

Project proposal

Title: Deep learning approach to 3D Lidar Odometry
Supervisor: George ADAIMI (VITA)
Timeframe: Spring 2021

EPFL Xplore is an interdisciplinary project whose aim is to design and develop a Rover to participate in two international competitions: the University Rover Challenge and the European Rover Challenge.

Project description

Problematic

Knowing the accurate position (not using GPS) of the rover is one of the most important and challenging aspect of Xplore Navigation Subsystem. This step is crucial for our path planner , the mapping of the environment and our motor controller. So far we use a IMU and encoder, but those solutions cannot detect slip and output wrong positions estimations.

The Goal of this project is to use only the 3d point cloud generated from our 3d Lidar (Ouster OS1 64) to estimate the rover position. The current state of the art method is called LOAM (see ref.) but it is hard to compute and to calibrate. Recently Deep Learning approaches (CNN taking as input 2 consecutive scans , LSTM on the all sequence , etc ...) have showed promising results, but often lacked of an appropriate dataset.

In this project you will design a supervised learning model to estimate the position of the rover given a sequence of 3d LiDAR scans.

The most challenging part of this project is going to choose the appropriate data structure to input the 3D point clouds into the model (raw data , depth image , voxelise matrix , graphs , etc ...)

We will provide you with a new dataset containing the 3D Lidar scans and their appropriate positions.

Requirements

Interest in Machine Learning and/or the Odometry challenge

Reference documents

- [1] LOAM : <https://www.youtube.com/watch?v=8ezyhTAEyHs> ,
<https://www.researchgate.net/publication/282704722> LOAM Li-
dar Odometry and Mapping in Real-time
- [2] LodoNet : <https://arxiv.org/abs/2009.00164>

Contact

george.adaimi@epfl.ch
arman.ehsasi@epfl.ch