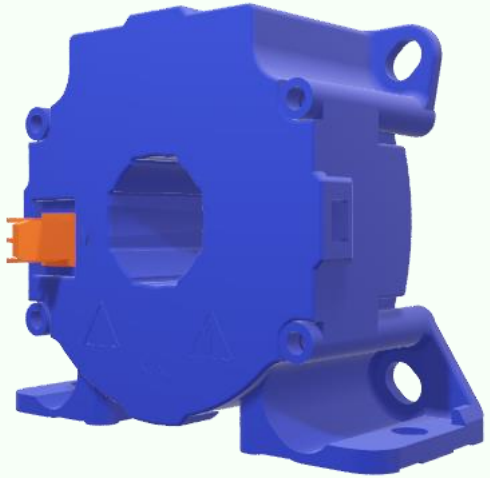
Avishkar Hyperloop

SENSE AND CONTROL

LEVITATION CONTROL UNIT

Gap Sensor

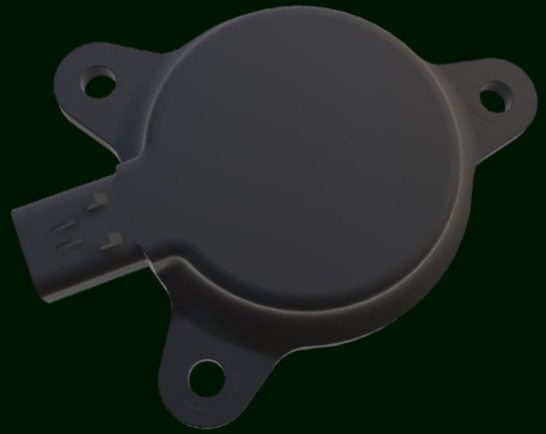
Monitors the air gap of the each of the 8 Electromagnets placed on the pod



