Robotic Platform Agnostic SLAM

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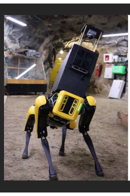
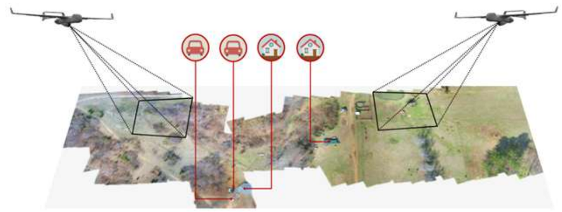


BACKGROUND AND MOTIVATIONS

Background:

- Standard Simultaneous Localization and Mapping (SLAM) Algorithms are used for real-time mapping and navigation in autonomous vehicles



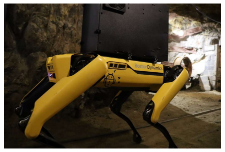
Issues:

- SLAM requires extensive computational resources
- SLAM requires various sensor information to function (LiDAR, Depth Sensing, etc)
- Hardware platforms that meet these needs aren't widely available for SLAM research
- Hardware platforms available aren't always made with multiple vehicles in mind

OBJECTIVES

Goals:

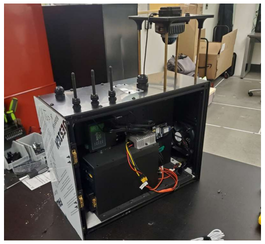
- Engineer, build, and assemble a modular sensor "backpack" for the Spot, Jack, and Husky robots, with sufficient hardware capabilities for SLAM
- Make design as user-friendly as possible
- Create adequate open-source technical documentation to support further research in this area



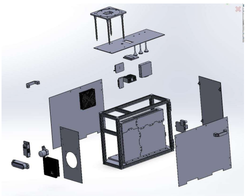
DESIGN ITERATION

Version 1

Version 2/3



Version 4 (Latest)



SYSTEM VALIDATION

Data Collection at Edgar Mine with v2:

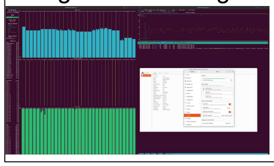
- Used Sensor Backpack v2 to record LiDAR & Depth Perception data

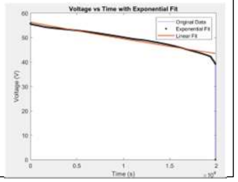
Maximum Power Draw:

- Stress tested biggest system draw (laptop) by pushing it to 100% CPU and GPU utilization
- Measured component draw on startup

Battery Curve Generation:

- Drained battery and used PCB logging script to generate voltage falloff curve

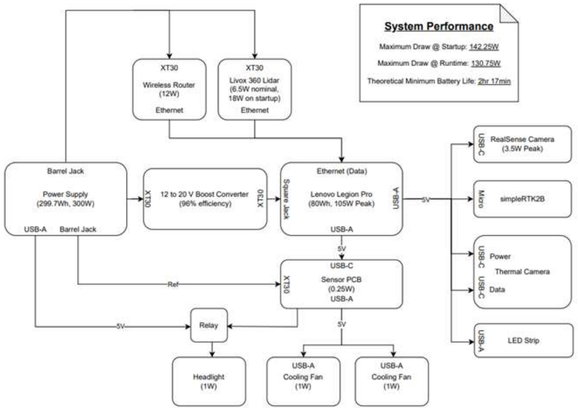




ELECTRICAL SUBSYSTEM

Must Address:

- Power and Communication Needs



CONCLUSION AND FUTURE WORK

Issues:

- Battery sourcing
- Sensor backpack dimensions prone to toppling
  - Battery Dimensions
  - Laptop Dimensions
- Bluetooth range

Upcoming Projects:

- Custom Sensor Backpack Battery
- Robot RF Controls Implementation
- Custom Size Efficient Computational Hardware
- And MORE!

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2. Hardware Team Members: Gavin Morrison, Nick Taylor, Grace England, Julietta Rozin, Ian McGrath, Eugene Lee, Christopher Joseph, Barry Behn, Kathryn Nakahira, Tobin Geren-Mori
3. Kaveh Fathian