Ro-Bin

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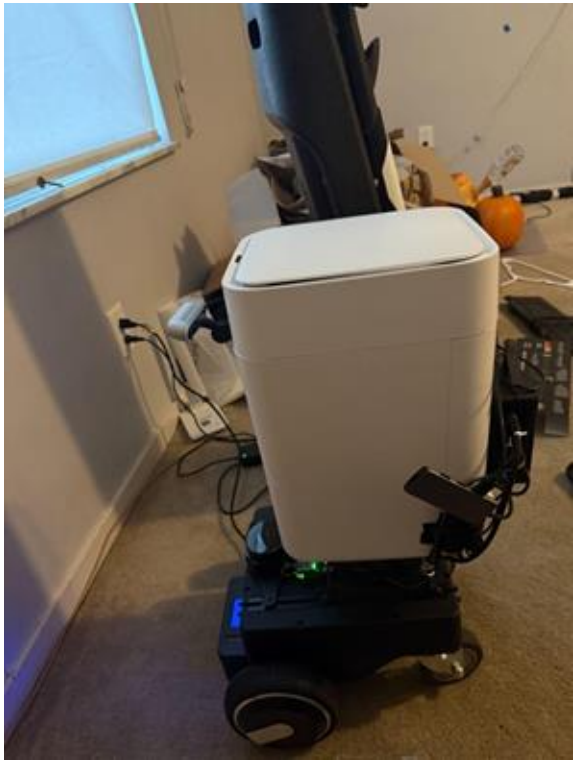
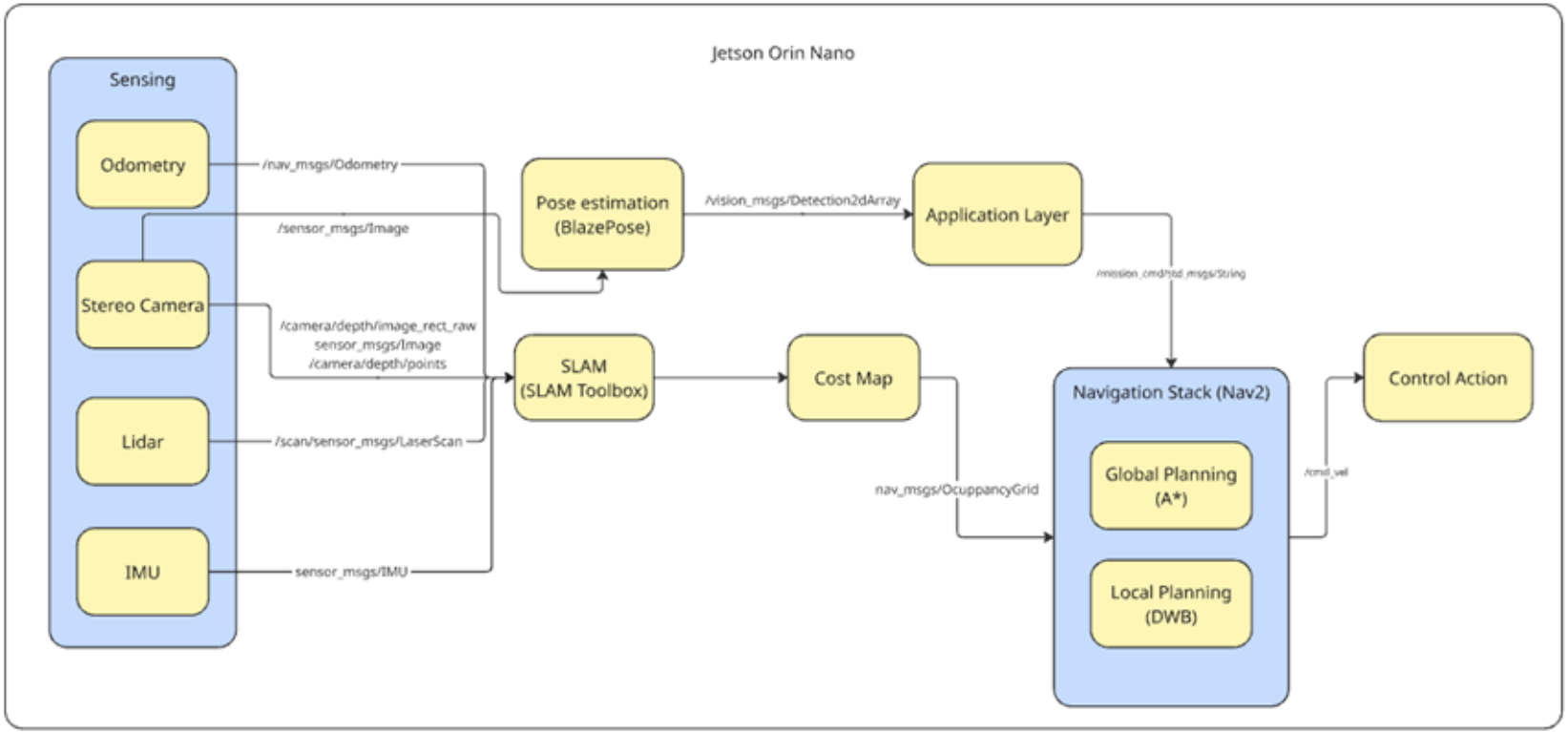
Abstract & Goals