Current Sensor

Monitors the current through each of the 8 Electromagnets placed on the pod

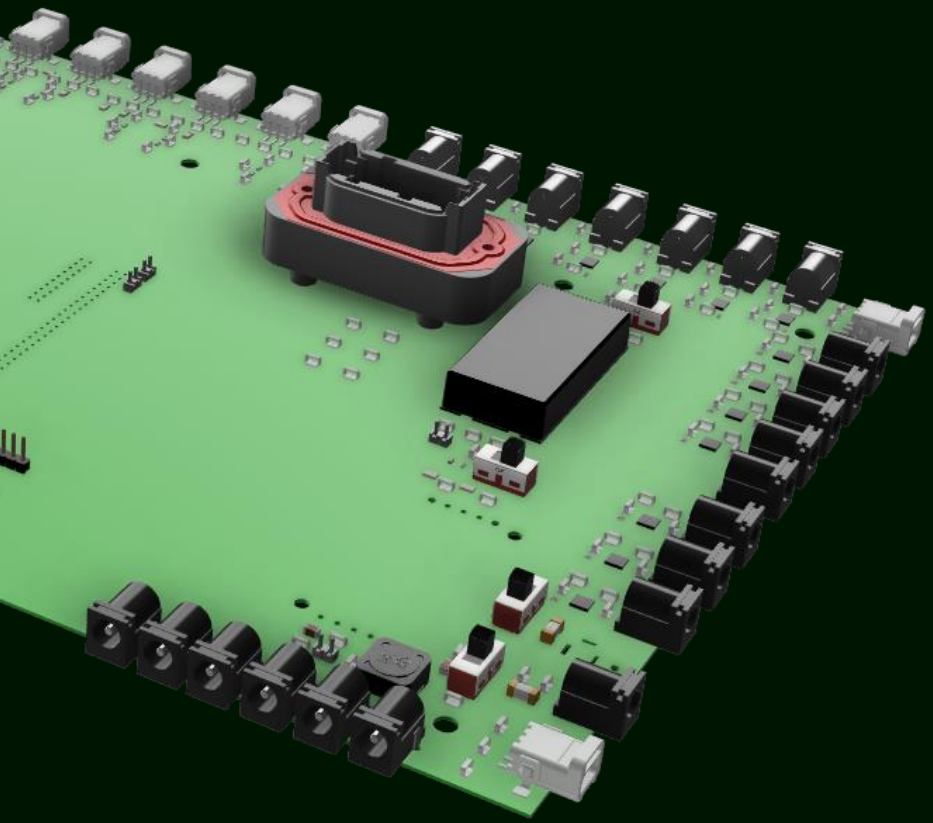
PROPULSION CONTROL UNIT

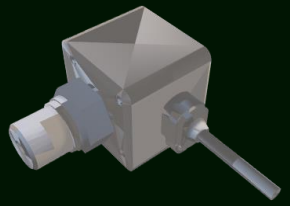


IMU

To measure the acceleration of the pod

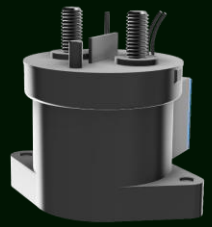
MAIN CONTROL UNIT





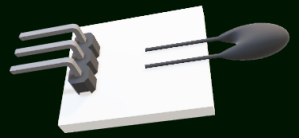
Pressure Sensor

Measures pressure at crucial points in pneumatic circuits



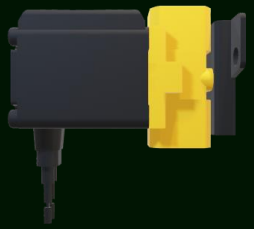
Contactor

Isolates Battery from Electromagnetic system



Temperature Sensor

Measures temperature of LIM



Pneumatic valve

Used to actuate brakes

Proximity Sensor

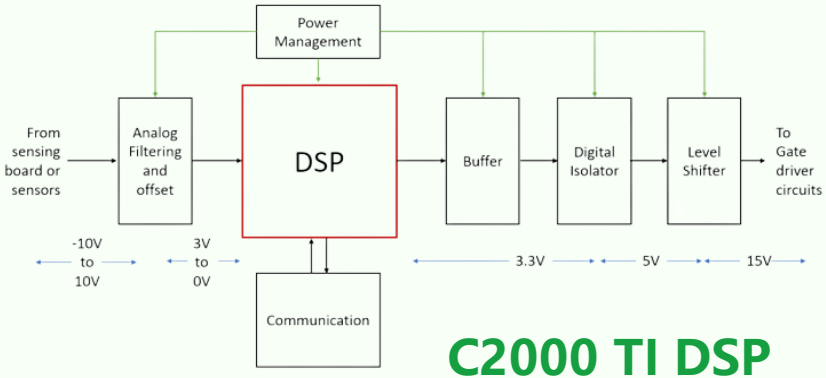
Detects the status of the braking actuator

