

AUTONOMOUS ROBOTIC EXPLORATION OF DYNAMIC ENVIRONMENTS

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PROBLEM STATEMENT

- How can we build exploratory behaviors for robotic agents to autonomously respond to objects of interest?
- How can we interpret an agent's reasoning in a difficult environment?

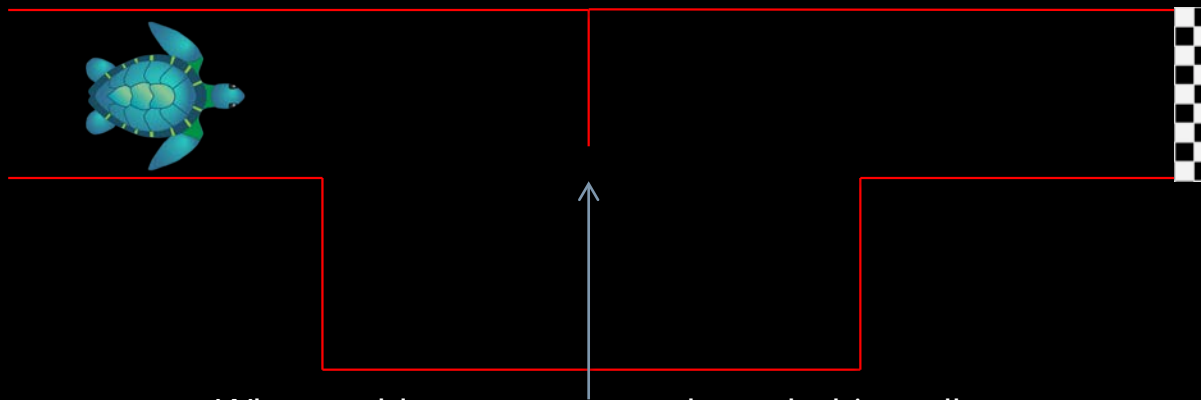


"Tier-Scalable Reconnaissance™:

The Future in Autonomous C⁴ISR Systems has Arrived, Progress towards an Outdoor Testbed", (Fink W., Brooks A. J.-W., Tarbell M. A., Dohm, J. M., 2017)

HOW WE THINK OF NAVIGATION

It's simple. Move towards* the objective!

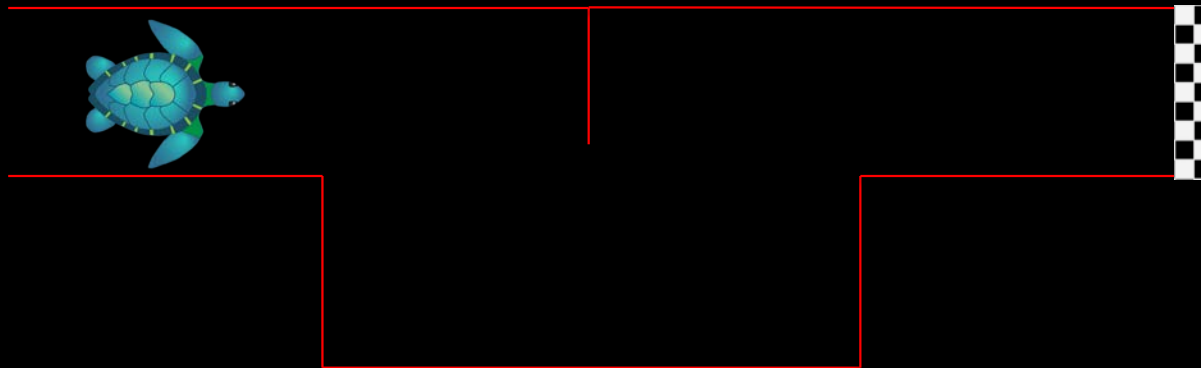


Why wouldn't we try to go through this wall
and take a shorter path?

*The selected route is generally determined by a combination of factors,
such as proximity, safety, and time.

