PIX MOVEIT HACKATHON

# Autoware Share

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# Autoware workflow

AutoWare

Install

Lidar

Velodyne 32C
Driver
Calibration

Map

Record
Create PCB
Create waypoints

Simulation

Obstable
detection

Test follow points
Test obstacle detection

# Install

- ndt_matching error with GPU cuda
    - Install Autoware develop branch
    - Remove folder: /ros/src/sensing/fusion/packages/autoware_camera_lidar_calibrator
    - https://github.com/CPFL/Autoware/tree/develop

# Lidar

- Connect Velodyne 32C Lidar
  - Install ros-velodyne driver:

    sudo apt-get install ros-VERSION-velodyne
  - Connect velodyne 32C and disconnect wifi

    Velodyne 32C IP
    - Robot Caffe: 192.168.1.201
    - CIVIC: 192.168.0.201
- Computer IP set with in Lidar net, eg(robot caffe 192.168.1.100)
- View Lidar data

```
roslaunch velodyne_pointcloud 32c_points.launch
rosrun rviz rviz -f velodyne
```

http://wiki.ros.org/velodyne/Tutorials/Getting%20Started%20with%20the%20HDL-32E

- Driver and Calibration file
- Modify distance to resolution only for Velodyne 32C

# Lidar

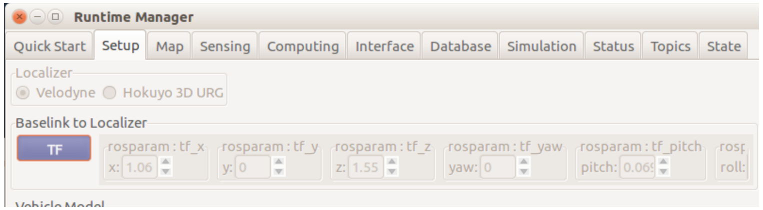
- Driver and Calibration file
  - Launch Autoware/ros/src/sensing/drivers/lidar/packages/velodyne/velodyne_pointcloud/launch/32c_points.launch
  - yaml Autoware/ros/src/sensing/drivers/lidar/packages/velodyne/velodyne_pointcloud/params/VLP-32C.yaml
  - Cc Autoware/ros/src/sensing/drivers/lidar/packages/velodyne/velodyne_driver/src/driver/driver.cc
- Modify distance to resolution only for Velodyne 32C
  - Autoware/ros/src/sensing/drivers/lidar/packages/velodyne/velodyne_pointcloud/src/lib/rawdata.cc
  - float distance = tmp.uint * DISTANCE_RESOLUTION;
  - float distance = tmp.uint * 0.004;

# Map

- Record rosbag
  - roslaunch velodyne_pointcloud 32c_points.launch
  - rosrun rviz rviz -f velodyne
  - rosbag record -a
  - Make sure enough free disk space, about 5G for 1 rosbag
- Create PCB
  - Downsample rosbag
  - Change message name to /points_raw
  - ndt_localizer / ndt_mapping
  - After run whole simulation rosbag
  - Output pcb
- Create waypoints
  - waypoint_maker \ waypoint_saver
  - Save waypoints

