Detection and Classification of Obstacles Using 2D LiDAR Sensor

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

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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 $\rightarrow$ Point cloud
- Point cloud $\rightarrow$ Local system
- Local system $\rightarrow$ 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

<table>
<thead>
<tr>
<th>True class</th>
<th>Predicted class</th>
<th>Ground</th>
<th>Obstacle</th>
<th>Pothole</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground</td>
<td>3633</td>
<td>0</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Obstacle</td>
<td>0</td>
<td>29415</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Pothole</td>
<td>0</td>
<td>0</td>
<td>107</td>
<td></td>
</tr>
</tbody>
</table>
Conclusion

- Correct classification in structural environments.
- Dynamic objects problem.
Thank you