DOCKING NODE - O V E R V I E W

Purpose

Algorithm Issues

Docking Diagram

Future Plans

Detection Algorithm

Docking procedure

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DOCKING NODE - PURPOSE

Main Goal

- Detect and publish Home Base position and orientation upon request (service - client)

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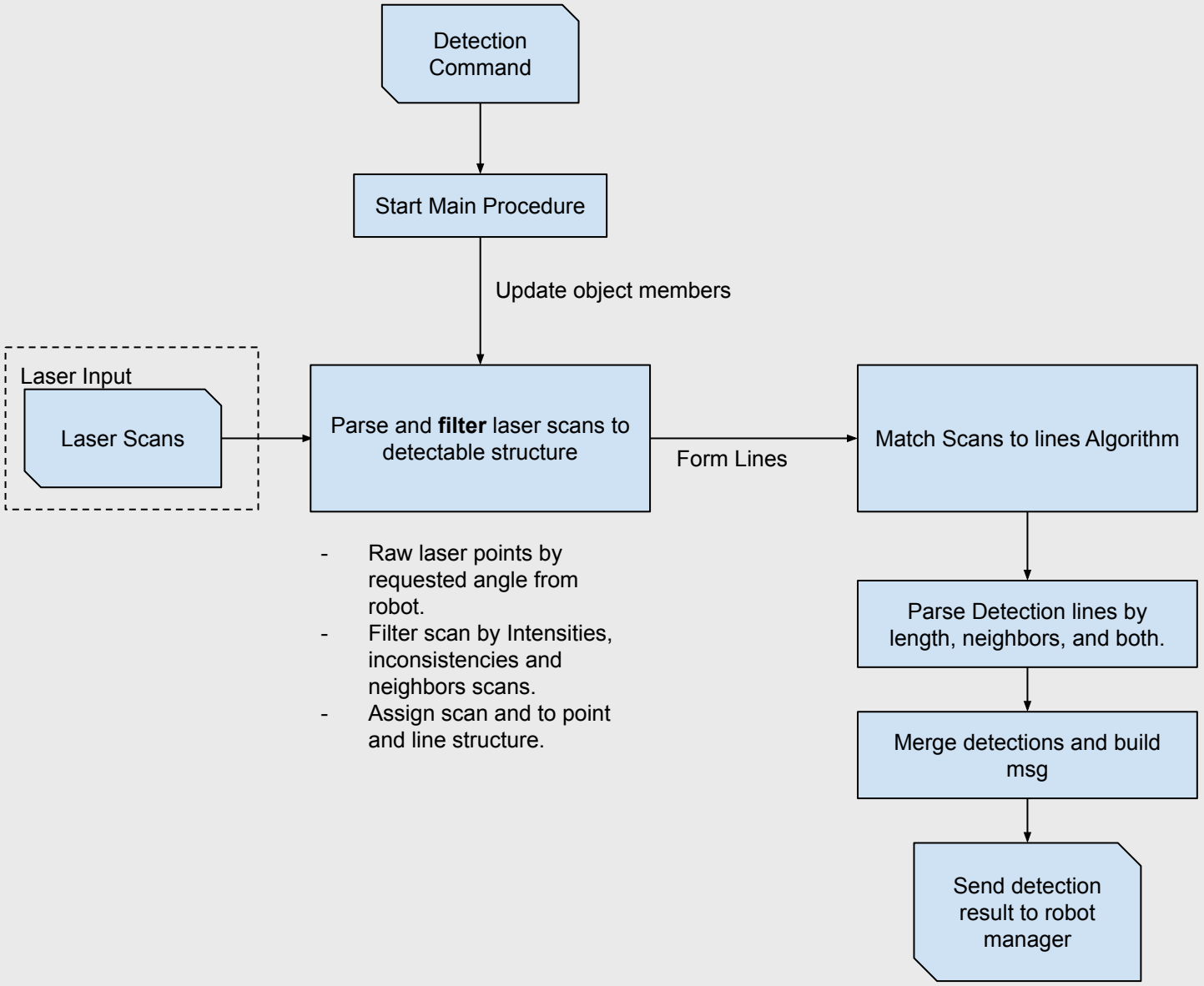
DOCKING NODE DIAGRAM