# Simulation

- Setup, sensing
- Map load pcb file
- Computing
- Rviz



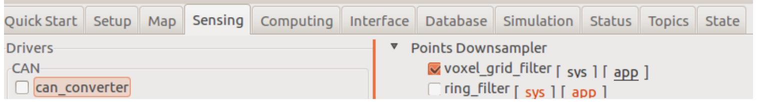
Localizer

● Velodyne ○ Hokuyo 3D URG

Baselink to Localizer

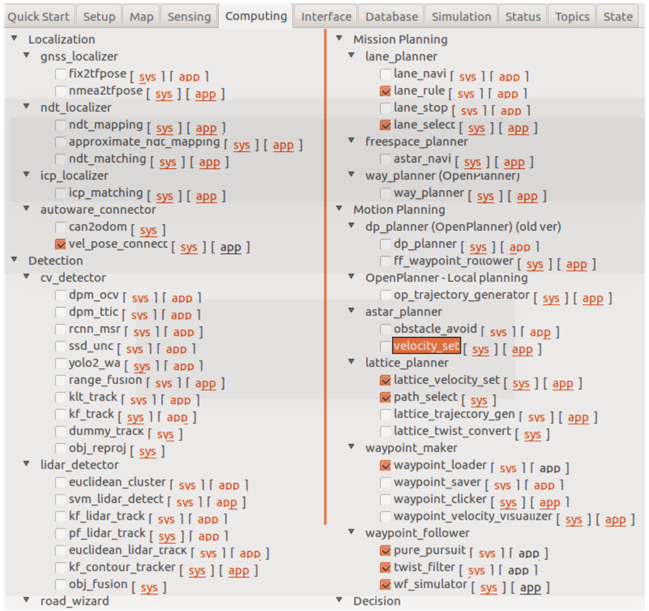
rosparam : tf_x x: 1.06
rosparam : tf_y y: 0
rosparam : tf_z z: 1.55
rosparam : tf_yaw yaw: 0
rosparam : tf_pitch pitch: 0.069
rosp roll:

Vehicle Model



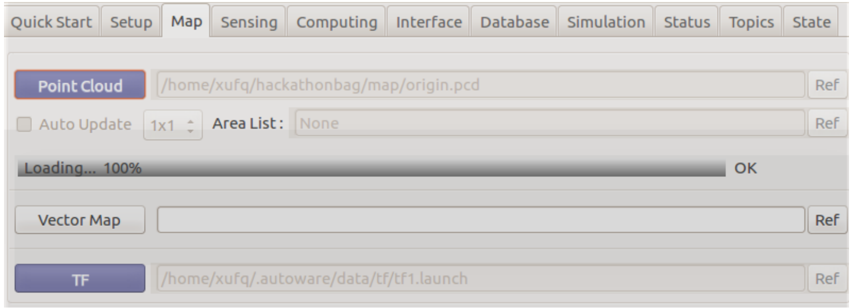
Drivers
CAN
□ can_converter

▼ Points Downsampler
☑ voxel_grid_filter [ sys ] [ app ]
□ ring_filter [ sys ] [ app ]



```
▼ Localization
  ▼ gnss_localizer
      □ fix2tfpose [ sys ] [ app ]
      □ nmea2tfpose [ sys ] [ app ]
  ▼ ndt_localizer
      □ ndt_mapping [ sys ] [ app ]
      □ approximate_ndt_mapping [ sys ] [ app ]
      □ ndt_matching [ sys ] [ app ]
  ▼ icp_localizer
      □ icp_matching [ sys ] [ app ]
  ▼ autoware_connector
      □ can2odom [ sys ]
      ☑ vel_pose_connect [ sys ] [ app ]
▼ Detection
  ▼ cv_detector
      □ dpm_ocv [ sys ] [ app ]
      □ dpm_ttic [ sys ] [ app ]
      □ rcnn_msr [ sys ] [ app ]
      □ ssd_unc [ sys ] [ app ]
      □ yolo2_wa [ sys ] [ app ]
      □ range_fusion [ sys ] [ app ]
      □ klt_track [ sys ] [ app ]
      □ kf_track [ sys ] [ app ]
      □ dummy_track [ sys ]
      □ obj_reproj [ sys ]
  ▼ lidar_detector
      □ euclidean_cluster [ sys ] [ app ]
      □ svm_lidar_detect [ sys ] [ app ]
      □ kf_lidar_track [ sys ] [ app ]
      □ pf_lidar_track [ sys ] [ app ]
      □ euclidean_lidar_track [ sys ] [ app ]
      □ kf_contour_tracker [ sys ] [ app ]
      □ obj_fusion [ sys ]
  ▼ road_wizard
```

```
▼ Mission Planning
  ▼ lane_planner
      □ lane_navi [ sys ] [ app ]
      ☑ lane_rule [ sys ] [ app ]
      □ lane_stop [ sys ] [ app ]
      ☑ lane_select [ sys ] [ app ]
  ▼ freespace_planner
      □ astar_navi [ sys ] [ app ]
  ▼ way_planner (OpenPlanner)
      □ way_planner [ sys ] [ app ]
▼ Motion Planning
  ▼ dp_planner (OpenPlanner) (old ver)
      □ dp_planner [ sys ] [ app ]
      □ ff_waypoint_follower [ sys ] [ app ]
  ▼ OpenPlanner - Local planning
      □ op_trajectory_generator [ sys ] [ app ]
  ▼ astar_planner
      □ obstacle_avoid [ sys ] [ app ]
      □ velocity_set [ sys ] [ app ]
  ▼ lattice_planner
      ☑ lattice_velocity_set [ sys ] [ app ]
      ☑ path_select [ sys ]
      □ lattice_trajectory_gen [ sys ] [ app ]
      □ lattice_twist_convert [ sys ]
  ▼ waypoint_maker
      ☑ waypoint_loader [ sys ] [ app ]
      □ waypoint_saver [ sys ] [ app ]
      □ waypoint_clicker [ sys ] [ app ]
      □ waypoint_velocity_visualizer [ sys ] [ app ]
  ▼ waypoint_follower
      ☑ pure_pursuit [ sys ] [ app ]
      ☑ twist_filter [ sys ] [ app ]
      ☑ wf_simulator [ sys ] [ app ]
▼ Decision
```

