



Department of Mechanical and Aerospace Engineering
Indian Institute of Technology Hyderabad
Kandi - 502285, Sangareddy, Telangana, India

MAE Industry Lecture 5 | ME6100 Industry Lecture



Title: Intelligent Control for Autonomous Vehicles

Speaker: Mr. Sivaraman Sivaraj – Divisional Expert in AI Operations

Affiliation: ZF Commercial Vehicle Control Systems Pvt. Ltd., ZF Group. Chennai – 600 058.

Abstract | This research work belongs to the public funded project **EEMotion** by the **German Federal Ministry for Economic Affairs and Climate Action** (BMWK). The work describes AI-based control techniques extending a conventional lateral controller for autonomous vehicles. Based on a target curvature requirement from position controller, the lateral control unit provides wheel angle signal which consists of feed-forward and feedback signals. A novel feed-forward control method is developed based on supervised learning. Data are generated from simulation using a functional mock-up unit of the vehicle model with different input combinations and from test drives of a prototype vehicle. The trained feed-forward model represents the inverse dynamical behaviour of the vehicle and liberates the advantages of AI in the place of conventional methods by additional information. Alternatively, a residual Reinforcement Learning-based agent trained by the Proximal Policy Optimization algorithm is used to enhance the feedback control. The reward function is designed based on the course angle error and the cross-track error. The developed models are compared against baseline controller in various scenarios on simulation and real test tracks. The absolute maximum and root mean square values of cross-track error are taken as performance measures for comparison.

About the Speaker | Sivaraman Sivaraj is currently working as a deputy manager in AI operations / divisional expert in technology, data science and AI. He obtained his bachelor's degree in mechanical engineering from ANNA University and Master of Science (by research) in ocean engineering from IIT Madras. His area of research is focused on AI-based control system development for autonomous vehicles and smart factory's manufacturing methods & upgradation.

Date: 19/03/2025

Time: 14:30 Hrs.