Detection and Classification of Obstacles Using 2D LiDAR Sensor

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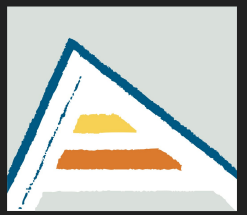

Group of Automation, Robotics and Computer Vision (AUROVA), Universidad de Alicante

- Student in the last year of the degree in robotic engineering in the University of Alicante.

- Final Degree Project: Segmentation and classification of the environment for the control and navigation of mobile robots.

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Grupo AUROVA

UA

- Bot for Localization on Unstructured Environment (BLUE)

Introduction

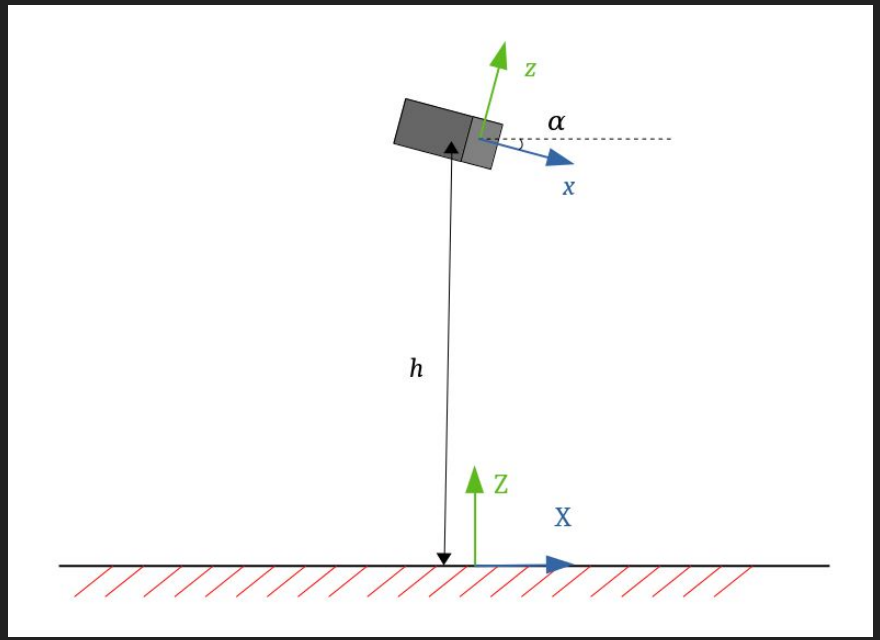
- The use of the 2D LiDAR: horizontally or down-ward looking.
- Generate a 3D map from the data of the 2D LiDAR.
- Detect lines and classify them as ground, obstacle or pothole.
- The goal is to reduce the costs of mobile robots.

Methodology

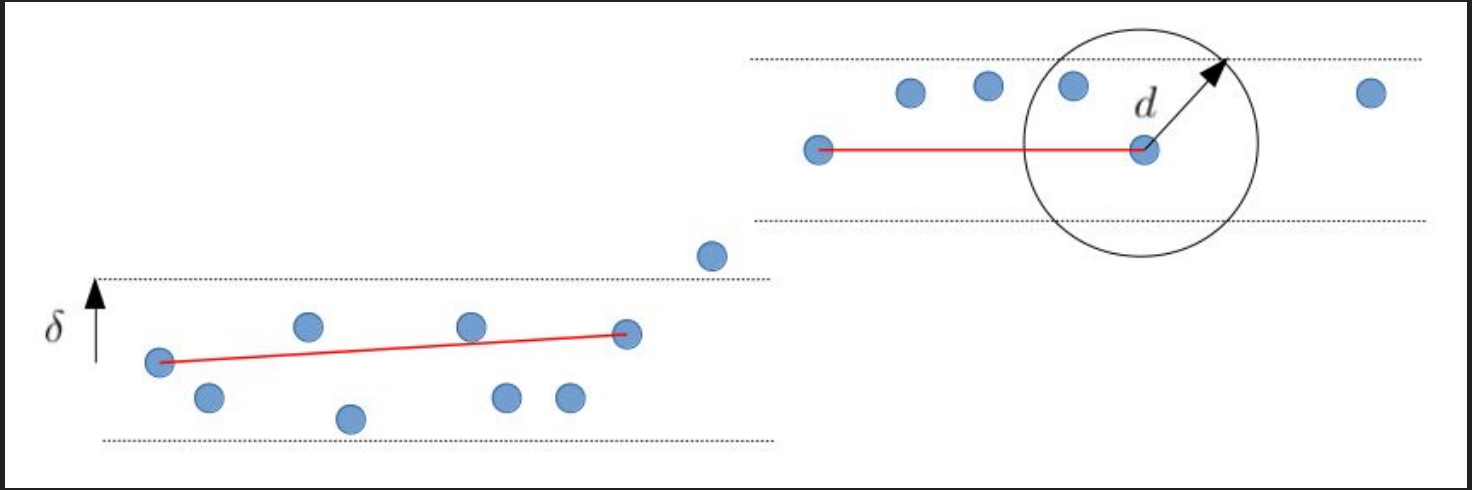
- Data acquirement
- Line detection
- Map of lines
- Line classification