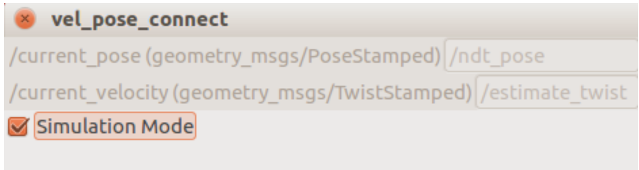


Point Cloud: /home/xufq/hackathonbag/map/origin.pcd

□ Auto Update 1x1 Area List : None

Loading... 100% OK

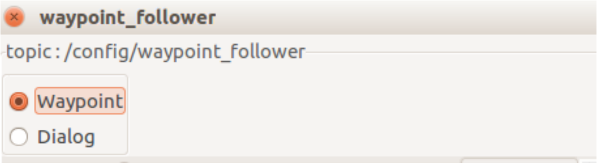
TF: /home/xufq/.autoware/data/tf/tf1.launch



/current_pose (geometry_msgs/PoseStamped) /ndt_pose

/current_velocity (geometry_msgs/TwistStamped) /estimate_twist

☑ Simulation Mode



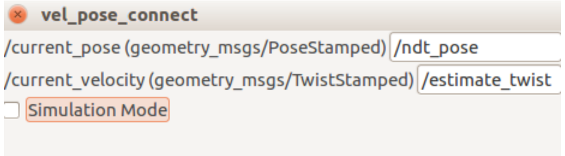
topic : /config/waypoint_follower

● Waypoint

○ Dialog

# Obstacle Detection

- Test follow waypoints

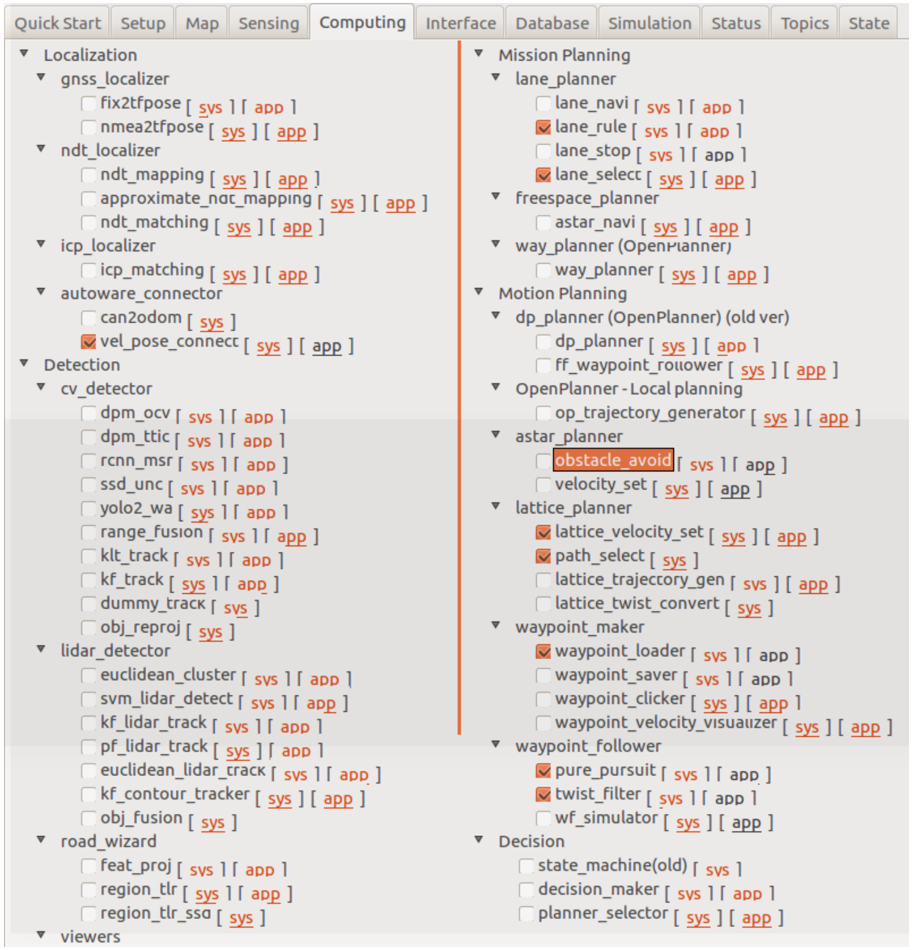


vel_pose_connect

/current_pose (geometry_msgs/PoseStamped) /ndt_pose

/current_velocity (geometry_msgs/TwistStamped) /estimate_twist

□ Simulation Mode



- Localization
  - gnss_localizer
    - □ fix2tfpose [ sys ] [ app ]
    - □ nmea2tfpose [ sys ] [ app ]
  - ndt_localizer
    - □ ndt_mapping [ sys ] [ app ]
    - □ approximate_ndt_mapping [ sys ] [ app ]