HIERARCHICAL BEHAVIOR DESIGN

Overall Objective: Get to the Goal



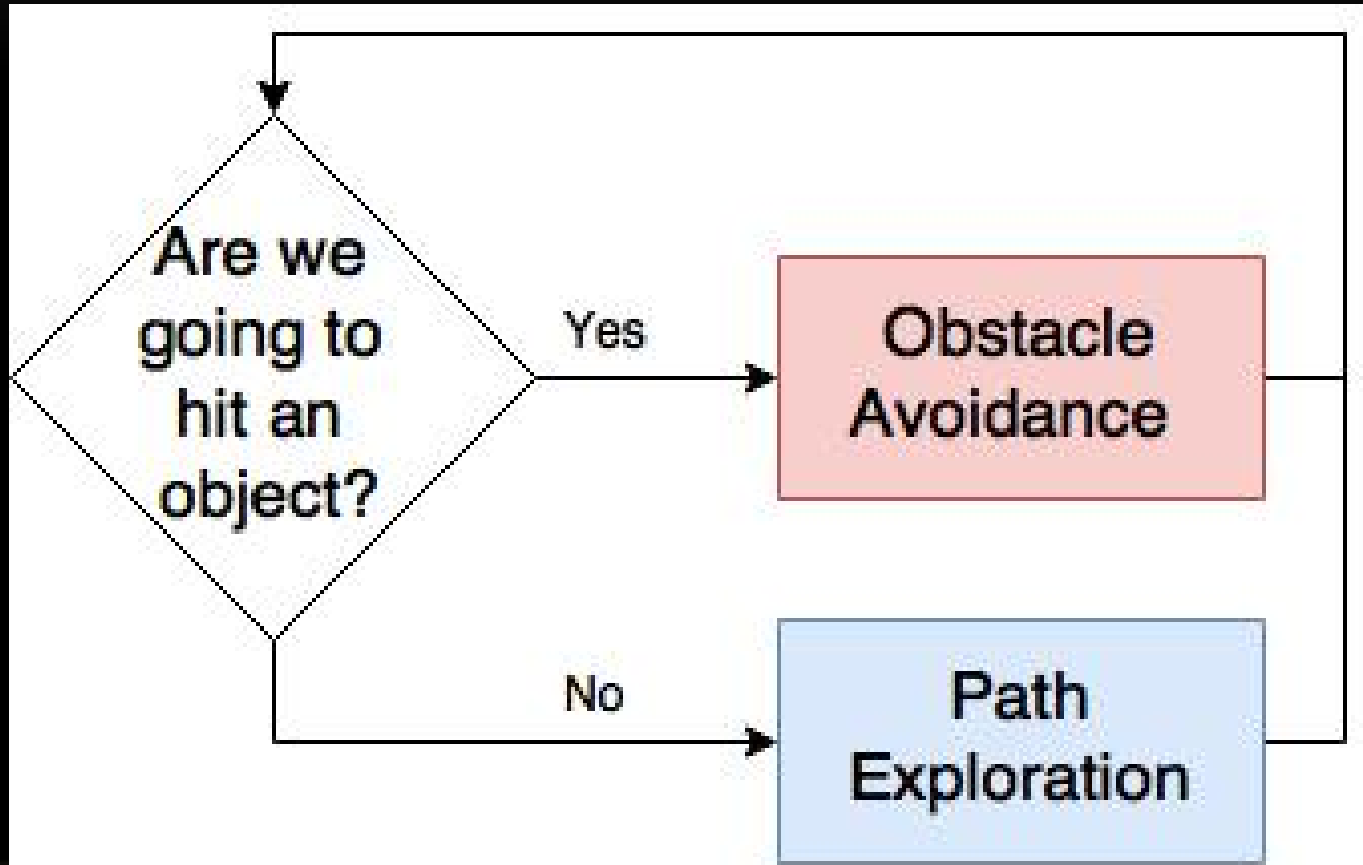
Current Behavior: ~~Approaching the~~ goal

