RIVITY

Autonomous Mecanum-Wheel Robot For Intelligent Navigation And AI Tasks

Mek4tronics

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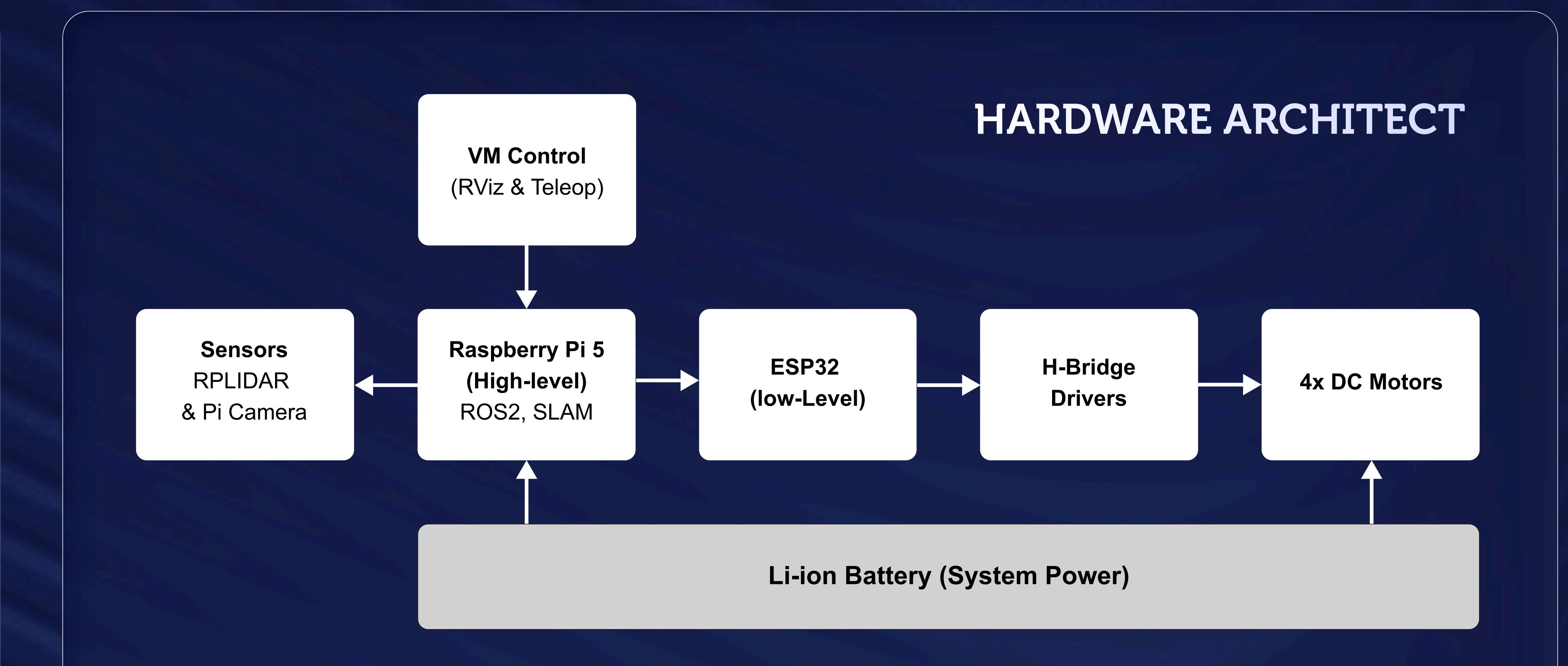
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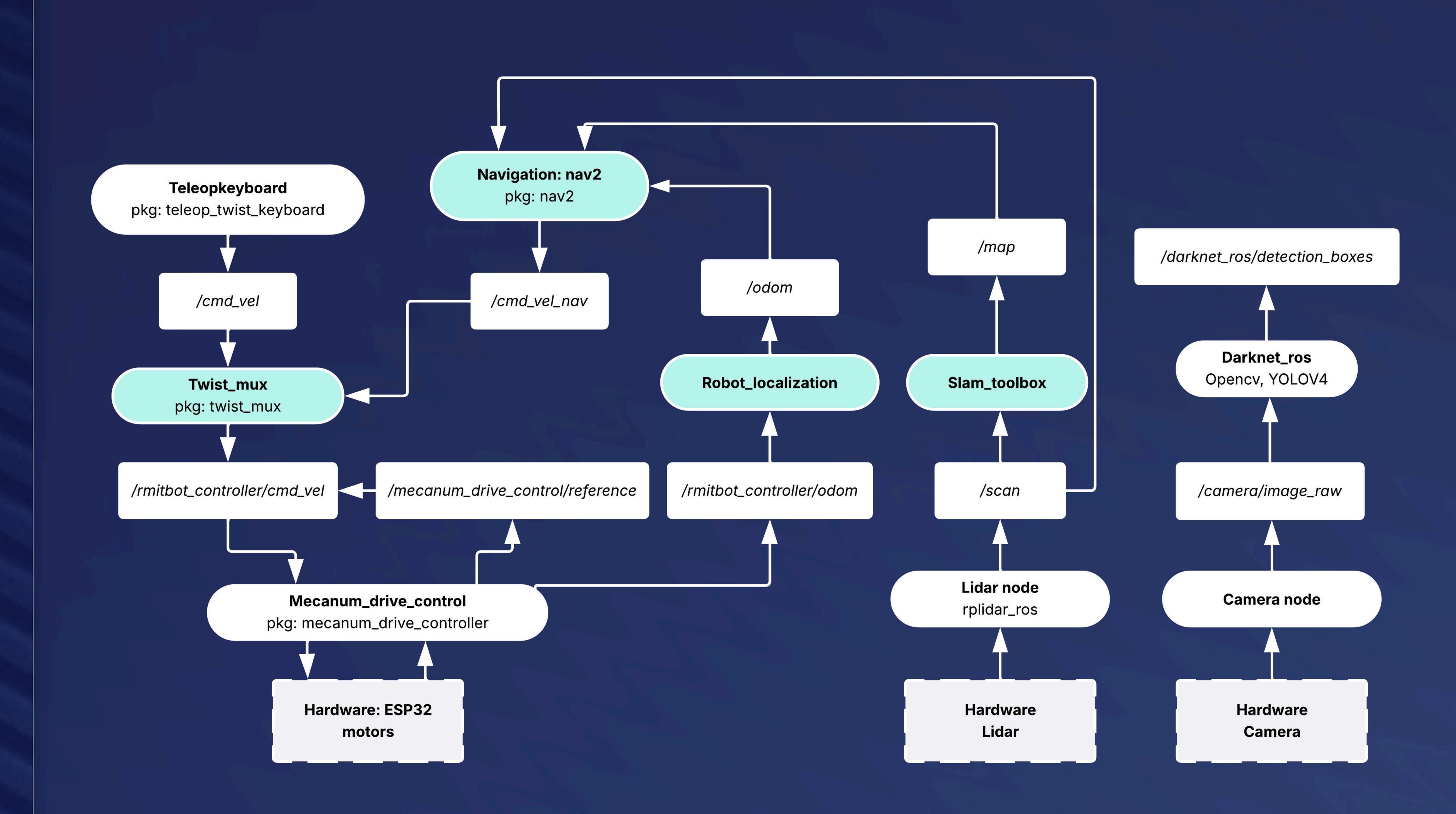