    - □ ndt_matching [ sys ] [ app ]
  - icp_localizer
    - □ icp_matching [ sys ] [ app ]
  - autoware_connector
    - □ can2odom [ sys ]
    - ☑ vel_pose_connect [ sys ] [ app ]
- Detection
  - cv_detector
    - □ dpm_ocv [ sys ] [ app ]
    - □ dpm_ttic [ sys ] [ app ]
    - □ rcnn_msr [ sys ] [ app ]
    - □ ssd_unc [ sys ] [ app ]
    - □ yolo2_wa [ sys ] [ app ]
    - □ range_fusion [ sys ] [ app ]
    - □ klt_track [ sys ] [ app ]
    - □ kf_track [ sys ] [ app ]
    - □ dummy_track [ sys ]
    - □ obj_reproj [ sys ]
  - lidar_detector
    - □ euclidean_cluster [ sys ] [ app ]
    - □ svm_lidar_detect [ sys ] [ app ]
    - □ kf_lidar_track [ sys ] [ app ]
    - □ pf_lidar_track [ sys ] [ app ]
    - □ euclidean_lidar_track [ sys ] [ app ]
    - □ kf_contour_tracker [ sys ] [ app ]
    - □ obj_fusion [ sys ]
  - road_wizard
    - □ feat_proj [ sys ] [ app ]
    - □ region_tlr [ sys ] [ app ]
    - □ region_tlr_ssd [ sys ]
  - viewers