THE AGENT: ROVER EQUIPPED WITH 2D LIDAR



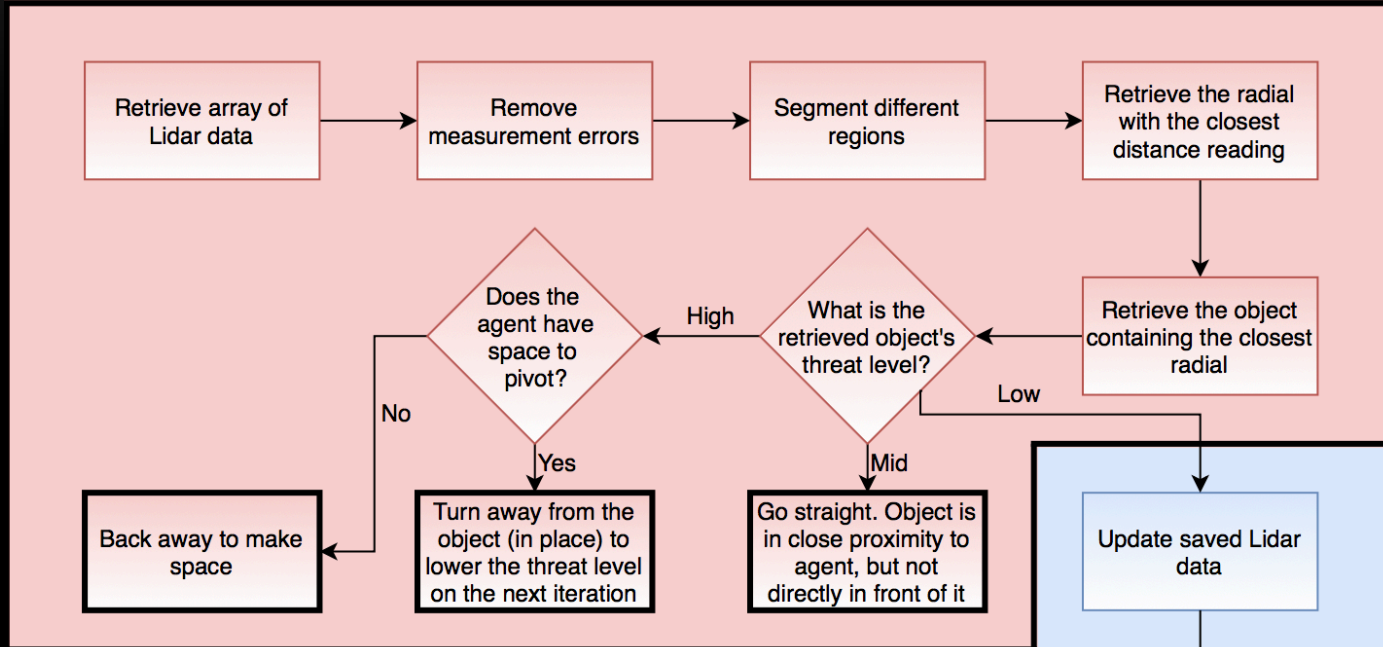
2D Lidar Module, taken from
<http://www.robosoup.com/2015/11/ransac-line-feature-extraction-from-2d-point-cloud-c.html>

