# 자율주행 Hyper 측위기술

# 다수, 다종 센서 기반 정밀 측위를 위한 HD MAP 모델 연구

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# A Study on HD MAP Model for Precise Localization Based on Multiple and Various Types of Sensors

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**Key Words :** High-definition map(고정밀 지도), Sensor(센서), Localization(측위), Autonomous driving(자율주행)


## ABSTRACT

By coming of the era of the autonomous driving, the awareness for importance on localization is increasing.

For the precise localization using multiple sensors, active research with various directions is being conducted on HD maps.

Since the map object used for localization depends on various types of sensors, HD map model including elements necessary for localization based on all sensors is required Thus, this study presents an HD map model optimized for localization.

For stability and accuracy in various situations such as shading environment, this HD map model focuses on optimization and weight reduction, which consists mainly of objects needed for localization, such as latitude/longitude correction, curvature information for sensor value verification, and data acquired from multiple sensors.

If the HD map model presented in this study secures localization-optimized map technology, intelligent and reliable automatic renewal technology, and stability of autonomous driving service in shaded areas, it is expected that HD maps will be enhanced and improved in reliability.


본 연구는 산업통상자원부 한국산업기술평가원의 자율주행기술개발혁신사업(과제명 : 악의조건 주행 환경에서 연속 대응 가능한 Hyper 자차 위치 인식 기술 개발, 과제번호 : 20018198)의 연구비 지원에 의해 수행됨.

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# 악의 조건 주행 환경에서 연속 대응 가능한 Hyper 자차 위치 인식 기술을 위한 다종센서 차량의 로깅데이터의 데이터 마이닝에 관한 연구

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# A Study of Data Mining of Logging Data of Various Sensor Vehicles for Hyper Self-vehicle Location Recognition Technology in the Driving Environment under Bad Conditions

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**Key Words :** Bad condition(악의 조건), Hyper self-vehicle location recognition(Hyper 자차 위치 인식)

ABSTRACT

We obtain a lot of vehicle data with difficulty to spend a lot of time and money. However, we also throw away a lot of information too easily. In order to reduce cost, we need to use that information more efficiently. We will find valuable resources that are wasted and use them to make more valuable information than now. and we extract the information necessary to calculate the Hyper self-vehicle location under bad conditions from that information.
The basic method is to pick the most important key information from that big data. it can be obtained empirically. so, we will mount various sensors on vehicles and get sensor data. and we will analyze logging data to find meaningful signals related to map and experiment it.
We expect that we can use it to support for Development of Hyper self-vehicle location recognition technology.

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# 도심환경 속 자율주행 차량 서비스를 위한 의미정보 기반의 강인한 자세 추정 시스템

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# Robust Pose Estimation System Based on Semantic Information for Autonomous Vehicle Services in Urban Environment

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**Key Words :** Semantic Information, Autonomous Vehicle, Pose Estimation System, Localization System

## ABSTRACT

Recently, various researches are conducted to provide services based on autonomous vehicles in urban environments. Among these research, the field of localization is one of the most important topics to estimate more accurate and robust poses with/without GPS that provide the absolute position of vehicles. Furthermore, the accurate GPS is not suitable for real-time estimation processes because of its low data frequency, normally.

To solve this problem, we integrated various sensor information such as LiDAR, camera, and IMU with an HD map. To handle this integrated information, we propose a system composed of a multi-sensor geometric model-based EKF method with lane extraction and static/dynamic models including semantic knowledge during map matching to enable precise localization.

Based on the proposed system, we experimented with actual driving with an autonomous vehicle to estimate the vehicle pose and confirmed that the system can manage diverse services in a dynamic urban environment.

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# 악의 조건 주행 환경에서 가상 자율주행 시험을 위한 오픈소스 시뮬레이터에 관한 고찰

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# Open-source Simulator for Autonomous Driving Testing in Harsh Environments

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**Key Words :** Harsh environment(악의조건), Autonomous driving(자율주행), Simulation(시뮬레이션)

ABSTRACT

In order for level 4 or higher autonomous driving to be useful in the real world, it must be able to safely respond to harsh driving environments. It has limitations to conducting autonomous driving tests on real roads under these harsh conditions due to risks and environmental constraints. Therefore, it is essential to utilize a simulator that can sufficiently simulate bad conditions, e.g., snowy weather, sunlight reflections, etc. There are several commercial-grade simulators, such as Simcenter Prescan, rFpro, and Cognata, and open-source simulators, e.g., CARLA ad LGSVL. Among these advanced simulation tools, we selected the CARLA simulator for testing autonomous driving scenarios in harsh environments.

In this paper, we investigate the CARLA simulator functions from the perspective of environmental control functions such as sunlight and road reflections, snow, and heavy rain, and the control functions of various sensors such as GNSS, cameras, radar, and lidar.

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