Hide and Seek

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Project Description

“A system of rovers that can autonomously map a room and use that map as the sole means for navigation.”

System Overview

Individual Components

1. Mapper Rover
2. Hider Rover
3. Seeker Rover
4. User Interface

Mapper Rover

- Uses a LIDAR sensor to continuously gather point data about the room
- Continuously build a real-time map to use for navigation
- Determines where to go in order to cover the unmapped regions
  - Route planning
  - Avoiding new obstacles
- Sync map to the database

Hider and Seeker Rovers

- Same basic design
- Gathers map data from the server (as well as starting point and destination)
- Using that data pre plan a route to the destination
- Execute that route
- Seeker uses and additional IR sensor to confirm the hider rover’s location

User Interface

- Has a Command Line Interface for interacting with the system
- Can see rover statuses:
  - Mapping
  - Going to destination
  - At destination
- Can send start/stop commands to each rover
- Can see a visual representation of the room being mapped
  - Includes rover positions

Functional Design

- Modularity
  - Codes are separated into different modules
  - Each modules has its own specific function
- Reusability
  - Some modules are used by all rovers
- Consistent message formats
  - All internal queues share the same message format
  - Communications between PIC and Server uses a JSON format

Message Formats

Internal Queues

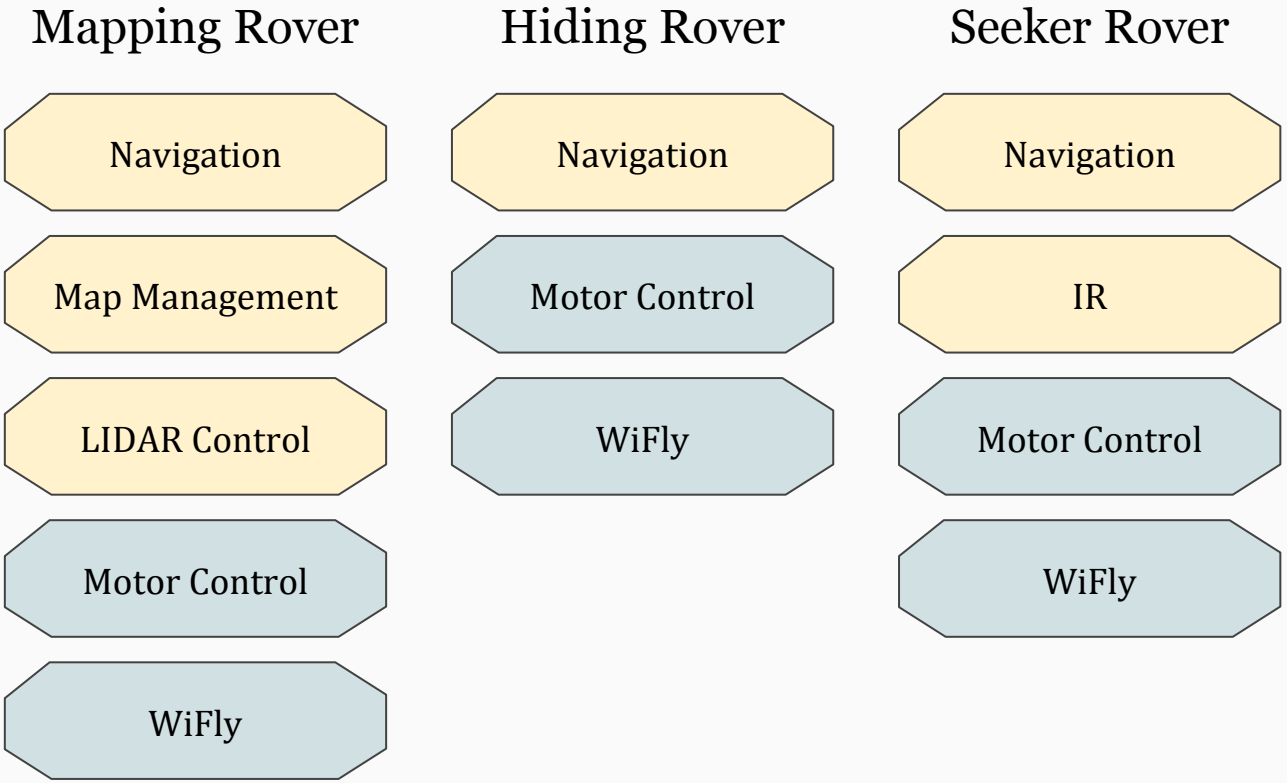
- 96-bit struct with three fields
  - 32-bit command
  - 32-bit type
  - 32-bit data

