Globetrotter – Automatic Extraction of Interesting Road Networks Around the World via Machine Learning Techniques

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Background

CommonRoad [1] is a collection of composable benchmarks for motion planning on roads, and provides researchers with a means of evaluating and comparing their motion planners. The scenarios within CommonRoad are either generated from real-world data set or hand-crafted. An exemplary scenario created from the data recorded in the city center of Munich (Stachus) is shown below:
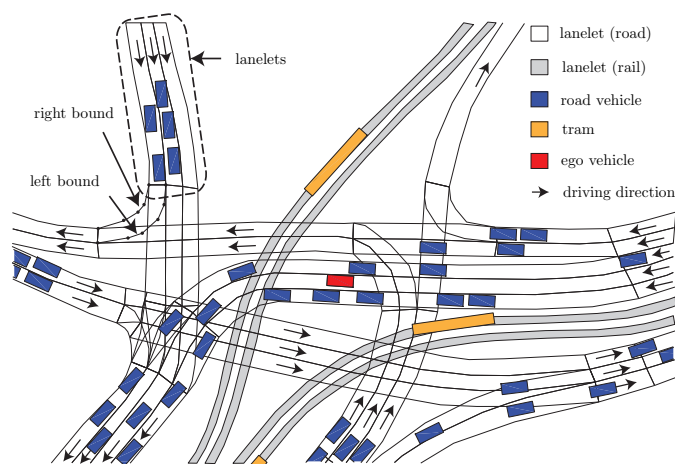
Visualization of an exemplary scenario from Stachus using CommonRoad.

Description

The aim of this thesis is to elevate the impact and influence of CommonRoad by automatically extracting interesting road networks around the world, possibly via Machine Learning techniques. This is expected to be done by developing a useful tool, named **Globetrotter**. A raw idea of its working mechanism is as follows:

1. Pick a random place from anywhere on the world within **OpenStreetMap** (coordinates of oceans should be immediately rejected)
2. Find the closest road from the random point
3. Drive along that road until an interesting situation arises, e.g., intersections, change from few lanes to many lanes, etc.
4. Decide on the size of the area around that spot
5. Generate map using the existing **OpenStreetMap to Lanelet** converter
6. Extract country, place, etc. to automatically label the map

To make this topic even more interesting, the following extensions could also be considered:

- Use Machine Learning techniques to find interesting spots
- Rate the significance of the spot by users
- Extract road networks at hot spots for accidents, see [2, 3, 4]

Other ideas are also welcomed.

Tasks

- Familiarize with CommonRoad toolkit (CommonRoad-io, OpenStreetMap2Lanelet converter, etc.)
- Familiarize with JOSM (an extensible editor for OpenStreetMap)
- Develop **Globetrotter** with the functionality as described above
- Generate a bunch of road networks using the developed **Globetrotter**

References

[1] Commonroad. https://commonroad.in.tum.de/.

[2] Unfallatlas. https://unfallatlas.statistikportal.de.

[3] Traffic crash report. https://www.opendatanetwork.com/dataset/data.cincinnati-oh. gov/rvmt-pkmq.

[4] Current traffic accidents. https://www.opendatanetwork.com/dataset/data. fortworthtexas.gov/eax3-qev8.

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