Autoware

ROS-based OSS for Urban Self-Driving

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Self-driving Dream
Autoware

- Today: *Algorithms, drivers, tools and best practices*
- Tomorrow: *Ubuntu of self-driving*
- After Tomorrow: *SAAS platform*
Public & Off Road Demonstration
Autoware Facts

- Out of university of Nagoya
- Functionality for urban areas
- Up to 40mph
- No security and functional safety
- 50+ developers
- 600+ forks on github
- > 20 companies using it (YAMAHA, TOYOTA, AISIN COMCRUISE, DENSO, TOSHIBA, UDACITY, NVIDIA, INTEL)
- Ubuntu 14.04 and 16.04 supported
Autoware Cars
Autoware modules
Sensing Drivers

- Velodyne HDL-64e (3D LiDAR)
- Velodyne HDL-32e (3D LiDAR)
- Velodyne VLP-16 (3D LiDAR)
- IBEO LUX 8L (3D LiDAR)
- Point Grey Ladybug 5 (Camera)
- JAVAD RTK-GNSS (GNSS/GPS)
- Point Grey Grasshopper3 (Camera)
Autoware HW
AD Map
AD Map Aisan
Lidar-based localization
NDT algorithm

Normal Transform Distributions (NDT) for Localization

3 D map data

Matching

Localization

Sensor scan data
Sensor agnostic
Localization with VLP16
Sensor fusion for localization
Calibration

Camera-LiDAR Calibration
Object detection and tracking
Object Detection with CNNs
Traffic Light Detection
Hybrid A* Path Finding
State Lattice Path Finding
Pure Pursuit for Waypoint Following
Services and Tools
Plug and Go
Future Work

- CI
- RTOS
- V&V
- Safety
- Security
QUESTIONS