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DESCRIPTION & OBJECTIVES

- RMITbot is an autonomous mobile robot platform built on ROS2.
- Its purpose is to be a versatile tool for education and research.
- It uses Mecanum wheels for omnidirectional movement.
- The system integrates various sensors and software nodes for navigation, localization, and perception.



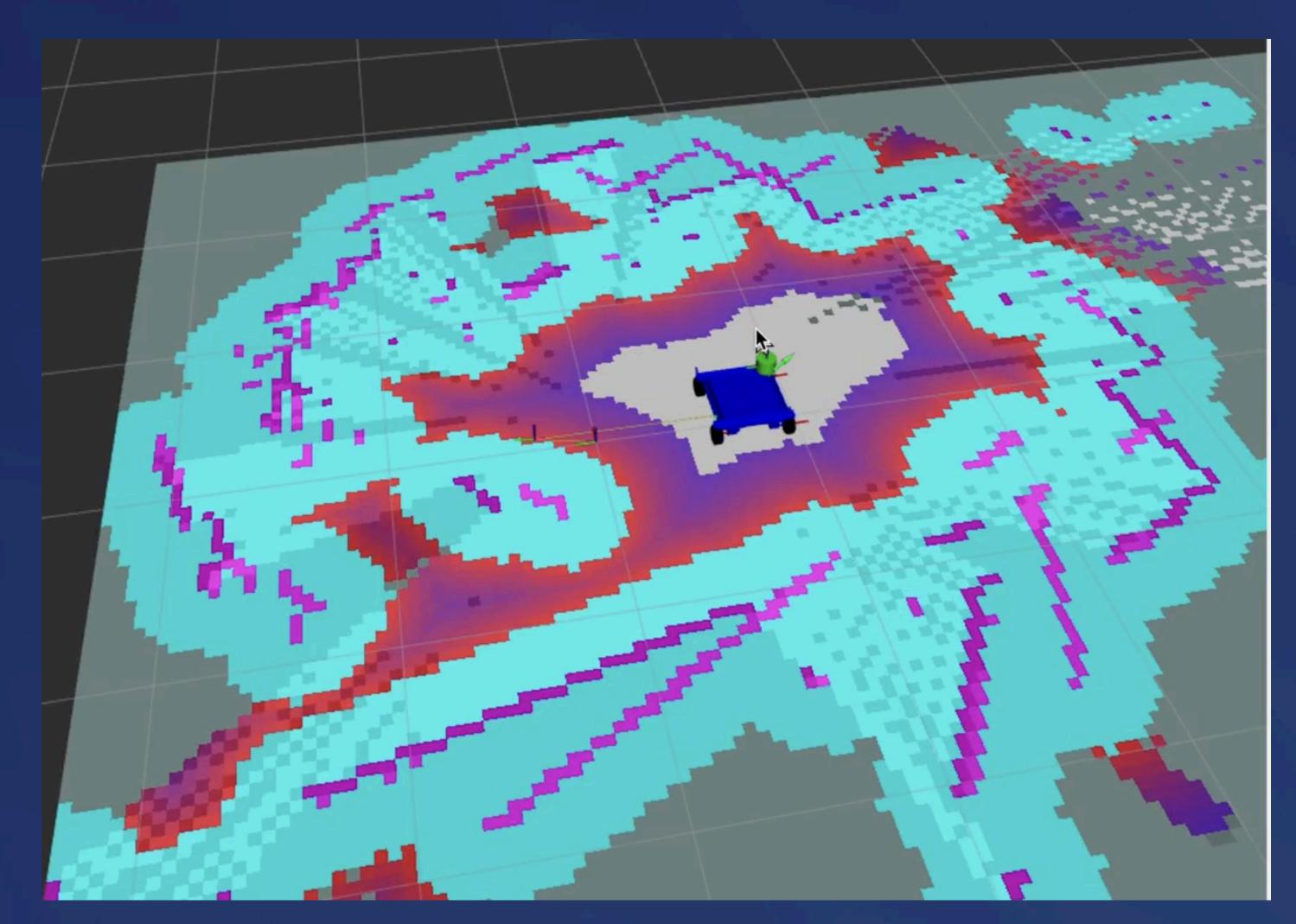


SYSTEM WORKFLOW

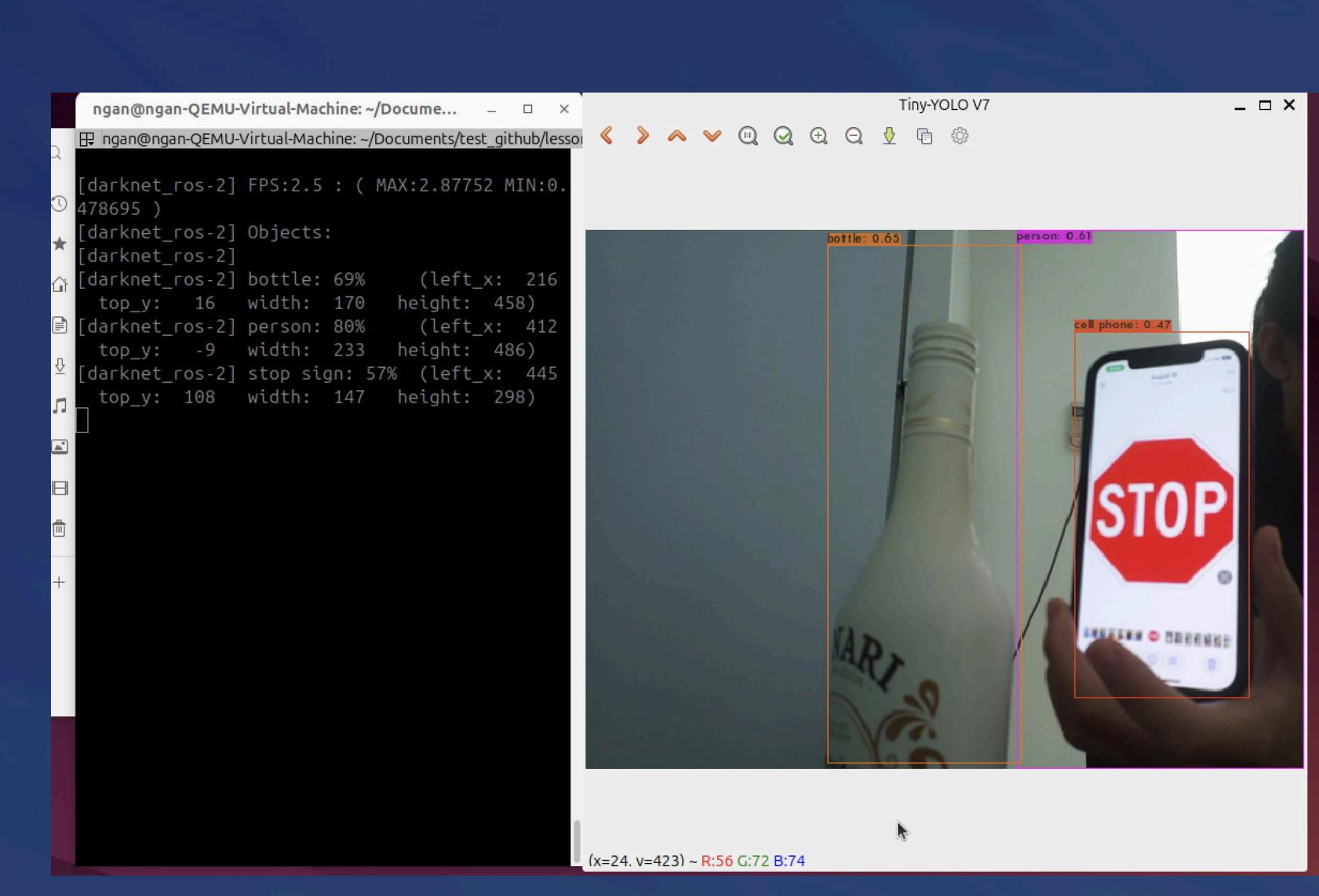
- **Distributed Real-time System:** ROS2 is designed as a distributed real-time system, enabling components to run across multiple processes and machines.
- **Nodes:** The fundamental computational units in ROS2 are "nodes," which are individual processes that perform specific tasks (e.g., a camera driver, a motor controller).
- **Topics:** Nodes communicate with each other by publishing messages to and subscribing to "topics." This forms a manyto-many communication pattern.
- Messages: Data exchanged between nodes via topics are structured as "messages," which are defined data types.
- **Services:** For request/response communication patterns, ROS2 provides "services," where a client node sends a request to a service server node and waits for a response.
- Actions: For long-running tasks with periodic feedback, ROS2 offers "actions," which extend services by providing continuous feedback and the ability to cancel goals.

EXPERIMENTS & RESULTS

- Simulation Validation: Evaluate control loops and sensor feedback in RViz and Gazebo.
- Real-Time Navigation: Verify autonomous path planning and obstacle avoidance.
- Object Recognition: Confirm the robot's ability to identify and react to objects.
- SLAM Accuracy: Assess the efficiency and precision of the mapping system.



Simultaneous localization and mapping



Object detection

FUTURE DIRECTION

- Enhanced Perception: Use 3D LiDAR for more robust SLAM.
- Interaction: Add voice commands or gesture control.
- Manipulation: Incorporate a robotic arm for grasping tasks.
- Multi-robot Collaboration: Enable multiple robots to work together.
- Advanced AI: Use machine learning to improve navigation and behavior.

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