Data acquirement

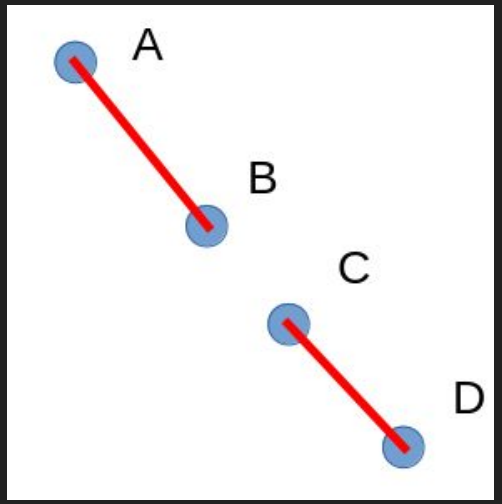
- Data → Point cloud
- Point cloud → Local system
- Local system → Global system

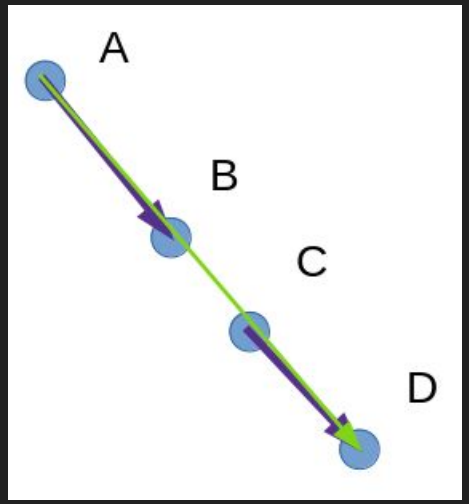


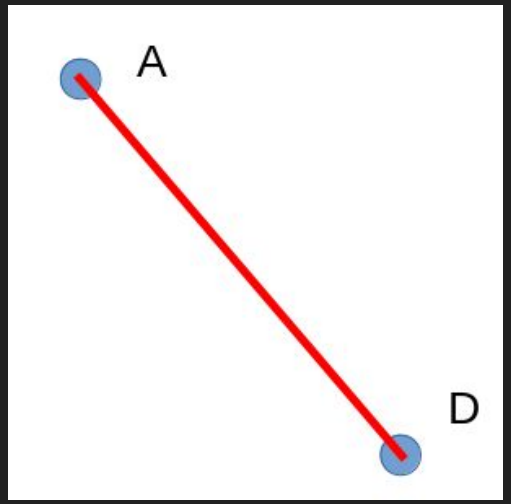
Line detection



Line detection refinement







Map of lines

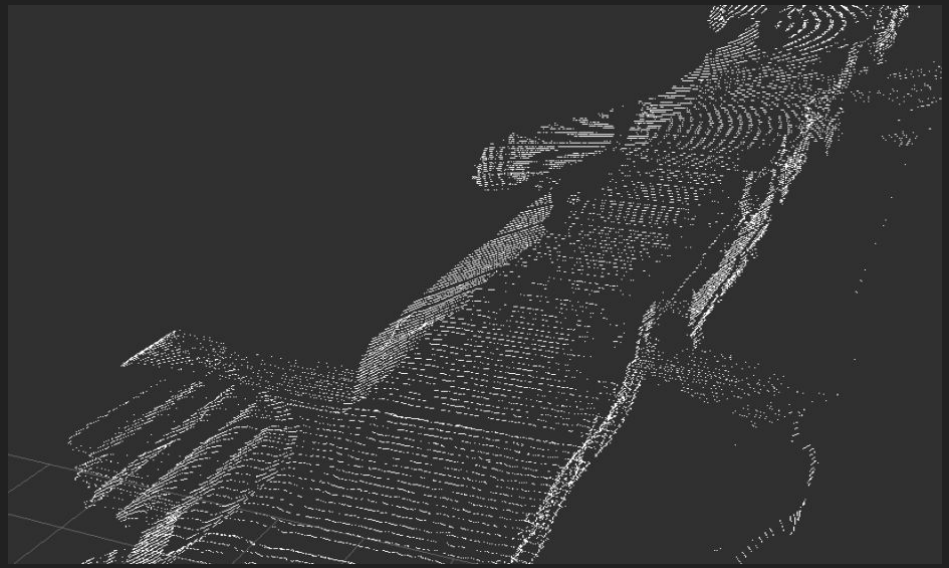
- The map of lines is divided into submaps.
- The lines are defined by two points.
- Search the submap where the first point is.
- Update the submap, searching the nearest line to the new one.
- Check if the line is in another submap.

