WiLiE: Wireless Lidar Explorer

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Overview

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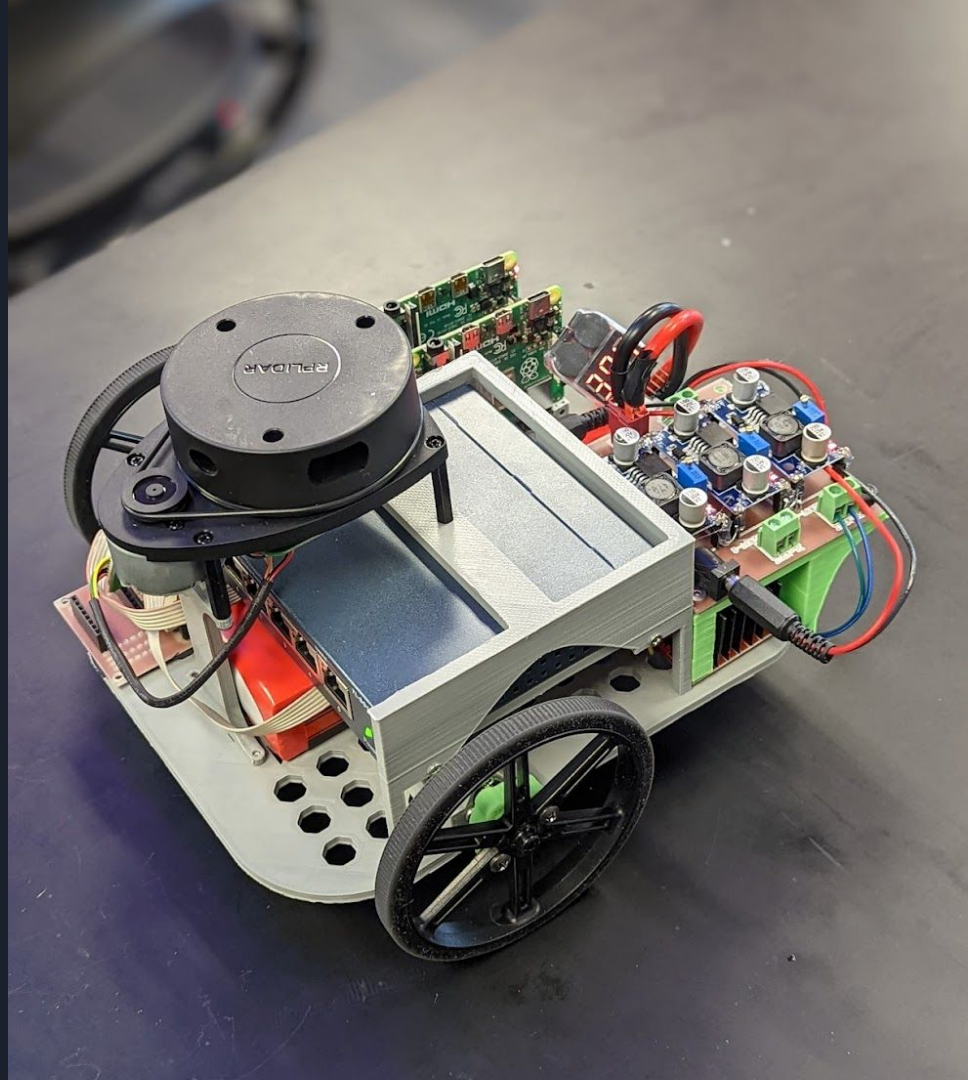


Introduction

- IT departments spend countless hours troubleshooting WiFi issues
- Our project makes use of commodity hardware to effectively make heat maps of any given environment with accuracy
- Success of this project displaces the need to maintain expensive licenses and hardware for occasional use

Related Work

- Ekahau Sidekick and like products
  - Strategic, static points
  - Vectors of measurement
  - AR assisted mobile measurements
- Drawbacks
  - Manually take measurements
  - Person has to be present for the process

Related Work (cont.)