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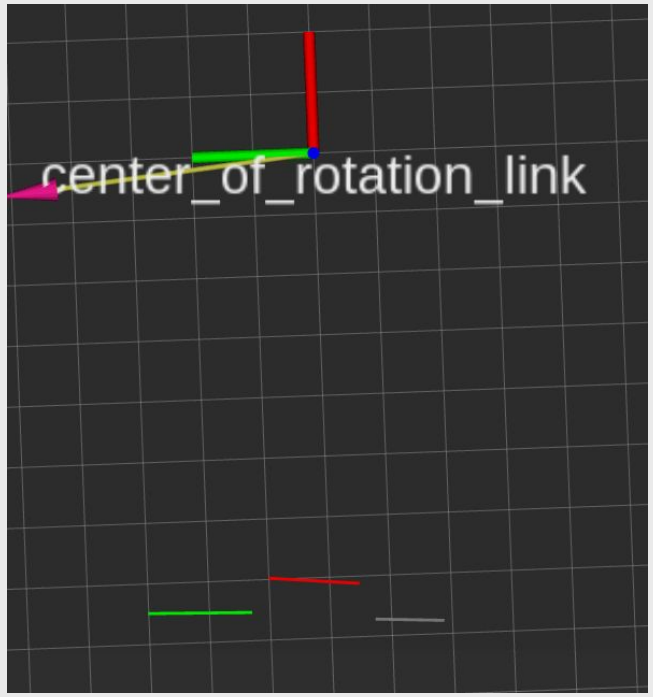
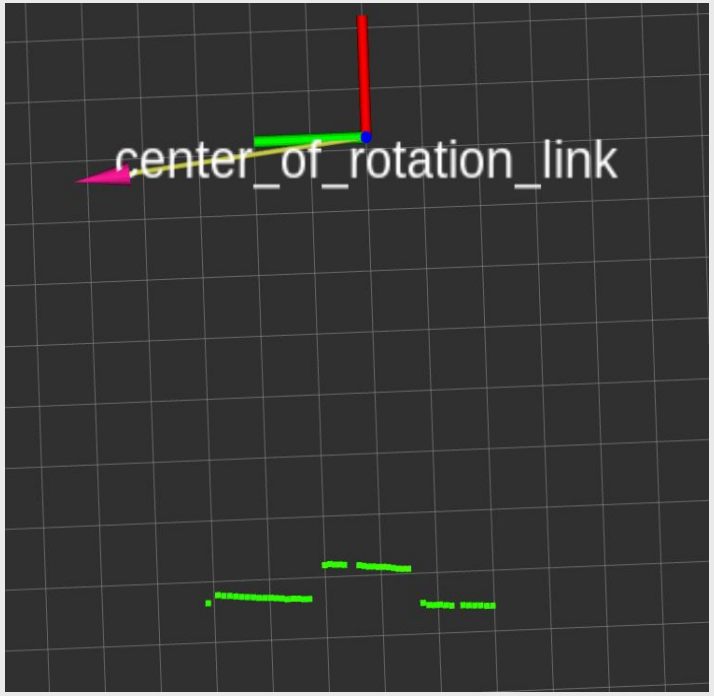
DOCKING DETECTION - ALGORITHM

- ➢ Raw laser scan → Form Lines
  - take raw laser scan according by desired angles from robot (currently 90 - 270 [degree] - robot behind)
  - filter laser pointsby :
    - basic laser properties (nan values or low and high intensities)
    - filter by inconsistent neighbors points (spikes)
    - filter points that are too far from each other
- ➢ Form lines from filtered points (main)
  - Form Lines In Reverse Bynaric Method
    - Test if segment is fit to line threshold properties
      - add segments of points to line, form new line and see if line properties are still valid
        - if yes -> add point to line
        - if not -> reduce points by half

