지도를 활용한 악의조건에서의 자차위치 정밀측위

악의 주행 조건에서 자율주행 차량의 측위 평가 시뮬레이션 환경 개발

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Developing Simulation Environment for Evaluating Positioning Performance Under Adverse Driving Conditions

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Key Words : Automated driving (자율주행), Adverse driving (악의 주행), Simulation Environment(시뮬레이션 환경)

ABSTRACT

The market for mobility is growing rapidly across many industries. In particular, verification and evaluation technologies are evolving to ensure the safety of autonomous vehicles from the development stage. Autonomous driving simulation technology is increasingly being used in R&D to efficiently and low-costly verify and evaluate the safety of autonomous vehicles before they are put on the road. In this study, we categorized various adverse conditions that a vehicle may encounter while driving and examined the impact of each on the sensors' ability to perceive the surrounding environment to build a scenario for evaluating precision positioning technology. In order to minimize the safety issues associated with conducting scenario-based evaluations in real road environments, consider factors that cannot be controlled in reality such as weather conditions, and ensure the reproducibility of the evaluation, we established a scenario-based evaluation environment for positioning technology in a software simulation. Through this, it was confirmed that the risk scenarios derived from each sensor can be combined with the risk scenarios obtained from other factors that cause adverse driving conditions and run in the simulation to enable more realistic positioning performance evaluation.

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Evaluation of 3D Spatial Information Data Quality According to Continuously Operating Reference Station arrangement

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Key Words : Continuously Operating Reference Station(상시기준국), Mobile Mapping System(모바일맵핑시스템), Tightly Coupled(강결합)

ABSTRACT

With the recent development of autonomous driving technology of automobiles, precise maps of roads are required. In order to efficiently build maps, post-processing of data taken with mobile mapping system (MMS) equipment is important. Although the method of MMS data acquisition is important, the location accuracy of the shooting performance is usually determined by the results of GNSS/INS integrated processing, and the results of GNSS/INS integrated processing vary depending on the quality and number of CORS fixed on the ground and receiving reception. In this study, the GNSS position error of a receiver equipped with CORS and MMS is corrected through GNSS/INS integrated processing, one of the post-processing processes, Under the conditions of good quality of CORS, one place, three place, five place and n place CORS were used to compare their each location accuracy. The GNSS/INS integrated processing algorithm is integrated using the Tightly Coupled method that utilizes the Kalman filter algorithm to secure location accuracy with less restrictions on the number of visible satellites, as sections where satellite signals are disconnected frequently occur during MMS shooting Processing was performed. The accuracy comparison method for each case was to calculate the position error using the measured reference point. The purpose of this research is to confirm that there is no significant change in positional accuracy from a certain number of CORS, and to determine the appropriate number of CORS required for post-processing in order to efficiently construct a map.

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HD Map을 활용한 자율주행 차량을 위한 객체 기반 장소 인식 방법

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Object-Based Place Recognition Method for Autonomous Vehicles Using HD Map

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Key Words : Place recognition(장소 인식), HD map(정밀 지도), Autonomous driving(자율 주행), Object recognition (객체 인식), Localization(위치 인식)

ABSTRACT

In recent years, there has been a significant surge in interest in autonomous vehicles, leading to diverse research endeavors in this domain. However, most commercially available vehicles claiming to possess autonomous capabilities are predominantly at the Level 2 Advanced Driver Assistance Systems (ADAS) stage. Even vehicles claiming to be at Level 3 can operate autonomously only in limited scenarios and environments. To achieve proper Level 3 autonomous driving, High-Definition (HD) maps are adjusted by numerous researchers to develop autonomous driving technologies. Among these technologies, knowing the precise location of a vehicle on the map is a pivotal aspect of autonomous driving. This paper presents a localization method for autonomous vehicles based on object recognition. Firstly, it constructs object graphs for each link point based on information from objects registered in the HD map. These graphs consist of undirected edges connecting objects within a specific distance threshold. Assuming each link point corresponds to a distinct location, a virtual perception range is generated based on the vehicle's sensor coverage, and objects from the HD map within this perception range are assembled into an object graph. Secondly, a recognition graph is created from real-time object recognition data obtained during the vehicle's operation. Similar to the previous method, this graph is composed of undirected edges and distance information from sensors is assumed to be available for each object. Lastly, the recognition graph generated from object recognition data is compared to the object graphs constructed from HD map information. This comparison is based on graph similarity, and the link point within the most similar object graph is estimated as the current location. Moreover, this technology is used to create virtual object recognition results and conduct experiments to obtain meaningful results in identifying the current location on an arbitrary HD map during real-world driving scenarios.

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악의 조건 주행 환경에서 연속 대응 가능한 Hyper 자차 위치 인식 기술을 위한 통합 데이터 포맷을 사용한 다종센서의 차량 데이터 로깅 환경 구축에 관한 연구

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A Study on the Establishment of Vehicle Data Logging Environment Using Integrated Data Format of Various Sensor Datas 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

Hyper self-vehicle location recognition (HSVLR) technology is an important task for autonomous driving systems, especially in adverse driving conditions such as bad weather, poor lighting and challenging driving environment. HSVLR aims to estimate the accurate and robust position of the self-vehicle relative to the surrounding environment and other vehicles.

In this study, we focuses on the development for HSVLR using Integrated Data Format. It is possible to integrate Data Format, because the data of various sensors(LiDAR, Radar, Camera, GPS) can be consistent and compatible with each other, enhancing reliability and accuracy. They can complement each other. LiDAR can generate high-resolution 3D point cloud data but is costly and susceptible to noise and occlusion. Radar is unaffected by weather or lighting conditions and can measure object velocity and direction, but it has lower resolution and is vulnerable to multiple reflections and interference. Cameras provide visual information like color and texture but are sensitive to changes in lighting and distortion, making it challenging to obtain depth information. The key idea is that various sensors all have information about the position of objects.

By integrating this, we aim to enhance their capability to navigate safely and efficiently, contributing to the autonomous driving technology.

We expect that we can use it to support for Development of HSVLR technology.

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