Inverter Control Card

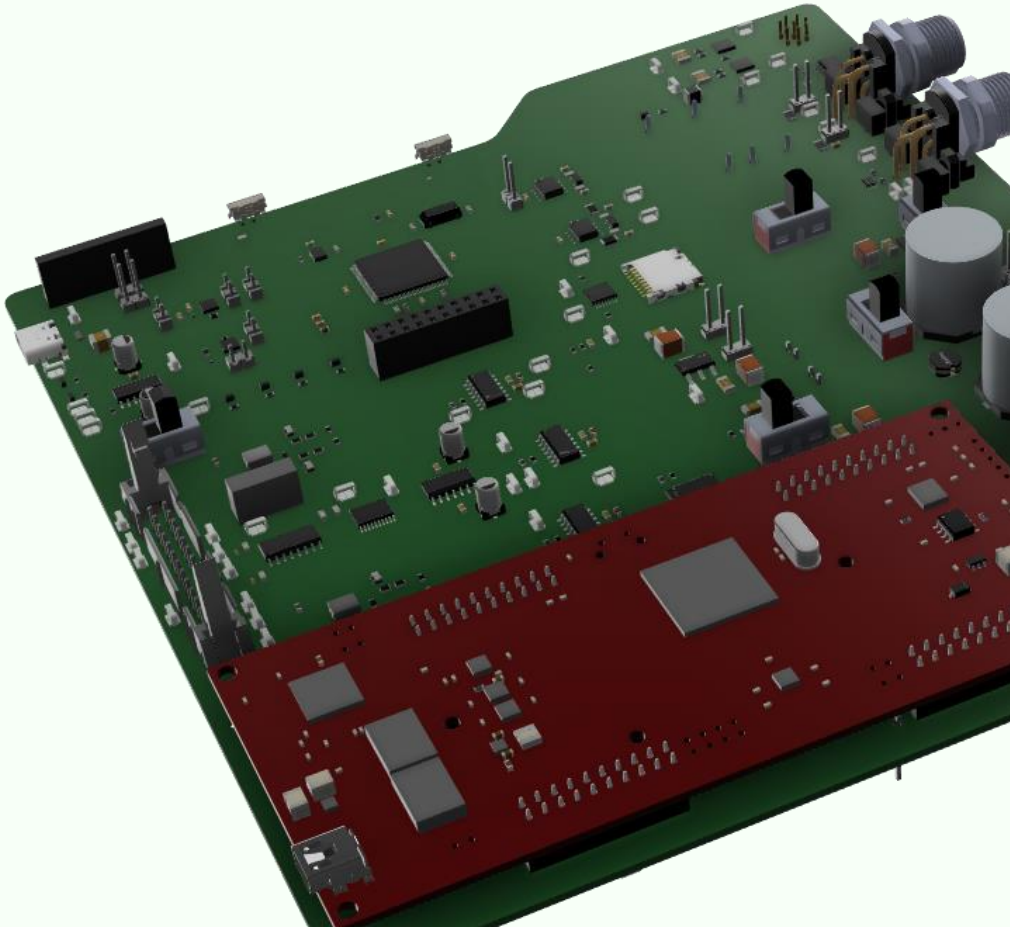
10kHz
Control Loop Maximum Frequency

V/F Control Loop
For LIM

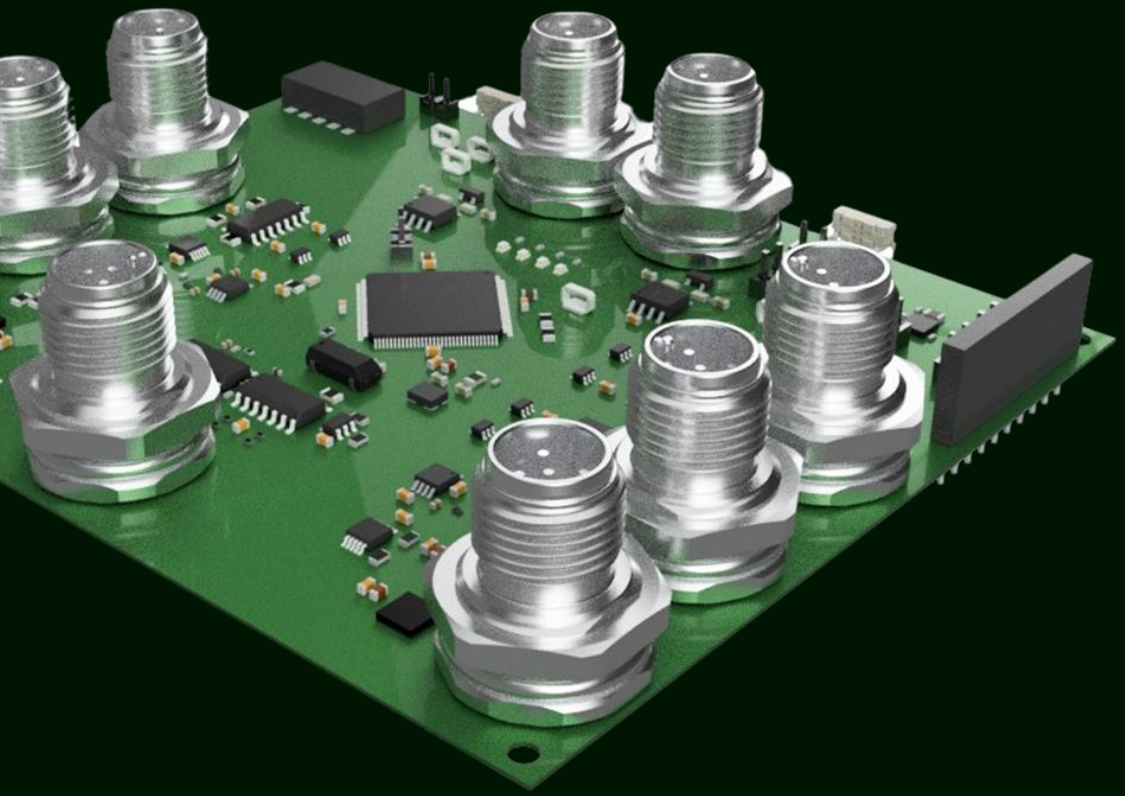
Variable Frequency
Control Loop Maximum Frequency