After filtering and line forming



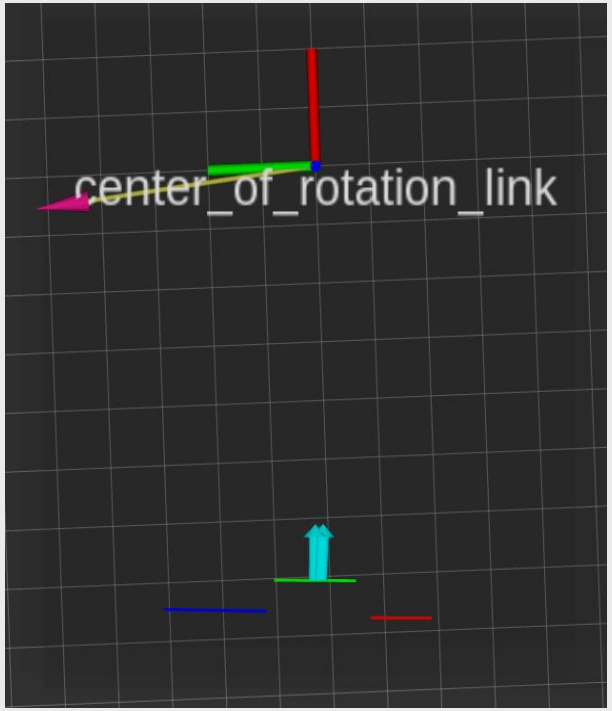
Raw laser scan



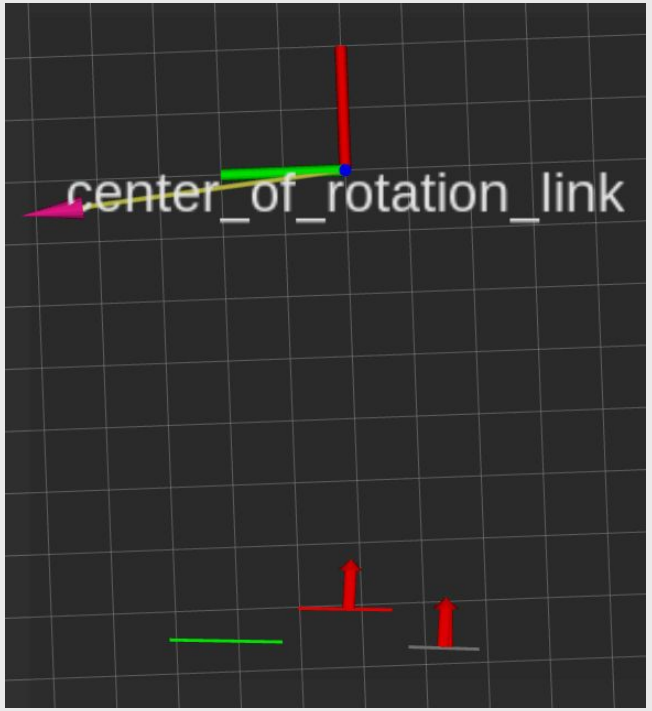
DOCKING DETECTION - ALGORITHM

- Detect Docking Lines By width
  - Detect lines by docking width thresholds
  - Assign to data structure by line proximity to robot and suspected home base pose
- Detect Docking Lines By Neighbors
  - Detecting lines by neighbors. since docking suppose to by near a wall, we suspect to perfect lines in each side
  - Assign to data structure by line proximity to robot and suspected home base pose
- Choose the best docking line (full detection line)
  - A line id that sustained both width and neighbors conditions it will get prioritize as true home base.
  - Prioritizing is made proximity to robot and suspected home base.

After filtering and line forming



Home base line by width



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DOCKING PROCEDURE VIDEO

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DETECTION ALGORITHM POTENTIAL ISSUES

- Laser scans inputs may differ from robot to robot
  - Filtering important laser scans
  - take into account unfiltered laser scans
- Line forming issues
  - Fixed Thresholds that does not always stays the same
    - SD value threshold
    - SD relative error percentage
- Detect objects similar in shape to the home base
- Currently limited to backward angles. i.e cannot scan 360 degree around the robot
- Limited to robot distance from home base - laser scan can not “see” the home base from about 1.0 meter aways
- Will work better if the home base will be position near a wall without objects near it.
- Any more? let’s hear it

Future Plans

- Detection with Depth cameras
  - integrate it with the current detection procedure
  - Will Promise detection in almost close to 100% percent certainty
- Use the docking position as landmark for SLAM
- Add Scan with rotation of the robot inorder the increase the detection odds