OVERALL OBJECTIVE: EXPLORE (ROAM) AREAS

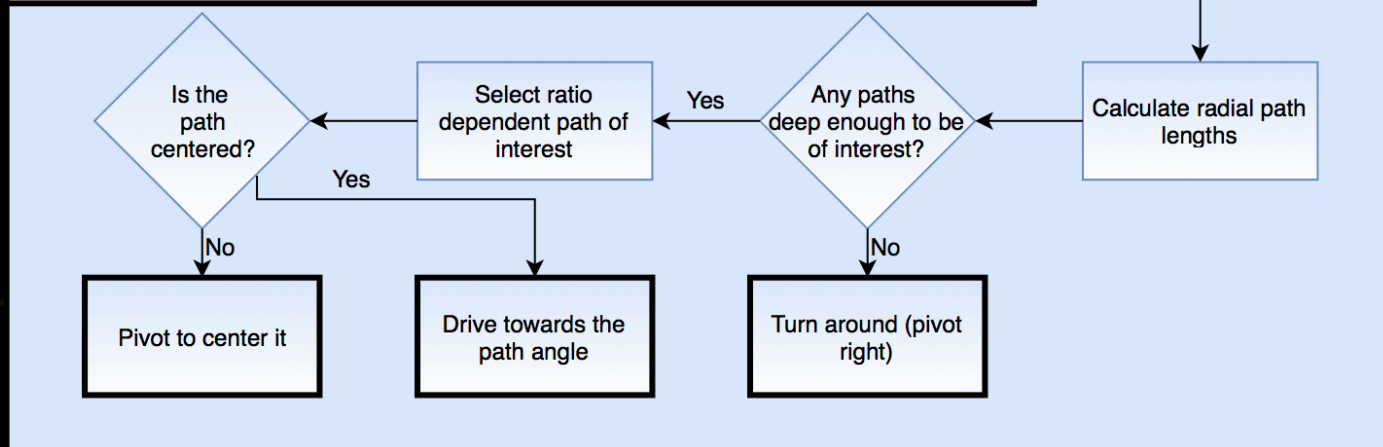


HIERARCHICAL DESIGN IN PRACTICE

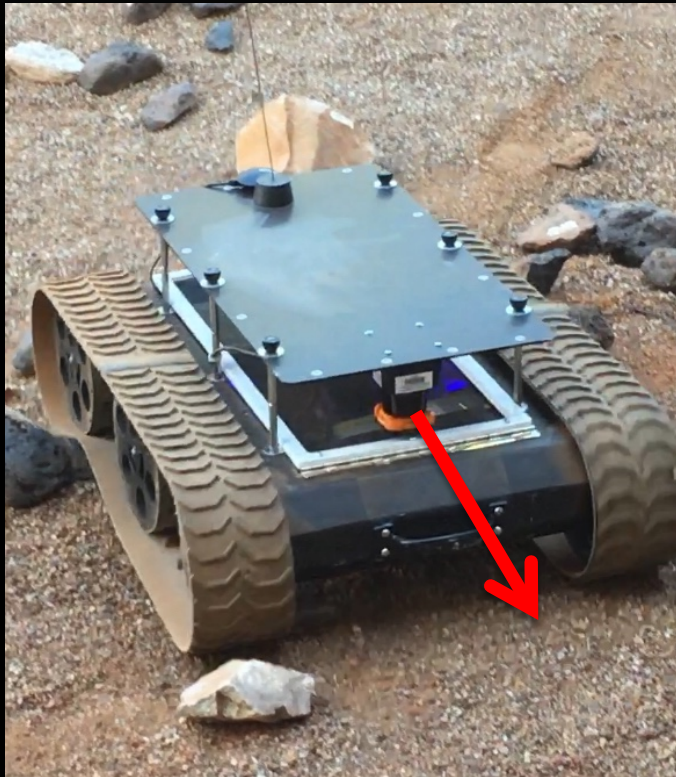
Object Avoidance



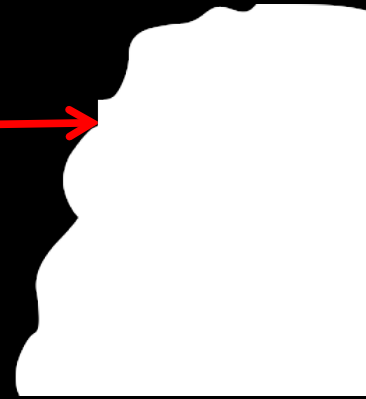
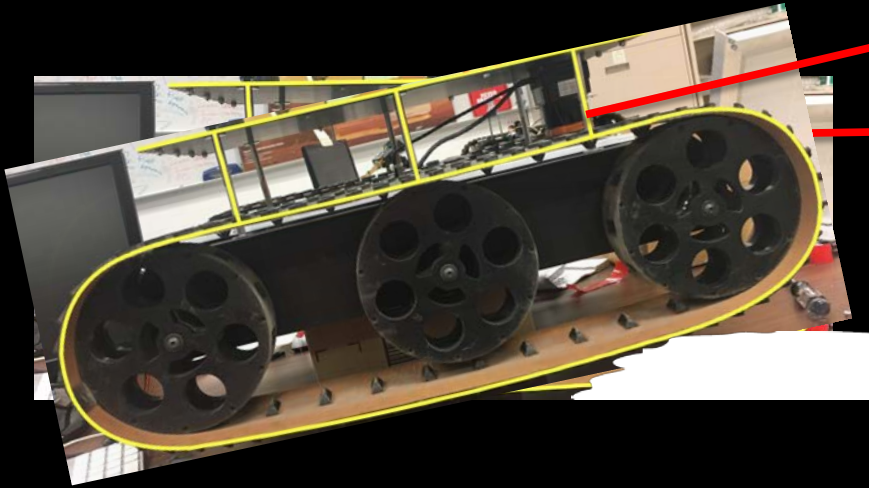
Exploration



PROBLEM: TILTING MEANS CHANGING LINE OF SIGHT!