C2000 TI DSP



Data Acquisition Unit



Data Acquisition

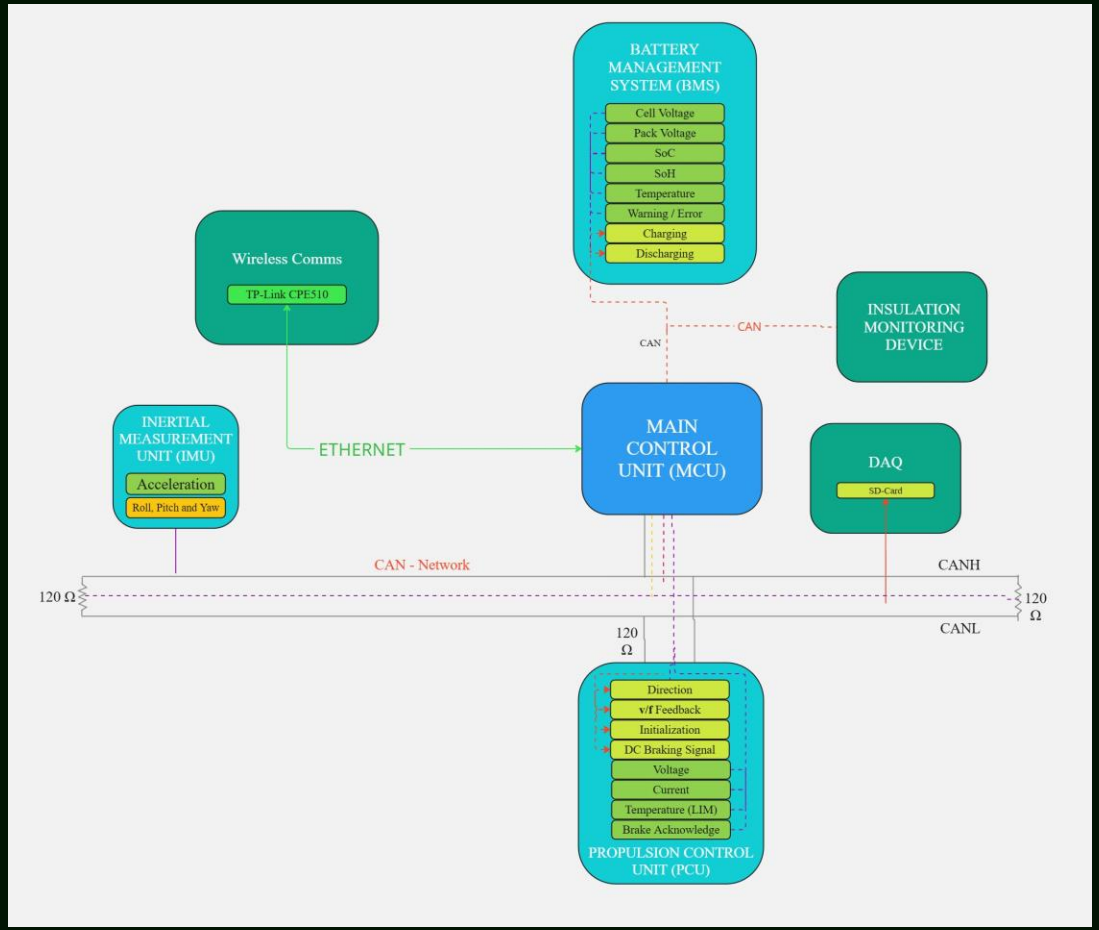
Software Stack
32 possible configurations, set using DIP switches

Analog Front End
Consisting muxes, switches and Anti-aliasing filters

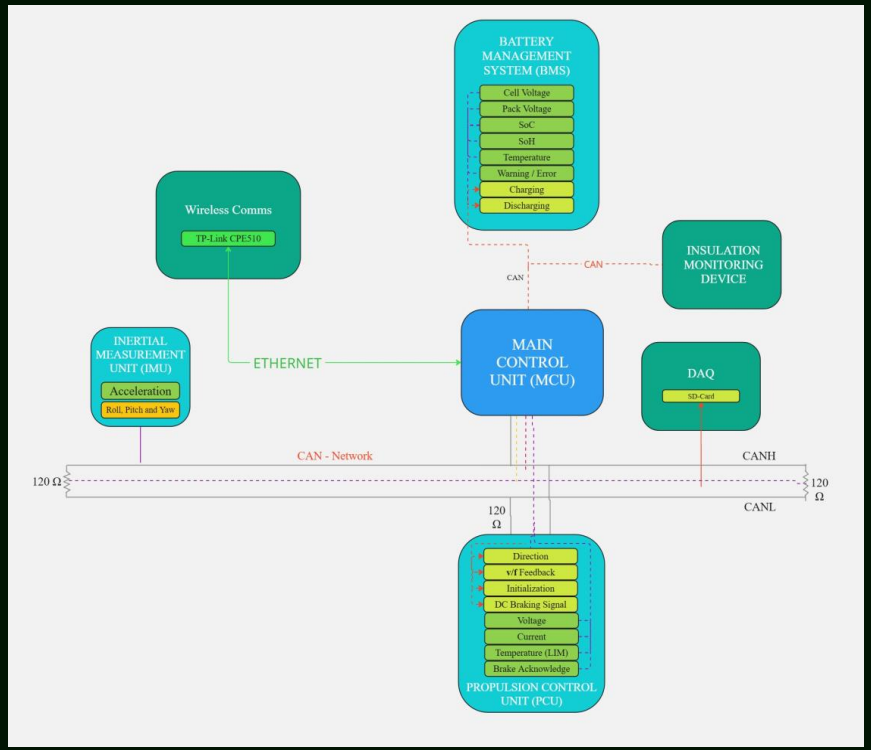
CAN Communication
Single connector for 2 CAN buses and power

