-Layered PCB (Wafer Testing)



Underwater Remote Operated Vehicle



Problem

For my 3rd year design course, I worked as part of a team comprised of four students to build and improve upon an initial ROV design. The objective of this project was to modify the ROV to increase its maneuverability and speed.

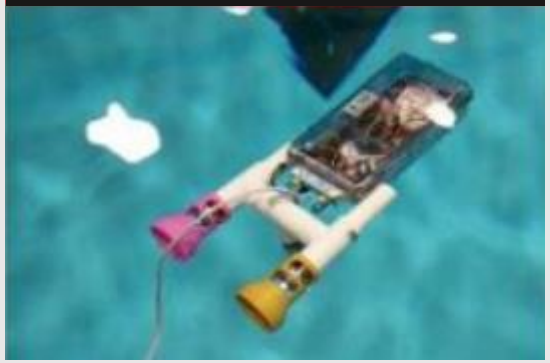
Solution

A new chassis was designed to house four propeller motors in order to increase the applied thrust force. Additionally, the lift motor was relocated to fit directly at the ROV's center of mass, in order to maximize stability during vertical motion.

Result

- Increased maneuverability by 44%
- Increased speed by 50%

Before



After

Underwater ROV Exploded View