External Communication

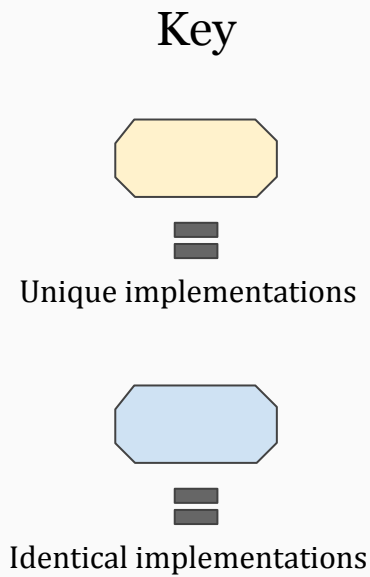
- JSON Object with three fields
  - 32-bit checksum
  - 32-bit sequence number
  - 96-bit payload
- Payload is another JSON Object with three fields
  - 32-bit command
  - 32-bit type
  - 32-bit data

Note: Each command and type are kept track of in enumerated lists

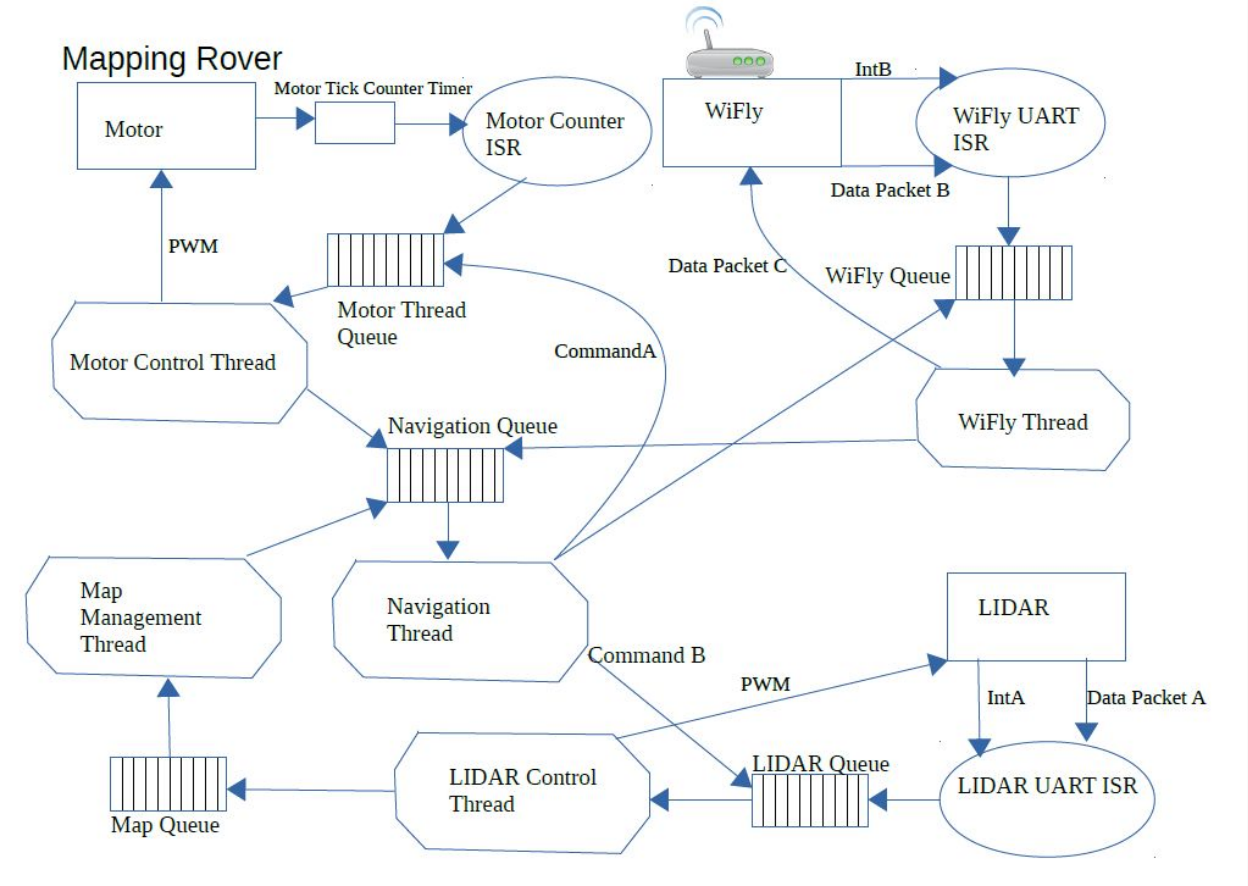
Threads



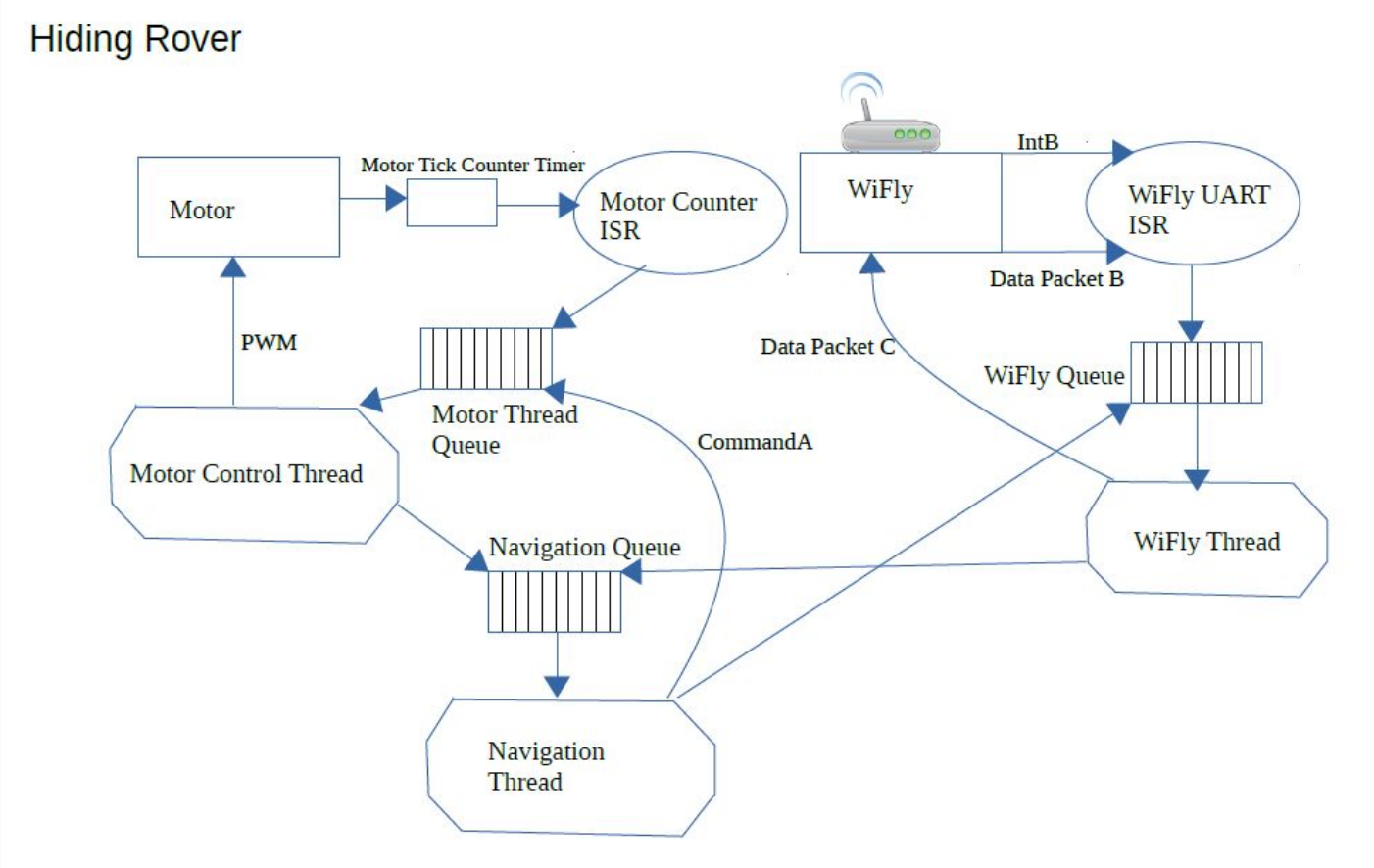
Note: Each thread receives data from exactly one queue, named after the thread's name



