Who we are?

› Robert Hilbrich
› Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR)
› Research Manager Traffic Simulation and Modeling
› ~6 years at the DLR
› ~8 years at Fraunhofer
› Business and academic development in the field of traffic simulation

› Matthias Eicher
› TÜV Süd Auto Service GmbH
› Senior Expert Functional Safety
› more than 5 year experience in safety critical software development

› Andreas Riexinger
› Robert Bosch GmbH
› Product Manager Automated Driving
› ~22 years at Bosch
› ~15 years experience in embedded software development
› Pushing Open Source development and business within Robert Bosch GmbH
Autonomous Driving

The car has to mirror a driver’s abilities to see, evaluate and act.
Autonomous driving accelerator “OpenADx” launched

Today at the Bosch ConnectedWorld conference in Berlin, a new open source autonomous driving accelerator was introduced. OpenADx focuses on the software development toolchain for autonomous driving, an enabling component in the landscape of highly autonomous driving.
The OpenADx community provides a platform which leverages...

...open source to increase efficiency and create standards

Reason Why
AD requires a multifaceted process incorporating a variety of software tools

But none of these tools were ever designed to work together

This costs the industry time and money

We are mitigating this problem by creating the leading automated driving ecosystem ➢ OpenADx

RB launched OpenADx at BCW 2018 ...

... and established an Eclipse hosted community

- 30+ entities
- 60+ active contributors
- Initial projects:
  - Cloe (simulation kit for testing AD software components)
  - Standardized AI labeling
  - SiL standardization

Targets
- Accelerate time to market
- Share costs
- Free up resources to focus on customers

Approach
- Define Industry-wide AD toolchain
- Ensure high interoperability
- Provide easy access
- Establish basis for reference arch.
OpenADx

...with a wide-ranging tool landscape

GOALS

- Industry-wide accepted definition of the AD toolchain
- Tool interface standardization
- Ensure efficient implementation and interoperability
- Foundation for reference architecture

Focus on tool interfaces

Many vendors, many specialized tools!

Make a complex tool landscape more accessible for enterprise users
Big Picture OpenADx – Vision

(HAD) SW Stack

(HAD) Functions
Perceive
Locate

Think
Act

Eclipse iceoryx

Automotive Middleware

OS (open, e.g. Zephyr)

Hardware
(open architecture, e.g. RISC-V)

Architecture definition
Ingest/store
Deep learning
Simulation and test
Integrate
Build
Simulation-based validation
Test drive
Connectivity-based validation
Eclipse Cloe – Simulation Middleware
Eclipse iceoryx – Shared Memory

Simulation Engine
- World Model
- Traffic Model / Simulation
- Sensor Model
- Actuation

Eclipse Cloe (closed loop simulation environment)
- Simulator Binding
- Controller Binding
- Interface
- HMI

HAD SW
- (HAD) Functions
- Perceive
- Think
- Act
- Locate
- Eclipse iceoryx
- Automotive Middleware

Architecture definition
Ingest/store
Deep learning
Simulation and test
Integrate
Build
Simulation-based validation
Test drive
Connectivity-based validation

Proprietary
Open Source
IP
Shared memory

Eclipse iceoryx

Eclipse iceoryx is an IPC middleware for POSIX based operating systems with a zero-copy shared memory approach, optimized for the huge data inter-process-communication.

https://projects.eclipse.org/proposals/eclipse-iceoryx
OpenADx and other initiatives

Embracing not Competing

Open Environment

Integrative

Focus on Organizational Needs
Cooperations and potential

- openMDM: Measurement data
- openGENESIS: Verifiable AI
- openMobility: Urban Traffic Simulation
- openPASS: Simulation
- iceoryx
- Public funded projects: e.g. Simulation
- ... (additional nodes)

- FMI Standard
- openMHD: Automotive platform
- Design efficiency
- Mobile app for timing / performance simulation
- Exchange platform for timing / performance simulation
openMobility Working Group

Driving the evolution and broad adoption of open source mobility modelling and simulation technologies.
openMobility Working Group

Vision
› Drive the evolution and broad adoption of mobility modelling and simulation technologies. It accomplishes its goal by fostering and leveraging collaborations among members and by ensuring the development and availability of an open software framework.

Members

Homepage
› https://openMobility.eclipse.org
openMobility Working Group

Coordination of related Eclipse Projects

Eclipse SUMO  openMobility  Eclipse MUSTANG  t.b.d.
Eclipse SUMO

Overview

› DLR’s open source microscopic transportation system simulation software

› Under development since 2001, with the explicit goal to simulate even large cities / areas in more than real-time

› SUMO comes with a full-fledged suite of helper programs that do setting up, running, and controlling such a simulation

› (Almost) any moving object in a city can be simulated with SUMO
OpenADx  //  Open Collaboration for safer Autonomous Mobility of the Future

10/25/2019
Eclipse SUMO

Dynamically Control Your SUMO Simulation: TraCI – Traffic Control Interface

› Retrieve information from a simulation on run-time
› Change the behavior of objects within the simulation on run-time

› TraCI = TCP/IP socket communication + standardized message format
› Clients can be implemented in C++, Java, Python, and Matlab

SUMO (Server)

TraCI API

TCP / IP Sockets

Intranet / Internet

Multiple Clients are possible too!