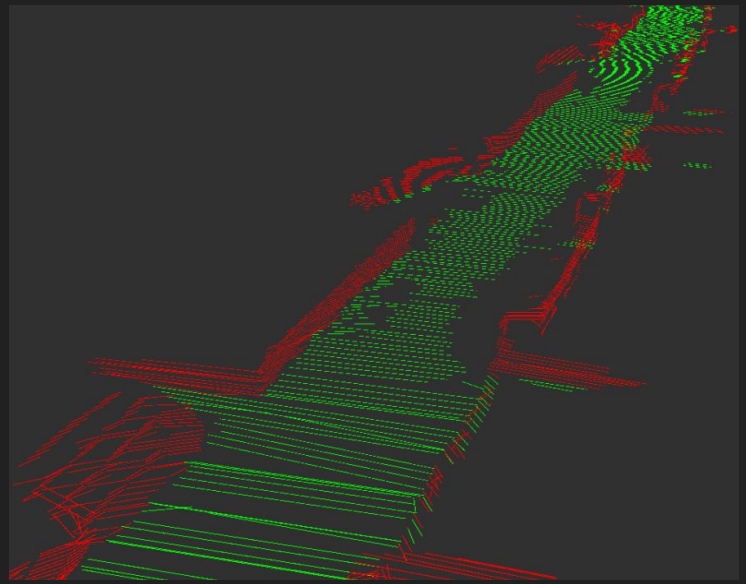
Line classification

- The line are classified according to their mean height.

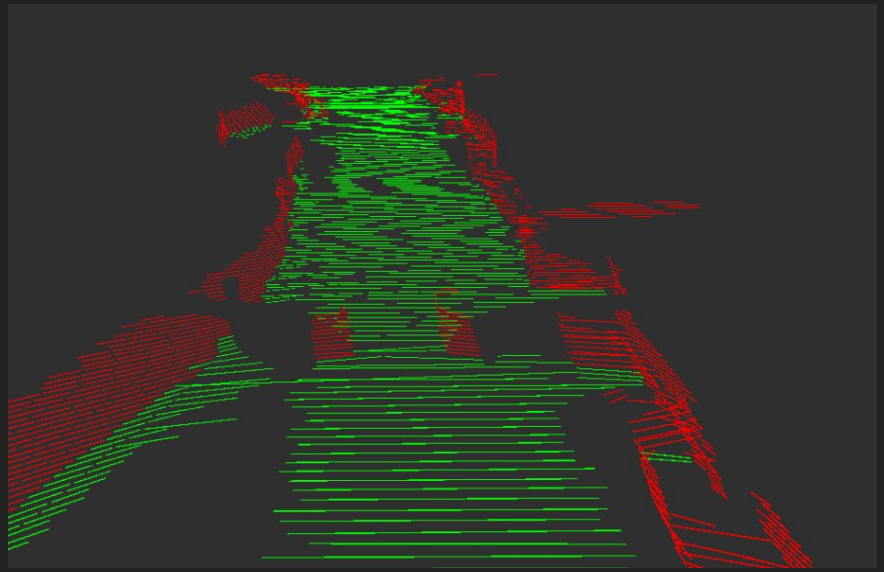
- Three classes:
  - Ground
  - Obstacle
  - Pothole

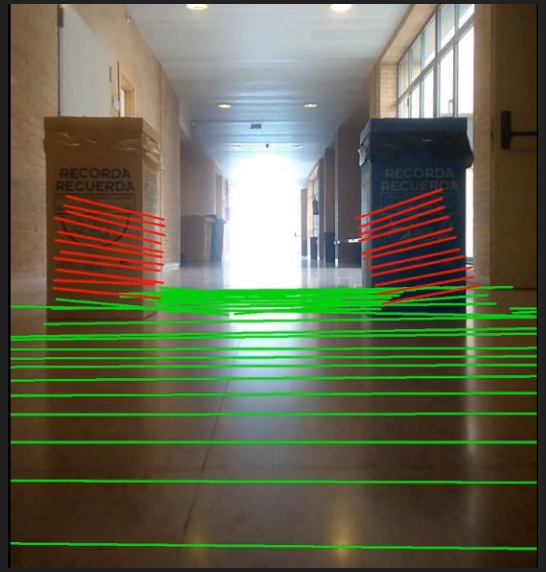
Experiments





Experiments





Results

		Predicted class		
		Ground	Obstacle	Pothole
True class	Ground	3633	0	90
	Obstacle	0	29415	0
	Pothole	0	0	107

Conclusion

- Correct classification in structural environments.

- Dynamic objects problem.

Thank you