Data Storage
Up to 8Gb

Control Architecture



On-Pod Communications



CAN Protocol
Comms and Data Transfer b/w all modules

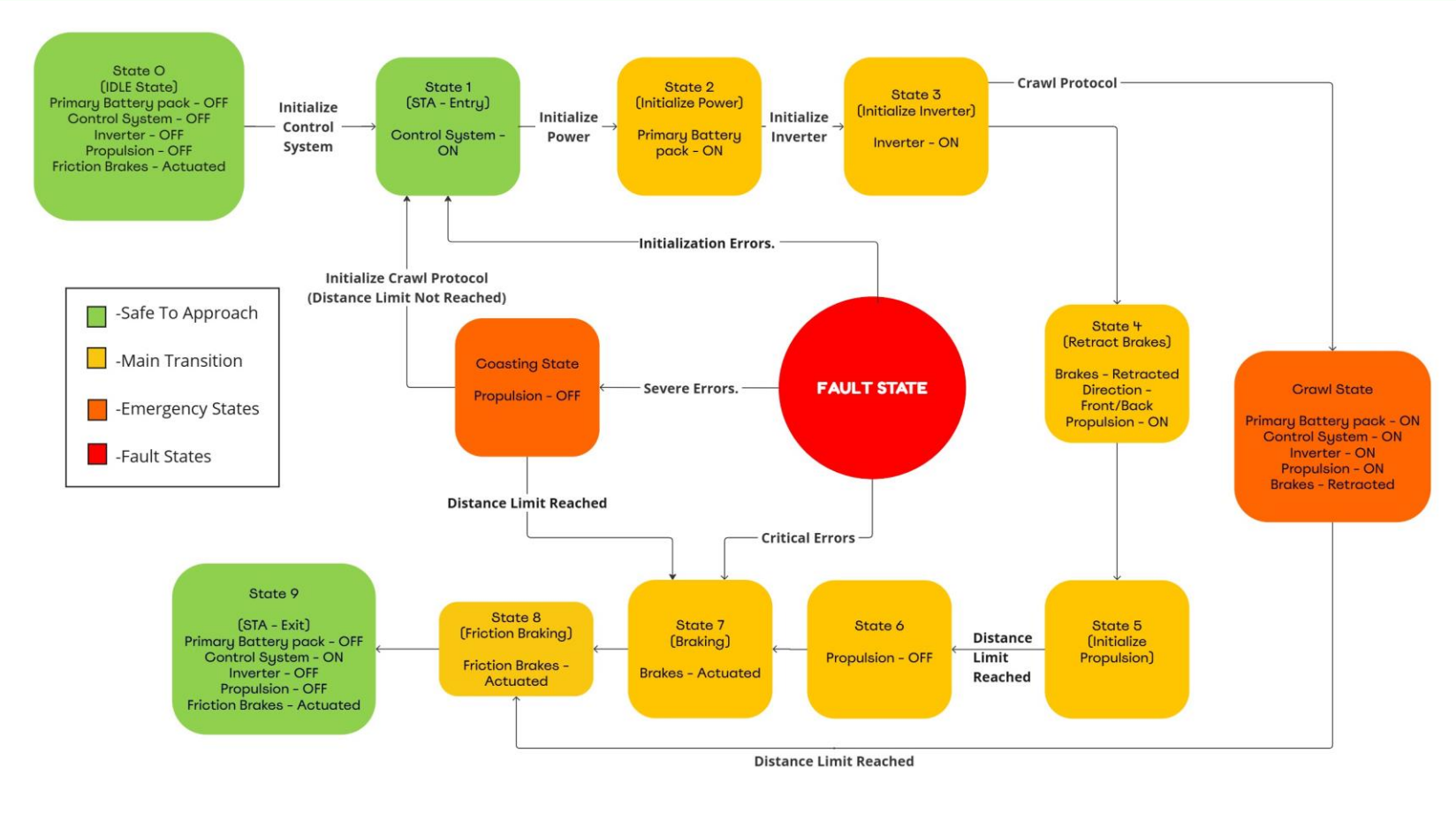
500 Kbps Baudrate
Industry Standard Bandwidth