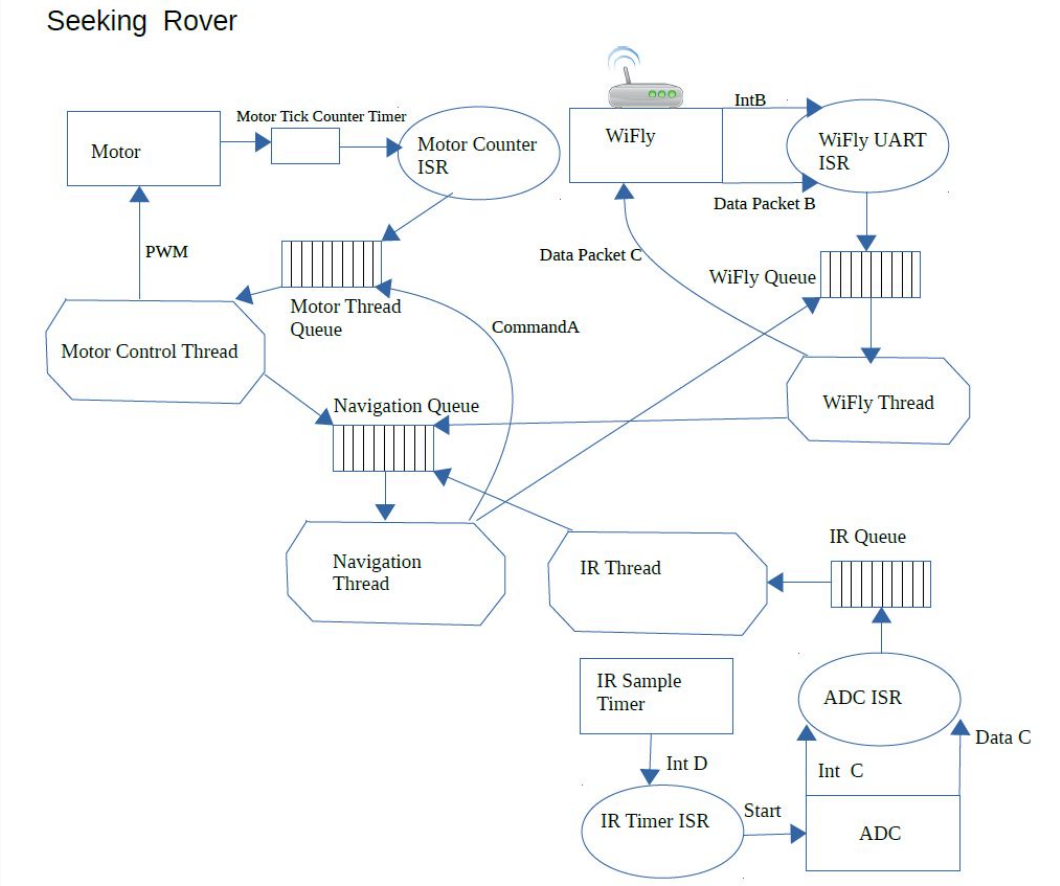
Overview of Task Diagram: Mapping Rover



Overview of Task Diagram: Hiding Rover



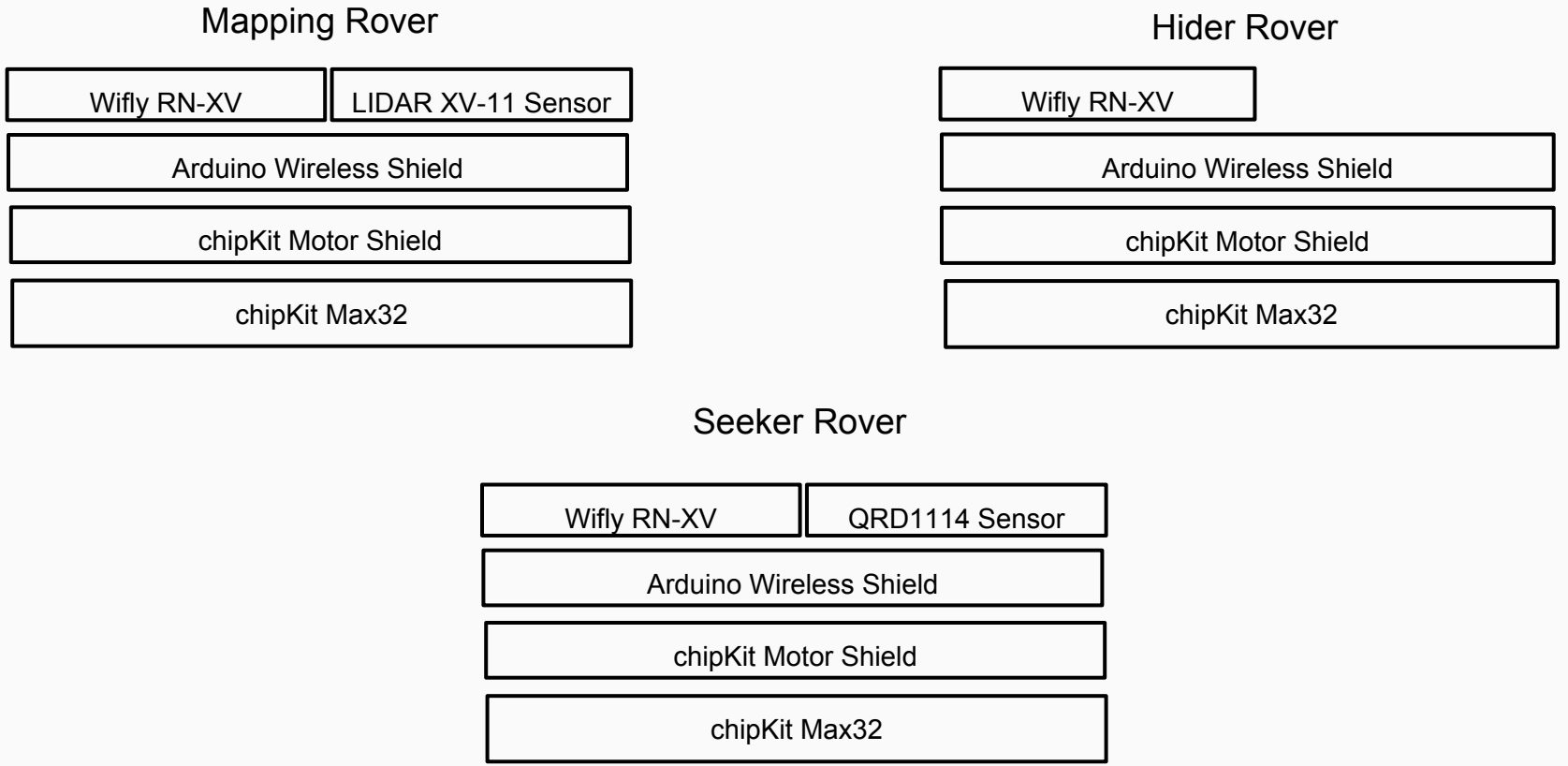
Overview of Task Diagram: Seeking Rover



Hardware Design

- Board placement
- LIDAR sensor
- IR sensor

Board Placement



Neato LIDAR Laser Distance Sensor XV-11

- UART communication
- 360 degree sensor range
- 15 cm-6 m range
- Sensor and Motor both powered by 3.3V

QRD1114 Optical Detector

- ADC Communication
- 0.75-10.15mm range
- Low Voltage