- *3D interference mapping for IOT scenarios*
  - Installed in the room it's measuring
  - Scanning in X, Y, and Z axes
  - Location specific
- Drawbacks
  - Unwieldy, not portable
  - Does not scale well, location specific

Methodology

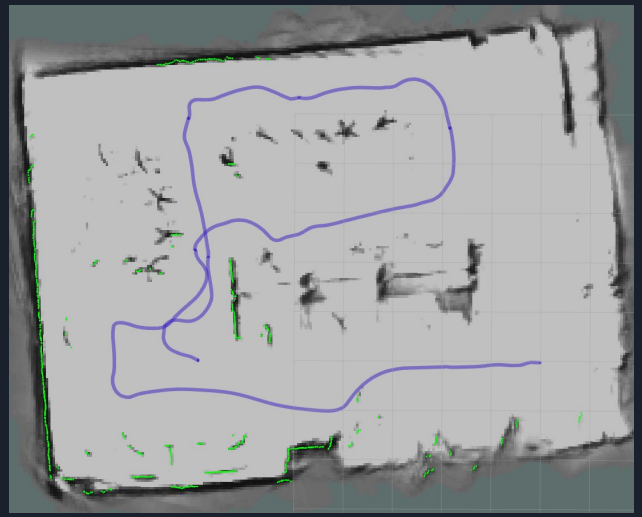
- Low cost solution with the capability to take consistent and equidistant measurements with little human intervention
- Uses ROS2, an open platform, for helping different components of a robotic system to communicate effectively
- Relies on commodity hardware as opposed to expensive spectrum analyzers which can be too overpowered or expensive to license for certain routine tasks

Methodology (cont.)

- 2 Raspberry Pi 4B
  - Uses ROS2 which facilitates communication between processes
  - Motor control and LiDAR done on one
  - RSSI scanning and throughput measurement done on the other
- Teensy 4.1
  - Controls the wheel odometry
- LiDAR Unit
  - Used to make a real-time map of the current environment
- PS5 Controller
  - Moves WiLiE

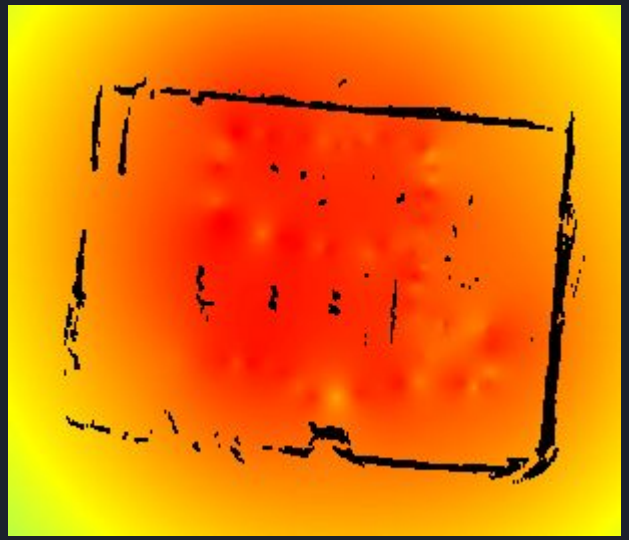
Implementation/Experimentation

- Select area to map
  - NetLab
  - Fourth floor of EB
- Start and record data on WiLiE
- Post process data
- Collect Ekahau data
- Compare data