Dual Bus Channels
Maintains Low Bus Load

Master – Slave Architecture
Central Maintenance of State Diagram

Fault Identification
CAN-based Diagnosis

STATE DIAGRAM

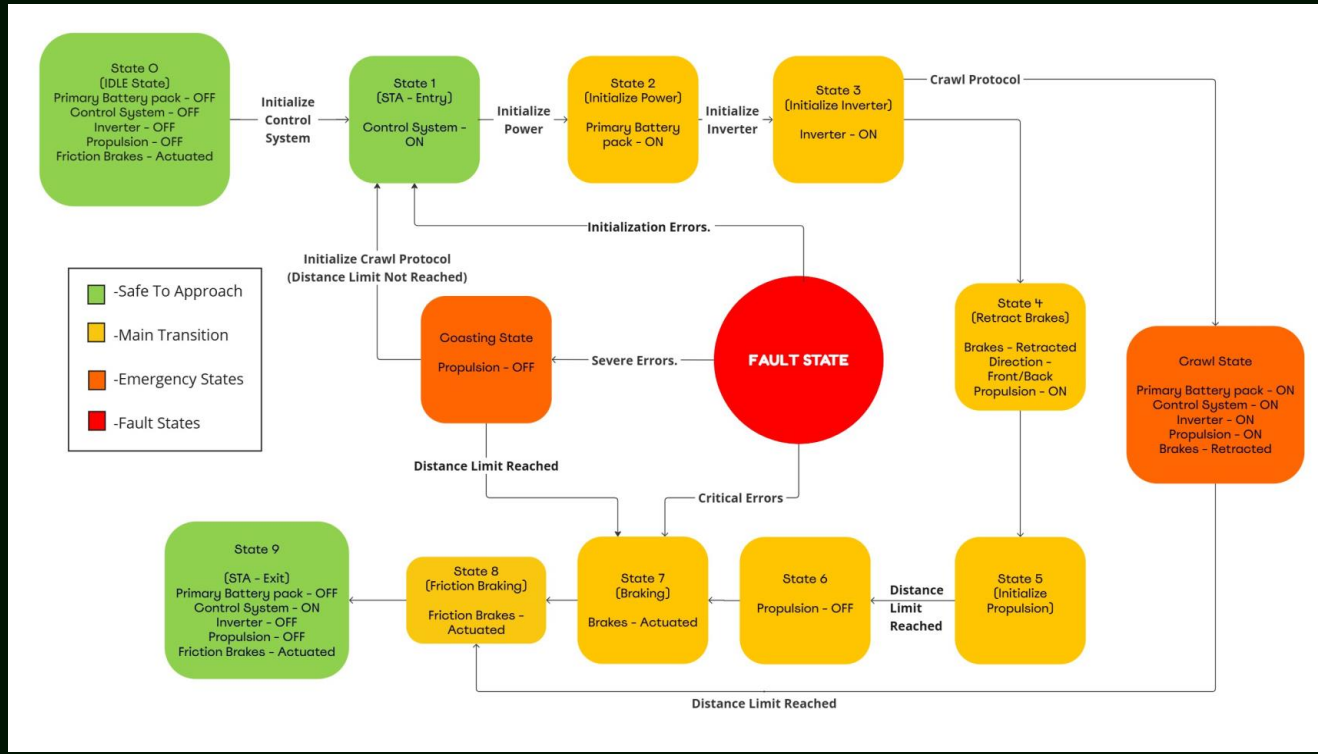


STATE DIAGRAM

RTOS
Real Time Operating System

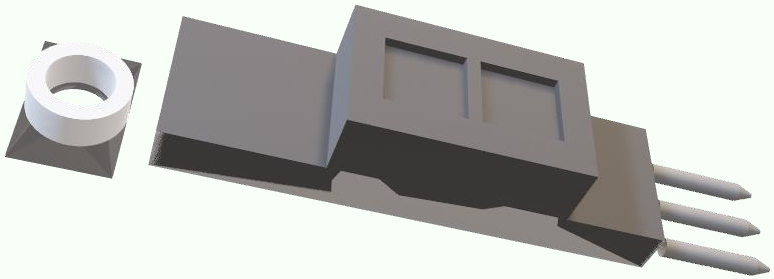
Parallel Processing
Efficient Multi-tasking

Fault Handling
Continuous Fault detection



Graphical User Interface (GUI)