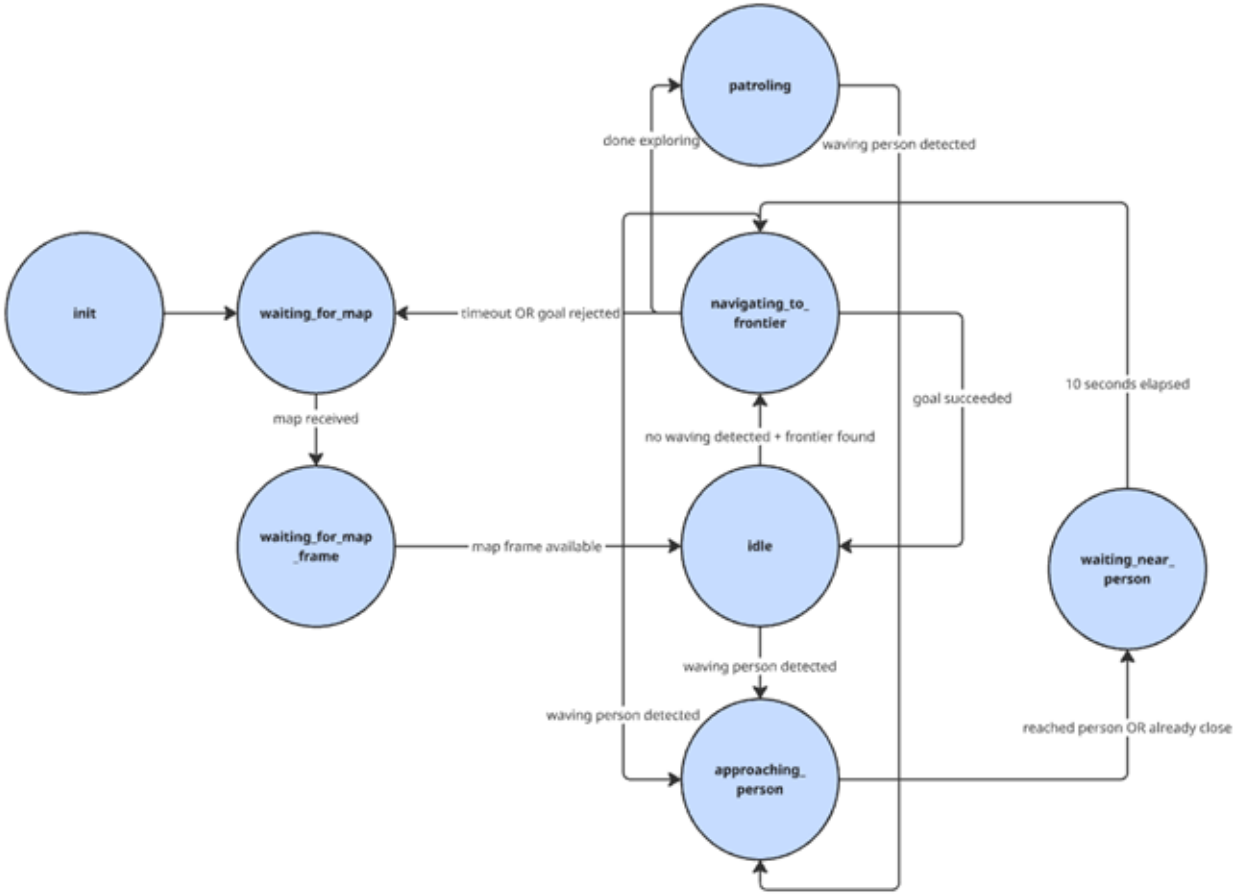


- Address overfilled and insufficient trash receptacles
- Robot should autonomously approach humans for waste disposal
- Interaction with robot should be natural and intuitive
- System should aim to improve cleanliness in high-traffic areas

System Diagram



State Machine



Frontier Exploration/Navigation

Looks for areas where “drivable” cells are adjacent to “unknown”

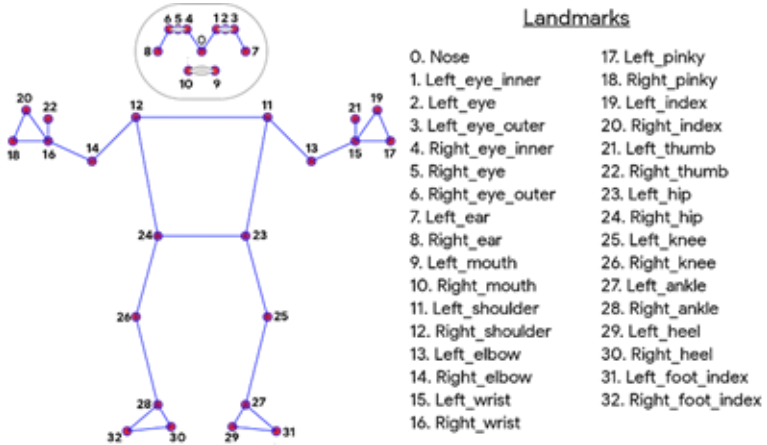
Groups these cells into clusters and scores each using a weighted sum of factors:

