Dongyoon Kim

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1994-12 | Male

Education

Tsinghua University	Vehicle Engineering	Master of Science 2021. 09 – 2024. 06 GPA: 3.76/4.0
UNIST	Mechanical Engineering	Bachelor of Science 2013. 03 – 2020. 09 GPA: 3.75/4.3

Technical Languages:	Python, C++, Java, SQL, MATLAB, Latex
Technical Skills:	Ubuntu, Docker, Casadi, Reinforcement Learning, Neural Network, MPC, PID, LQR, Nonlinear Control, Vehicle Dynamics Model, Git
Research Areas	Safety-Critical Control, Online Optimization, Autonomous Driving Decision and Control Platform, Autonomous Driving Simulation Platform
Awards & Positions	Second-class Scholarship (2023), Chinese Government Scholarship (2021-2023), Excellent Academic Performance Award (2020), Semester Honors (2017, 2019), Full Scholarship for Engineering Students (2013-2020), Violinist in University Orchestra (2018-2019), Mechanical Engineering Student Council (2014), Manager in Non-profit Educational Company (2013-2014, 2017), Air Force Military Service (2015-2017)

Experience

01. Intergrated Decision and Control (IDC) Platform Design and Development for Advanced Autonomous Driving

- Project Description: This project aims at addressing the inefficiency of existing hierarchical decision and control methods. This project involves designing an integrated decision and control approach to optimize efficiency. The approach involves static path generation and dynamic optimal tracking. It utilizes static information for path planning, selects an optimal reference trajectory based on five metrics, and employs neural networks or MPC for controlling the autonomous vehicle in dynamic environments.
- Main Contributions: Implemented the path selection module considering safety, compliance, traffic flow, economy, and comfort metrics. Developed the neural network deployment module and the static trajectory adjustment module based on front obstacles. tested IDC with the autonomous driving simulation platform and conducted troubleshooting. Participated in vehicle experiments.
- Main Technologies: C++, Python, Ubuntu, Evaluation Metrics, Docker, Autonomous Driving Simulation, Apollo

02. Large-scale Autonomous Driving Vehicle Simulation Software (LasVSim) Design and Development

- Project Description: This project is to develop a simulator for autonomous driving. It provides diverse simulation testing scenarios and various sensor models, supporting simulation and training of autonomous driving decision and control algorithms, along with result analysis and evaluation.
- Main Contributions: Implemented the V2V communication module and incorporated parallel programming.
- Main Technologies: Python, Autonomous Driving Simulation, SUMO, Simulation Scenario Construction

03. Explicit Safety-Critical Control Based on Control Barrier and Lyapunov Functions

- Project Description: This project aims to address the real-time performance issues of commonly used iterative controllers. It transforms constrained optimal control problems into an unified function and employs explicit control laws to achieve high real-time capabilities with path-tracking performance comparable to practical methods.
- Main Contributions: Researched and developed the explicit safety-critical method. Implemented MPC controllers for comparison. Deployed the algorithm within the IDC and LasVSim unified simulation platform. Conducted simulation tests and theoretical analysis. Write a research paper and a patent (papers and patents were already accepted).
- Main Technologies: C++, Python, Casadi, IPOPT, MPC, PID, Optimal Control, Dynamic Models, Nonlinear Control

Research Achievement

01. Patents

- Co-inventor of two patents related to IDC, serving as the third author on one patent and the seventh author on another.

02. Software Copyrights:

- Co-holder of copyrights for two autonomous driving software applications related to IDC and LasVSim, contributing as the sixth author on one and the seventh author on another.