LINEAR ENCODER



Opto-Reflective Sensor

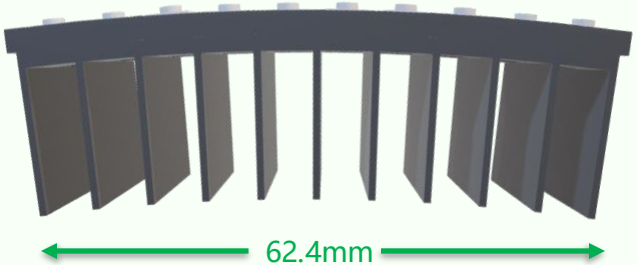
Response time of 1ms

Contactless Sensing

Detects black chart in the range of 0-26mm

Detects white chart in the range of 0-56mm

LINEAR ENCODING METHOD

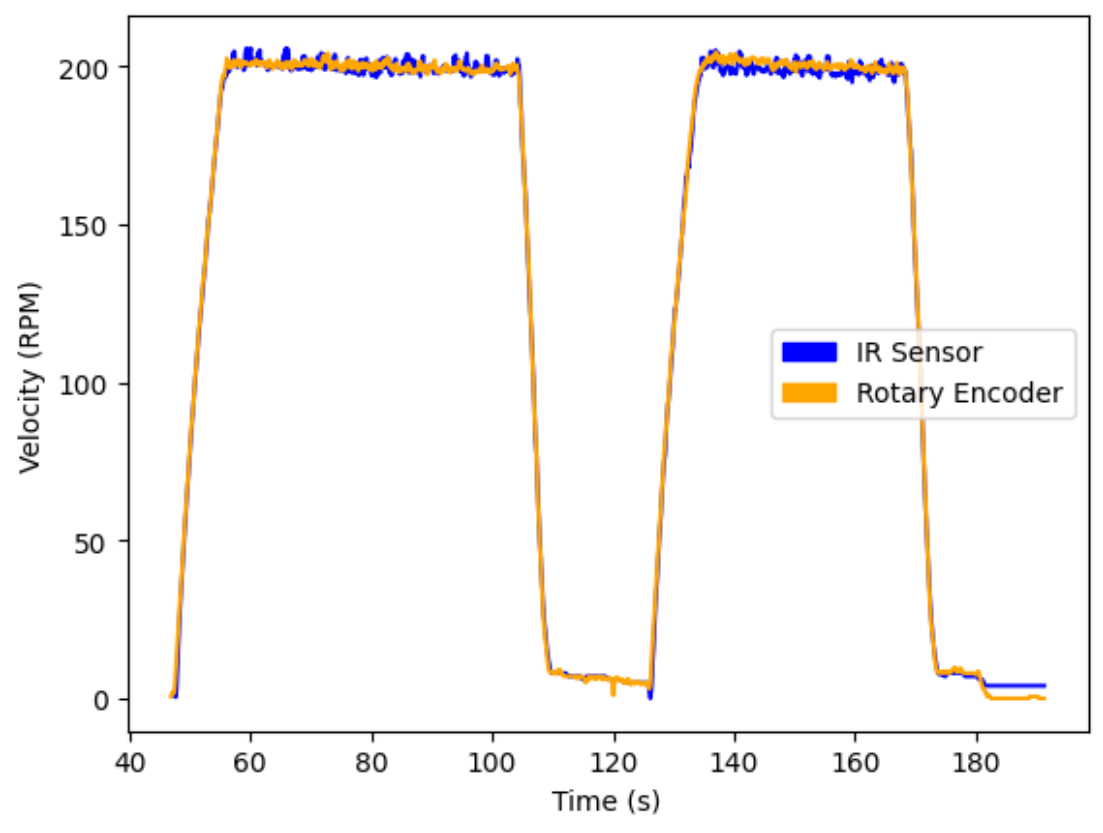


DISC SETUP

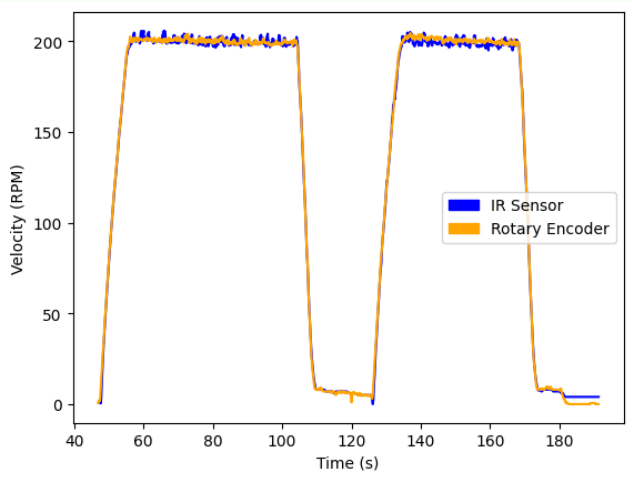
Sensor Data

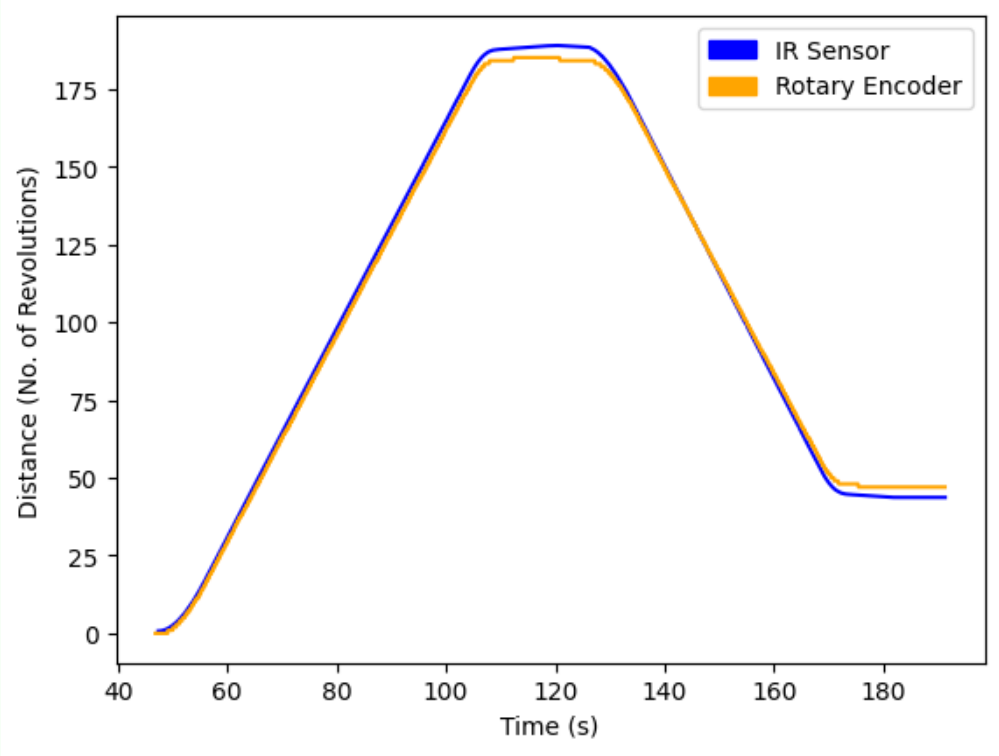

112 s : 700 ms
