Handling Bi-directional Lanelets #3421

Unanswered **ahmeddesokyebrahim** asked this question in **Q&A**

ahmeddesokyebrahim on Apr 12, 2023 Collaborator edited

We - as LeoDrive Planning & Control team - are currently working on situations where in some places vehicle can drive in both directions in same lane.

The information we started from is Lanelet2 repository that is speaking about the direction. It shows that there is a tag named `one_way` that can be used for bi-directional lanelet.

When I set the tag to be `no`, it is not making any difference in reading the lanelets properties, for example left and right boundaries. So, if you depend on calculating the lanelet angle for example, it will still provide the angle in normal driving direction.

This looked to be the behavior in AW since long time, as this information tells in Autoware.Auto :

> bi-directional lanes: In the original Lanelet2 format, lanes can be defined as bi-directional lanes with the tag one_way=no. Instead, Autoware expects bidirectional lanes to be defined by two overlapping lanes with opposite directions

So, mainly having overlapping lane is to inverse the right and left boundaries comparing to the original normal driving lane.

I tried to find a solution without adding an overlapping lane in the map, by using the Lanelet class `invert()` method.

> Inverting
> A lanelet implicitly stands for a certain driving direction. To get the opposite direction, Lanelets can be inverted in O(0). An inverted Lanelet shares its data with all normal lanelets, it just returns its bounds with left and right flipped.

I tried to invert the required lanelet when reading it in `mission_planner` before getting the route from `start_lanelet` and `goal_lanelet` and finding the shortest path. But this ended up with a lot of other errors propagated in other places in the code where AW reads a lot the lanelet with its normal properties (not-inverted)

It is worth mentioning as well that there is LaneletType defined in Lanelet2 library. But this type is never used, neither in Lanelet2 library nor in AW.

Knowing that overlapping lanes is a working solution but with some drawbacks, as LeoDrive engineers tried it in a previous project with the following conclusion :

Category

🙏 Q&A

Labels

component:planning

3 participants

> I remember it having problems with path planning since it's two lanes overlapping and was not able to figure out which lane it was on or which lane it should go to when given a destination.

Are there any efficient ways of handling bi-directional ways rather than adding overlapping lane ?

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mehmetdogru on Apr 13, 2023 Maintainer

@ahmeddesokyebrahim Actually I don't remember us having problem about orientation or routing regarding this topic. IMO drawbacks of handling bi-directional lanelets by annotating as overlapping lanes are:

- We don't regard if any vehicle will be coming towards us since we are in different lanelets
- Harder to annotate
- More complex HD-Map

↑ 1 0 replies

TakaHoribe on Apr 13, 2023 Maintainer

@ahmeddesokyebrahim Still, Autoware only supports the one-directional lane, but I also hope Autoware will support bi-directional lanes.

About the overlapping approach,

> I remember it having problems with path planning since it's two lanes overlapping and was not able to figure out which lane it was on or which lane it should go to when given a destination.

Some problems with overlapping lanes have recently been resolved (this is not about overlapping like bi-directional, but about crossing paths though). autowarefoundation/autoware.universe#2451

However, still have problems with route planning in mission_planner. Please let us know more details If there are issues in path planning for an overlapped lane.

↑ 1 0 replies