

# **Development of Multiple Sensor Detection Algorithms For Autonomous Driving Vehicle**

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Autonomous driving vehicle is the technology that will appear in daily life very soon. By 2025, the world will see millions of autonomous vehicles on the roads, and safety is undoubtedly the most important topic in this field. In this thesis, a multi-sensor data fusion system for multiple computers autonomous vehicle is developed. Environment perception is the foundation for ensuring safety, so accurate obstacles detection and tracking are critical aspects of autonomous driving.

Autonomous driving system contains vehicle, sensors, communication equipment and on-board computers. To improve system performance, this thesis proposed a parallel computing mechanism on two computers and complete architecture for sensor data processing and decision-making.

Multiple sensors including camera, lidar, and radar provide feasibility and complementarity for this goal. Raw data preprocessing, data format definition, and fusion algorithm development are integrated in the NCKU autonomous vehicle system based on Robot Operating System (ROS), which provides good modular development environment.

Camera has good classification ability; Lidar performs well in bad lighting environment; Radar provides long-range coverage and good velocity information. Deep Learning and Kalman Filter are used to implement detection-level and tracking-level fusion algorithm. Sensor fusion mechanism of autonomous vehicle is experimented on the campus road with vehicles and pedestrians. In the thesis, pedestrians tracking performance is focused on.

In order to increase safety and decrease road accidents of autonomous vehicles, tests in a controlled environment and/or open fields are essential. In the future, we will make efforts on adapting the system from the campus road to the urban road.

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