- Pre-Abort procedure
  - Try to detect home base again with moving the robot (translation and rotation)
  - more efforts to detect before decide to abort

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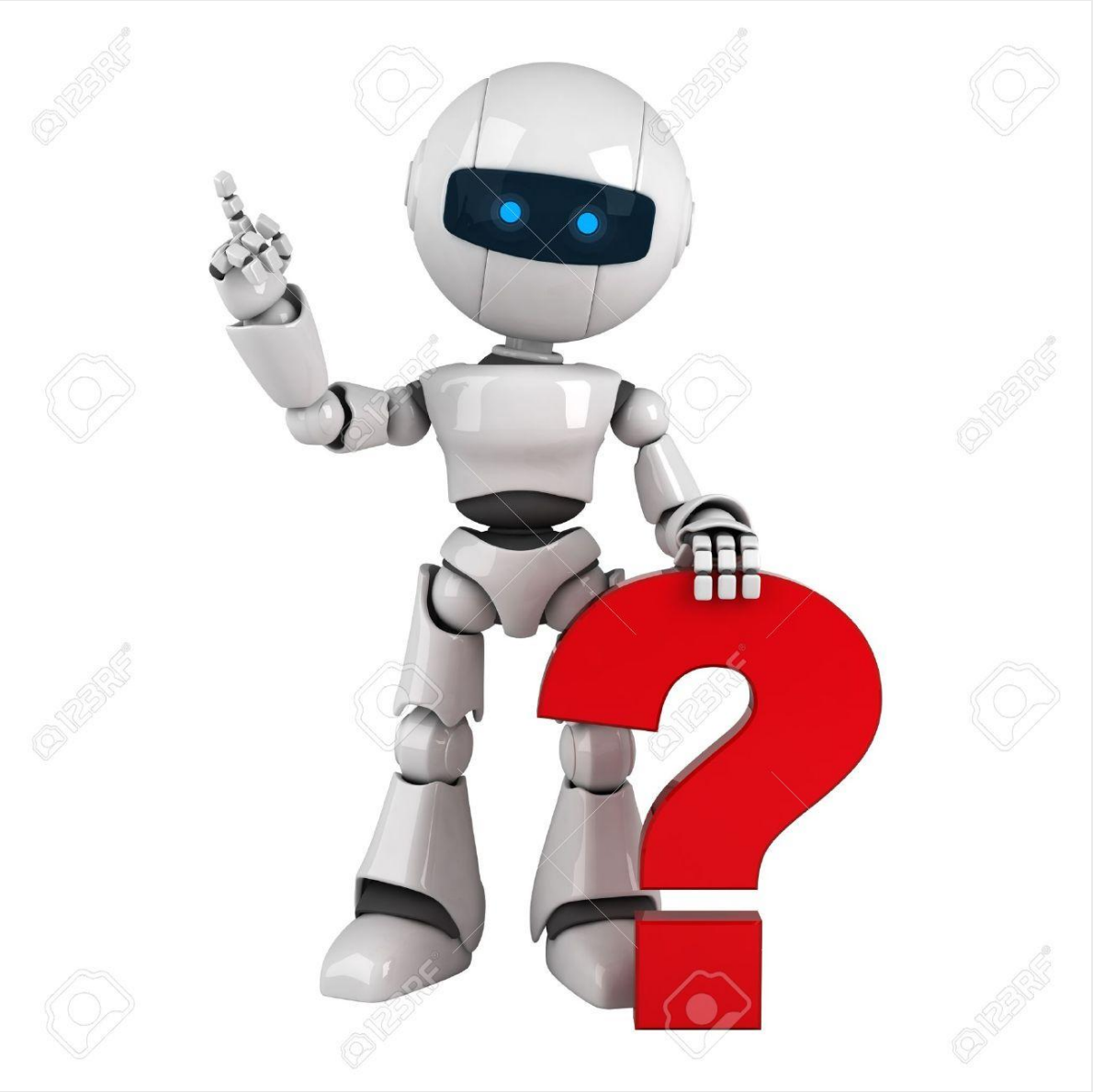
QUESTIONS



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