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Simulation for the Development of Autonomous Driving Techniques

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Autonomous Driving



Shared

Autonomous

Connected

Electric

- A trend in public and personal mobility.
- Potential benefits
 - Enhance safety
 - Improvement efficiency
 - Convenience in transportation
 - Complementary transportation infrastructure
 - Meet the needs in the aging society
 - Address the lack of drivers
 - Open up mobility as a service and passenger economy
 - Iogistics revolution
- This vision is shared in Taiwan.
- Taiwan is actively engaged in
 - Developing enabling autonomous driving technologies
 - Facilitating autonomous driving services

Development of Autonomous Driving Technologies

A (development x test) strategy is needed to reflect the V cycle model.

Simulation cannot be over-emphasized.

It is reported that 90% of the development tasks are conducted through simulations.

Unique characteristics

- Research and development of advanced algorithm or technique
- Test of the so-called corner cases
- Pave the way for the eventual verification and validation

Open-road testing

Closed-track testing

Simulation

Types of Simulation



Model in the loop
Software in the loop
Processor in the loop
Hardware in the loop
Vehicle in the loop
Human in the loop



Simulation Tools



Many software tools for the simulation of autonomous driving have been developed

- Commercial products
 - CarSim
 - CarMaker
 - PreScan
 - SCANeR
 - VTD
 - DRIVE Sim/Constellation
 - Forum 8
 - Automated Driving System Toolbox
- Open source projects
 - Gazebo
 - CARLA
 - LG SVL



CarMaker



CarSim



SCANeR



PreScan







Comparison



| | Dynamics | Sensors | Scenarios | Extensibility |
|------------|----------|---------|-----------|---------------|
| CarSim | **** | ** | *** | **** |
| CarMaker | **** | *** | **** | **** |
| PreScan | ** | **** | **** | **** |
| SCANeR | *** | **** | **** | **** |
| VTD | **** | *** | **** | **** |
| DRIVE Sim | ** | *** | *** | *** |
| Forum 8 | *** | ** | **** | **** |
| MATLAB ADS | *** | ** | ** | **** |
| Gazebo | ** | *** | *** | *** |
| CARLA | *** | **** | **** | *** |
| LG SVL | *** | **** | **** | **** |

LG SVL Simulator



Scene: Shalun Taiwan CAR laboratory
 Vehicle and sensor: configurable
 Environment and scenario: can be designed
 Autonomous driving software: integrated with the simulator



Talent Incubation



Ministry of Education inaugurated a talent incubation program of autonomous vehicles

- Development of educational modules
- Simulation and verification





執行單位:國立成功大學 主持人:莊智清教授、涂嘉恆教授

Local Contents



The streets on both Thailand and Taiwan are full of mobile agents, making the development of autonomous driving techniques very challenging.









Summary



Simulations on the development of autonomous driving techniques have been discussed.

Based on an open source tool, the simulator of the Shalun test site can be accessed from the github. https://github.com/lgsvl/Shalun



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