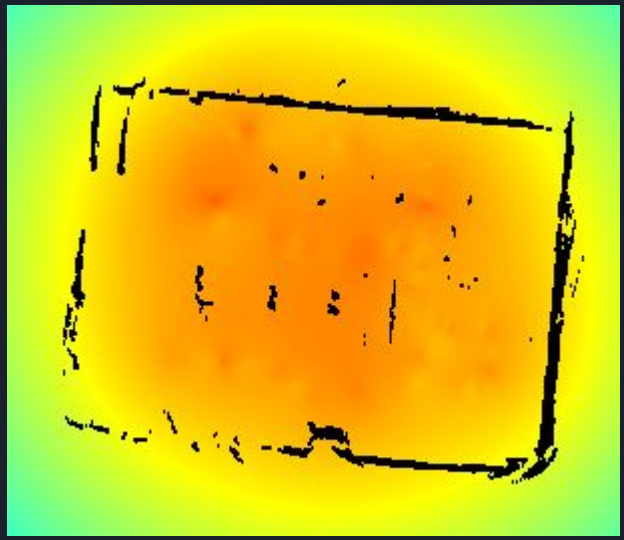
Results

External Antenna RSSI



Min: -59dB Max: -17dB

Onboard Antenna RSSI



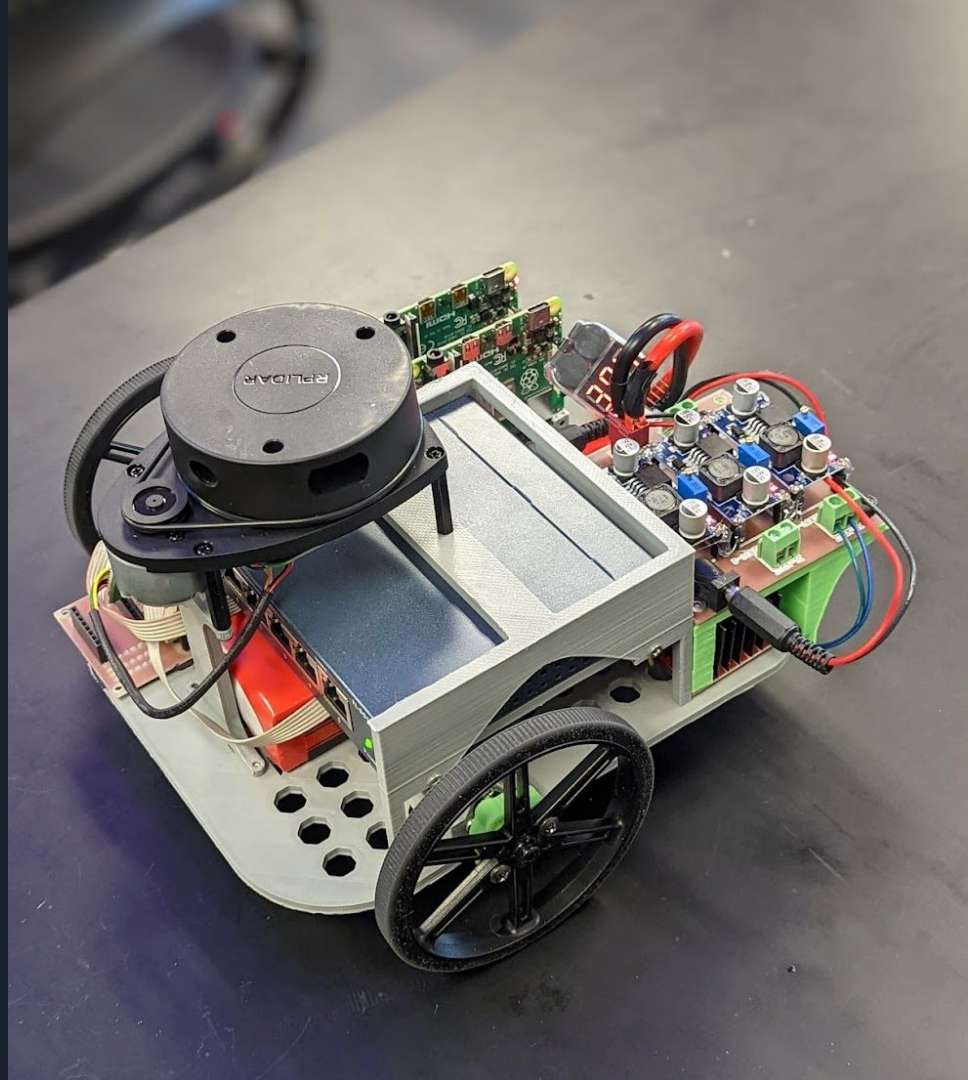
Min:-74dB Max:-30dB

Conclusion

- Hard for smaller IT departments/individuals to buy and maintain expensive hardware
  - Automatic map creation
  - Multiple metrics
  - Opensource
- Solution does not have to fill an entire room

Future Work

- Redesign chassis/electronics
  - Ekahau emulation? SDR?
- Autonomous navigation
- 3-dimensional measurement
- Robot localization projects



Questions?