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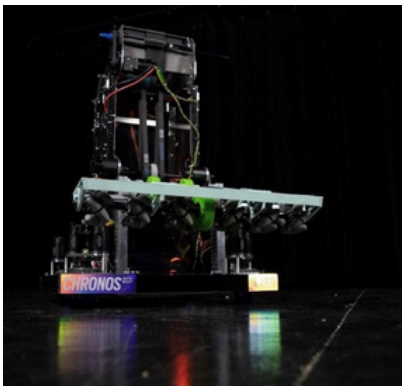
SPARTABOTS 2976 - CHRONOS



What?

- CHRONOS was the Spartabots' 2021-2022 robot, competing in FRC

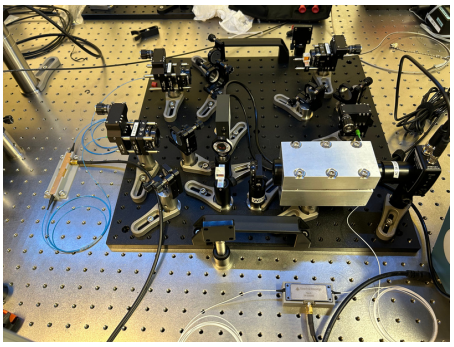
How?

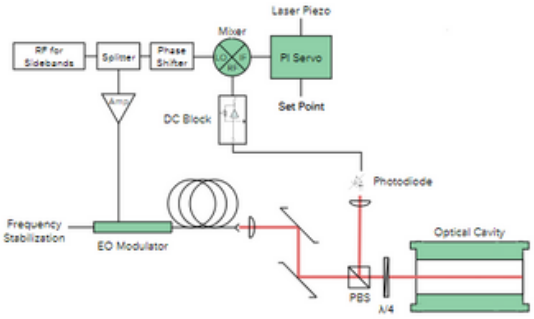
- Responsible for the entire electrical architecture of our robot CHRONOS.
- CANbus, power distribution, Falcon 500 motor wiring for swerve drive, intake, and shooting,

Results

- Our award-winning robot ranked 4th in the Pacific Northwest
- Qualified for FRC worlds in Houston in 2022.

DIAMOND QUANTUM PROCESSOR LASER LOCK





Link to full poster, presented at the Washington NASA SURP Symposium.

What?

- To read qubit spins in diamond nitrogen-vacancy centers, we need stability within approximately 10-5 nm.
- All lasers demonstrate some frequency wander due to temperature and mechanical vibrations.

How?

- Pound-Drever-Hall laser stabilization technique uses the phase shift of light to actively tune the laser on the resonance condition of a stable cavity.

Results

- Achieved a laser lock estimated to be robust and precise enough for qubit spin readout.
- Sideband modulation allows the ability to compensate for NV strain while maintaining frequency stability.

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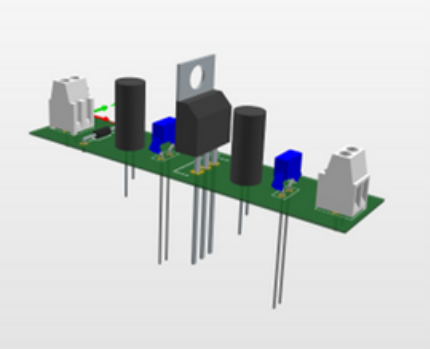
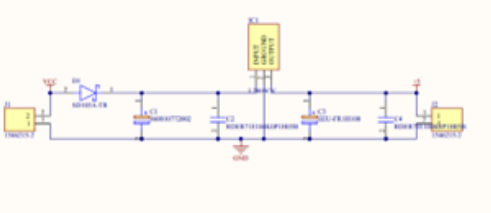
5V REGULATOR





What?

- 5V regulator, designed to regulate DC voltage (up to 25V) down to 5V.
- Entry point in PCB design and ECAD software.

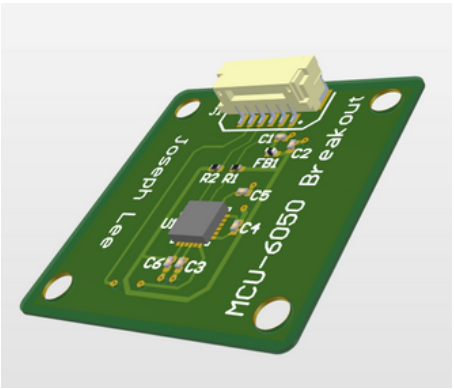
How?

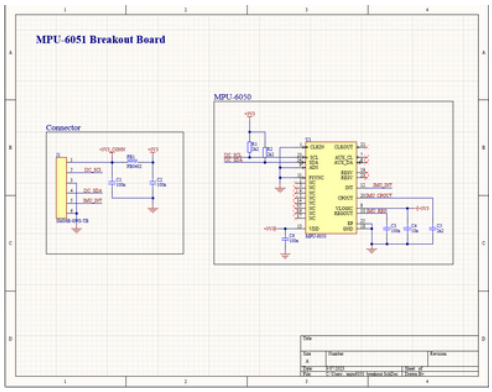
- Comprised of a protection, two 0.10µF, a 0.22µF and a 10µF capacitors to filter noise, along with a LM7805 regulator.
- Designed in Altium.

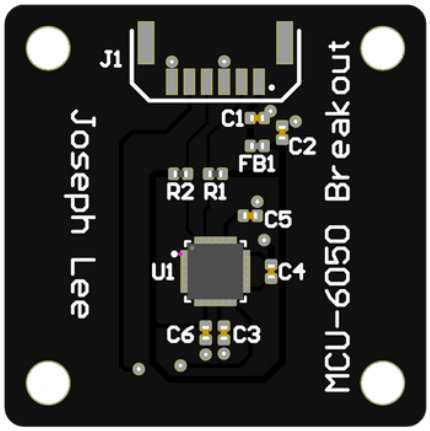
Results

- Created a sufficient regulator circuit, capable of stepping voltage down to 5V at a max 1.5A.

MPU6050 BREAKOUT BOARD







What?

- Created a MPU6050 breakout board, an accelerometer gyroscope module.
- Communicates via I2C, powered by 3.3V.

How?

- Designed in Altium
- Features 3.3V filtering, decoupling capacitors, pull up resistors, and ground plane.

Results

- Created a compact PCB, manufactured and assembled by JLCPCB.

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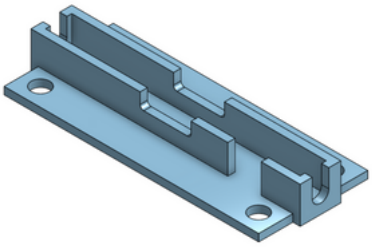
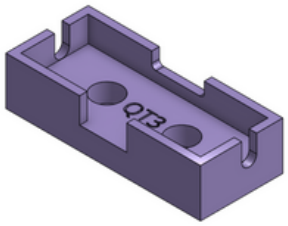
EOM & AOM ENCLOSURE





What?

- Mounts for critical components in the Diamond Quantum Processor Laser Lock system
- Intended for the Electro Optic Modulator and Acoustic Optic Modulator

How?

- Utilized Onshape to create accurate and secure mounts.

Results

- Successfully created mounts that held the EOM and AOM onto the optics table in the lab.