Autonomy Software WG Meeting 2022/09/06 #2829

BonoloAWF started this conversation in **Working group meetings**

BonoloAWF on Aug 30, 2022 edited

Administrative

- Previous Meeting Minutes

Common Resources

- Bus ODD software architecture proposal
- Bus ODD architecture design discussions
- Bus ODD candidate simulator comparisons
- Bus ODD milestone development plan
- Bus ODD Project Board
- Autoware contributors list

Announcements

None

Autoware.Universe

- [x] Bus ODD July-Aug Milestone - overdue
- [x] Bus ODD Sep-Oct Milestone
- [ ] Bus ODD high priority issues not in the current milestone
- [ ] PRs waiting for review
- [ ] Autoware.Universe reported bugs
- [x] Autoware design discussions and demos

Discussion topics

Prediction module for autonomous racing

- **@phkarle** (TUM) will present a prediction algorithm, which was developed for autonomous racing. The paper is already published: https://arxiv.org/abs/2208.01862.

Summary (see paper and slides in the comments for details):

Category

Working group meetings

Labels

meeting:software-wg

3 participants

- Deep learning approach for prediction called MixNet for a real world use case (no public data available), driving up to 27km/h speeds, and non-cooperative driving style
- The prediction module runs real-time with a 5s prediction horizon
- Object history and track map is model input
- Model goal is to find the weight parameters of base curves, select the most plausible base curve, and apply the interaction module to produce the final output
- Model is an encoder-decoder based on LSTM for temporal smoothing
- Weights should sum to one to ensure predictions stay inside the track (quality guarantees with good accuracy)
- Prediction is compared to extrapolation of the kinematic data which provided a robust plausibility check
- Hardware in the loop simulation was used for testing and data gathering (real-world data is difficult to acquire safely and in large volumes)
- Prediction performance is worse at low speeds (due to unbalanced datasets)
- Low sensitivity to increase in number of vehicles on the track
- TUM message format was used and there are plans to integrate into the AWF interface in future

Ambroise - what is the added value of having an optimisation of the lane for regular driving? Phillip - for highway driving it could be used to model transient behaviour between the lanes.
Fatih - how can the model be tuned for different vehicles? Phillip - the prediction is using the tracked positions so it is not sensitive to the type of vehicle used.
David - could this be scaled down to a smaller vehicle or would you need a 3D lidar? Philip - No, the input is tracking so it doesn't matter how the other vehicles are tracked or which sensors are used. The last 3s of the tracked position of the tracked object (x,y) is used. We use radar and lidar for these results.
Fatih - what are your plans for integrating to Autoware? Phillip - we are working on road traffic application (robo-taxi) which is based on AWF software, racing software will be integrated to be compatible with AWF stack from next year

Bus ODD progress updates:

ITRI bus integration update (In meetings with 7am UTC time slot)

-

LeoDrive bus integration update

- See slides in the comments for details
- Delays are experienced when using the camera pipeline - only partially solved by creating different camera containers
- Turning radius is too short on curves autoware.universe#1759 turning radius issue was submitted

- Checking only 4 corners in the drivable area autoware.universe#1716 checking corners of drivable area issue submitted
- User interface GUI allows driver to enter goal/check points, press the engage button to start the mission, observe the current state of Autoware, visualise lanelet and pointcloud data (including vehicle velocity, steering wheels etc.)

Action Items

None

Review of Issues and Discussions

The following Discussions and Issues were highlighted:

- Collect training/test data for object detection for Bus ODD autoware.universe#564 - data is gathered, needs to be uploaded to S3
- Non-successive way points generated by A-star algorithm in freespace planner autoware.universe#1151 - ongoing
- The `detection_area` module does not visualize debug markers when some obstacles are not detected by it autoware.universe#1121 - tests showed that debug markers are working (should be tested for cases where there is no obstacle)
- A bug in scenario_simulator in the presence of multiple parking lots autoware.universe#861 - removed from milestone
- Map Based Prediction Incorrect Predictions autoware.universe#494 - possible solution outlined
- Checking only 4 corners in the drivable area autoware.universe#1716 - ongoing
- Run Lidar Centerpoint with TVM autoware.universe#908 - Xinyu will contact contributor directly. Meeting minutes will be posted by Ryohsuke
- Autoware keeps following old local path after `behavior_velocity_planner` is dead autoware.universe#1253 - code is being modified to allow stopping a running node
- Sometimes the sensing module doesn't publish concatenated pointcloud autoware.universe#1009 - Fatih will create a new issue for temporary fix
- Finalize the field type for pointcloud autoware.universe#563 - documentation has been updated in PR
- Ground segmentation fails for points behind the low objects autoware.universe#669 - ongoing
- behavior_path_planner generated path outside of drivable area autoware.universe#1761 - angle of pose not footprint is being checked
- Turning radius is too short on curves autoware.universe#1759 - case where there is no physical solution
- Implement sensor drivers for ROS 2 autoware.universe#551 - radar will not be included for demo

- Performance Analysis Report with CARET #2822 - performance analysis results
- CARLA Simulator + Autoware Universe Tutorials #2828 - steps for running Carla with Autoware.Universe

↑ 1

2 comments

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MertClk on Sep 6, 2022 Collaborator

Leo Drive Bus ODD Update: Presentation

↑ 1 0 replies

phkarle on Sep 6, 2022 Collaborator

Today's presentation of our prediction algorithm: Slides
Contact: phillip.karle@tum.de

↑ 1 0 replies