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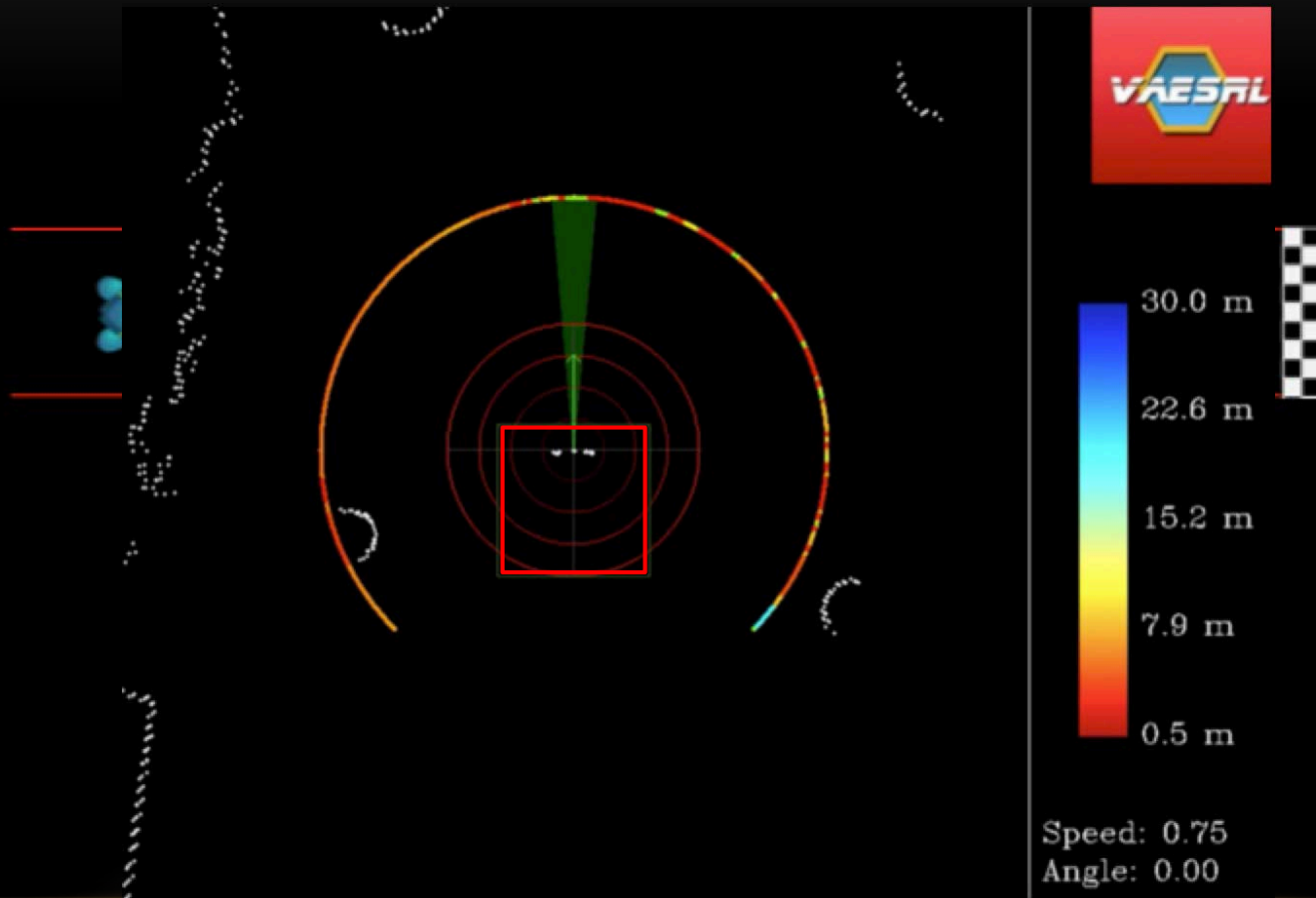


HOW CAN WE UNDERSTAND AN AGENT'S ACTIONS IN AN UNFAMILIAR ENVIRONMENT?

- Structuring the code as independent entities in a hierarchy is convenient for rapidly prototyping new behaviors.
- If the agent behaves unexpectedly, how do we know why it took the steps that it did?

Visualization!

HOW VISUALIZATIONS LOOK – A BIRD'S EYE VIEW



ROVER LIDAR VISUALIZER



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THANK YOU!