- Mission Planning
  - lane_planner
    - □ lane_navi [ sys ] [ app ]
    - ☑ lane_rule [ sys ] [ app ]
    - □ lane_stop [ sys ] [ app ]
    - ☑ lane_select [ sys ] [ app ]
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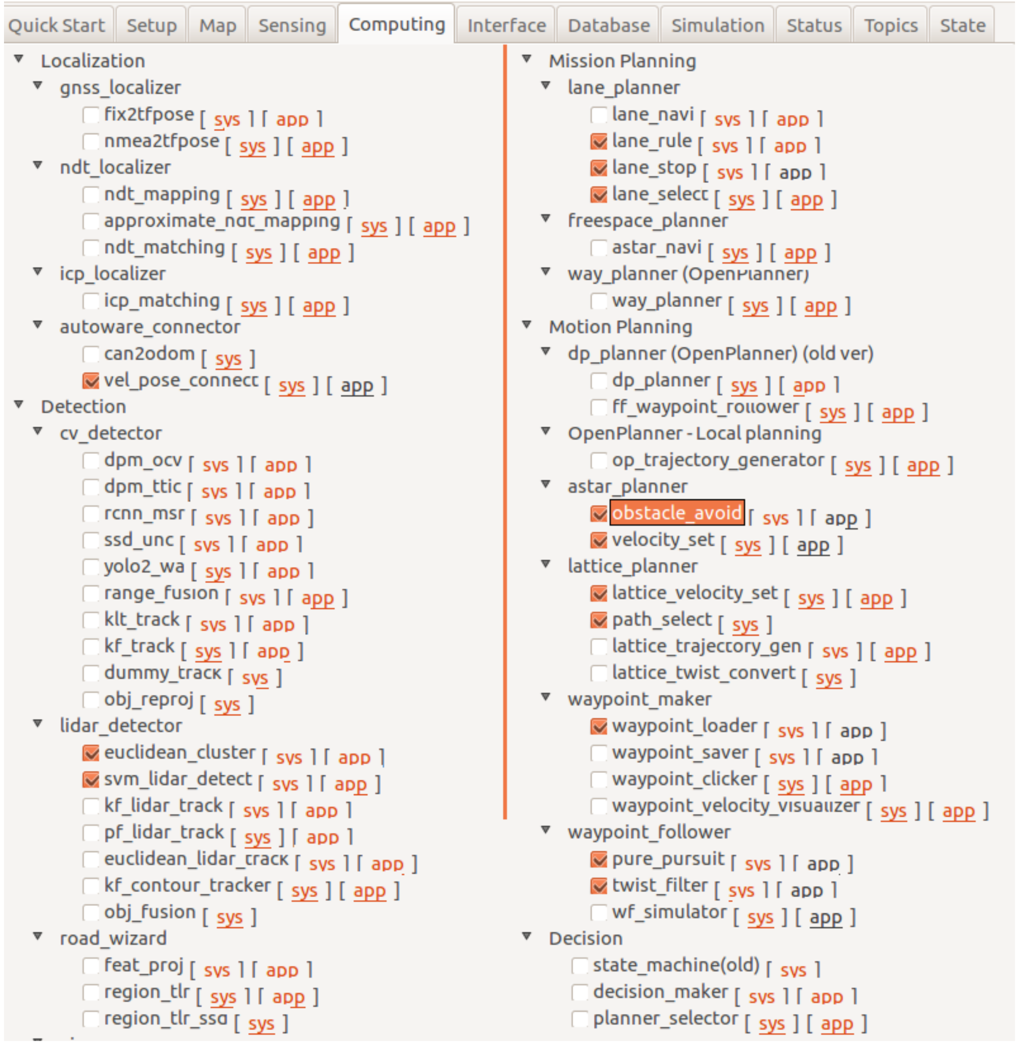
    - ☑ pure_pursuit [ sys ] [ app ]
    - ☑ twist_filter [ sys ] [ app ]
    - □ wf_simulator [ sys ] [ app ]
- Decision
  - □ state_machine(old) [ sys ]
  - □ decision_maker [ sys ] [ app ]
  - □ planner_selector [ sys ] [ app ]

# Obstacle Detection

- Test obstacle Detection



Quick Start | Setup | Map | Sensing | Computing | Interface | Database | Simulation | Status | Topics | State

- ▼ Localization
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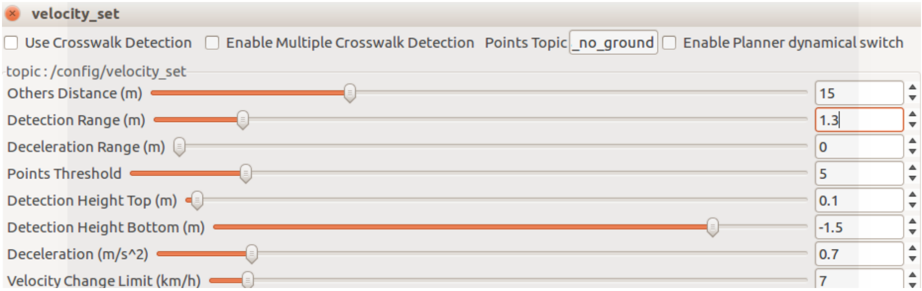

velocity_set

□ Use Crosswalk Detection □ Enable Multiple Crosswalk Detection Points Topic _no_ground □ Enable Planner dynamical switch

topic : /config/velocity_set

| | |
|---|---|
| Others Distance (m) | 15 |
| Detection Range (m) | 1.3 |
| Deceleration Range (m) | 0 |
| Points Threshold | 5 |
| Detection Height Top (m) | 0.1 |
| Detection Height Bottom (m) | -1.5 |
| Deceleration (m/s^2) | 0.7 |
| Velocity Change Limit (km/h) | 7 |

# MOVE-IT HACKATHON