

Assignment 5: Probabilistic Occupancy Grid Generation from Lidar Data

Feb. 20th, 2019

Objectives

- To understand how to use lidar data to generate occupancy probabilities
- Apply logodds updates based on given Bresenham raytracing outputs
- Convert a logodds grid to a probabilistic occupancy grid

You are provided with lidar measurement data (Measurements.txt), as well as a Python 3 Jupyter Notebook which contains the required supplementary code (thanks to Paul Balzer). Your task is to complete each TODO section of the notebook in order to generate a probabilistic occupancy grid, as well as answer the given written questions.

Resources and Instructions

There are 3 TODO sections to complete in the given Jupyter notebook:

1. Write code to convert lidar data in spherical coordinates to Cartesian coordinates in the function `ibeo2XYZ()`.
2. Perform the logodds update for the `'grid'` global variable in `insertPointcloudBRESENHAM()`. Make sure to complete both TODOs in this section.
3. Convert the logodds grid to a probabilistic occupancy grid.

In addition, there are two written questions you must answer:

1. What are the computational advantages of using logodds when generating our occupancy grid?
2. Is the angle ϕ in our Spherical to Cartesian calculation the same as the polar angle in standard Spherical coordinates? Why?

Deliverables

HTML output: In the Jupyter Notebook, go to File > Download as > HTML (.html).
In addition, include a PDF file of your answers to the two written questions.
Submit a ZIP file containing the HTML output and the PDF file.

Run all code blocks before downloading the HTML.

Please follow the naming convention for your zip file: `a5_<user_id>.zip` .

Due Date

11:59 PM, Monday Mar. 4th, 2019.

No late submissions will be accepted. There will be no extensions.

Marking Scheme

Assignments are marked on a 0-5 point scale.

2 points will be given for answering the written questions. The remaining 3 points will be given for completing each TODO section correctly, 1 point each.

Policies

Collaboration

You can discuss the problem with peers, but you must design and implement your own solution independently.

Use of online resources

You may consult online resources for inspiration, but you must develop your own code.