+30 ms
+40 ms
+50 ms
+60 ms
+70 ms
+80 ms
+90 ms
112 s
D0 Channel 0
D1 Channel 1
D4 Channel 4
D2 Channel 2
D3 Channel 3
D5 Channel 5
H
L

Sensor Data vs Rotary Encoder Data

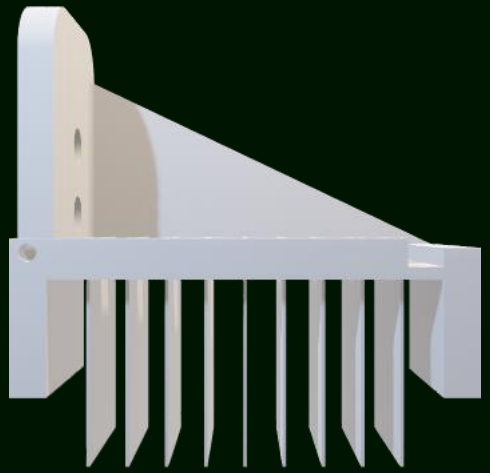


Moving Average Method

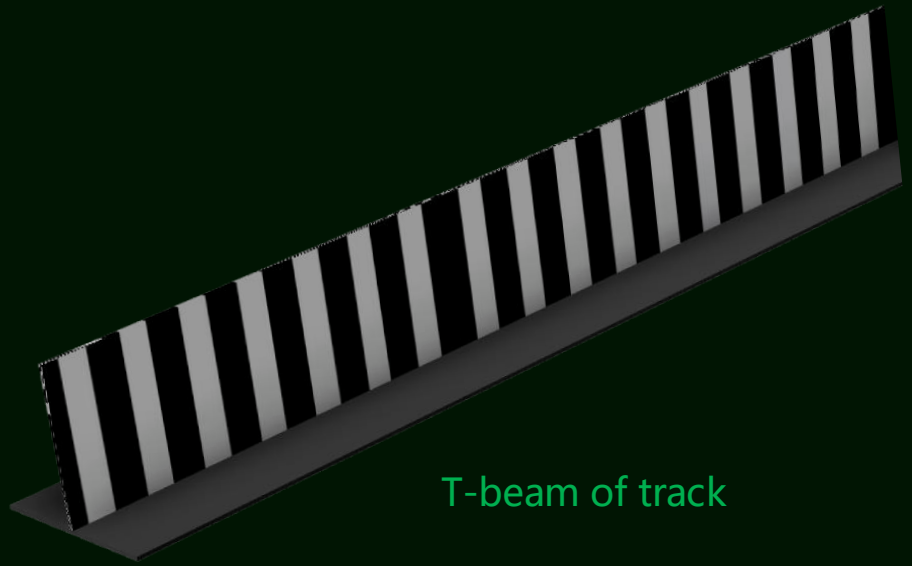




VELOCITY ON POD



Sensor Mount



T-beam of track

Avishkar Hyperloop

Thank you for your time!

#LeapOntoTheLoop