- Cluster size
- Goal clearance
- Path length/reachability
- Path clearance
- Time away from area

Uses A* for global path w/ DWB as the local controller

Pose Estimation with BlazePose

- Benefits:
  - Sufficient Accuracy
  - Lightweight
  - Compatible with Jetson/Jetpack 6.2

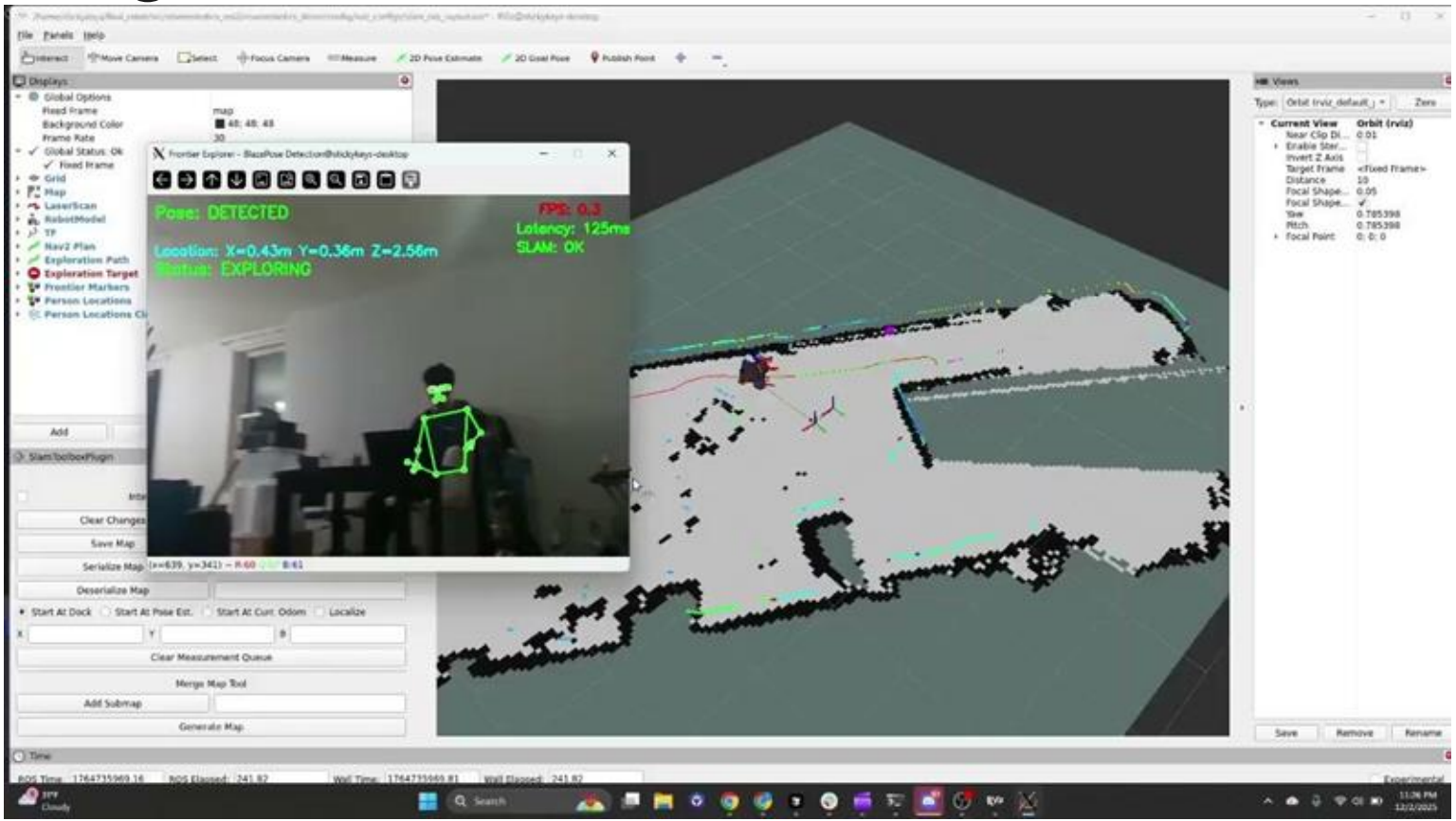


Reference: Bazarevsky, V., Grishchenko, I., Raveendran, K., Zhu, T., Zhang, F., & Grundmann, M. (2020). *BlazePose: On-device Real-time Body Pose tracking*. arXiv. https://doi.org/10.48550/arXiv.2006.10204

Approaching Person Demo

Rviz2 Visualization

Waving Demo


Pose: DETECTED
FPS: 0.3
Latency: 125ms
Location: X=0.43m Y=0.36m Z=2.56m
SLAM: OK
Status: EXPLORING

Future Directions

- AprilTag Support for Docking
- Trash Bag Unloading System
- Work with Other RoBin Robots in Sync