<Your Code> (Client)

TraCI API

TCP / IP Sockets
Eclipse MUSTANG
Multiscale Simulator Coupling

Vehicle Simulation
LIDAR, vehicle dynamics, in-vehicle sensors, …

Traffic Simulation
vehicle flow, traffic lights, real traffic patterns, …

Communication Simulation
ITS G5 ad-hoc, LTE, 5G

User Simulation
driving behaviour, emotions, mood, …

Virtual Testing
with Eclipse MUSTANG

Events, map and trace data

ADAS Functions
platooning, self-driving, …
Eclipse MUSTANG

The Multiscale Simulation Framework

› Use different simulators according to your needs and required level of detail

› Vehicles: Use traffic simulation or vehicle dynamic simulation, or both!

› Communication: Simple heuristics, or detailed communication/network simulation (all OSI levels).

› Exchange simulators easily without touching the simulation scenarios
New Eclipse Project from DLR is coming up

› DLR plans to open source the code for their own research vehicles under EPLv2.0 (vehicle dynamics, trajectory planning, …)

› Code can be used for building your own autonomous vehicles …

› … or for plugging it in your favourite open source traffic simulator!

› Expect more news in 2020!
openMobility Working Group

Collaboration Model

› Joint definition of user stories and feature roadmaps for the associated Eclipse Projects
› Joint definition and advancement of interface definitions
› Joint marketing and dissemination

More Information

› Homepage: https://openmobility.eclipse.org
› Wiki: https://wiki.eclipse.org/OpenMobility
› GitHub: https://github.com/openmobility-wg
› Mailinglist: https://accounts.eclipse.org/mailing-list/openMobility
› Twitter: @open_mobility
openGENESIS
Make AI verifiable and certifiable - “TÜV for AI”

AI will be the enabling technology for SAE level 4 & 5 driving

framework for AI regulation, verification and certification is necessary

verification of AI is an unsolved challenge today
openGENESIS

Motivation

openGENESIS is a collaborative platform with the mission to provide knowledge, methods and tools for the assessment of artificial intelligence (AI) that is used within autonomous driving applications.

Before deployment onto public roads, learning algorithms must be proven safe and roadworthy.

openGENESIS provides both public and regulatory authorities with approaches to help them deal with the challenges of AI approval and certification.

The openGENESIS collaboration platform leverages knowledge among its members, enabling them to cooperate efficiently and share research results in an open access domain.

This establishes a strong global exchange between industry, research and regulators to develop common criteria for the quality of AI.
openGENESIS
Scope

AI Data Quality Assurance
- Specification
- Acquisition
- Labeling

AI Training Implications
- Data Selection
- Performance
- Reproducibility

AI Algorithm Inspection
- Comprehensibility
- Understandability
- Explainability

AI Algorithm Testing
- Data Selection
- Robustness
- Deployment

AI Field Observation
- Continuous observation
- Incident identification

Examples of technical aspects to be investigated within the scope of openGENESIS
openGENESIS
Members

- host: ECLIPSE FOUNDATION
- steering: TÜV SÜD, iMotion
- development: DFKI, INCENDA AI, Quality Assurance
- guests: UNIVERSITÉ DU LUXEMBOURG
openGENESIS
Project Examples

- Establish quality processes regarding data, training and evaluation aspects
- Discuss possible adjustments of safety standards to fit for machine learning
- Advances in understandable and explainable AI
- Find and define metrics for quantitative statements about performance and robustness
- Establishment of an open and public available training and validation data set
- Identification of the necessary properties of synthetic data for an adequate real data representation
- Establish quality processes regarding data, training and evaluation aspects
openGENESIS
Projects

knowledge

Project Phoenix - Quality assurance of AI data for machine learning by labelling process considerations
A process for annotating data and generating corresponding ground-truth information to train and test Artificial Intelligence (especially for Machine Learning) shall be described, investigated and potential weaknesses identified.

metrics

openDS - Open source driving simulation
Driving simulation for research purposes. In addition to the actual driving simulation, it also includes traffic simulation, traffic light simulation, weather simulation, analysis capabilities for driving behaviour.

data

Incubation phase

Approval phase

tools
openGENESIS timeline

- Idea of openGENESIS
- Bring Eclipse Foundation on board
- F2F Kick-Off Meeting Munich
- Publish openGENESIS Charta
- Official formation of openGENESIS 18th July 2019
- Become capable to assess AI
- New spotlights
- GSLP – Quality of AI Data labeling
- Annual F2F Meeting
- New spotlights
- GSLP – openDS
openGENESIS
more information

Charta:  https://www.eclipse.org/org/workinggroups/opengenesis_charter.php

Wiki:  https://wiki.eclipse.org/OpenGENESIS_WG

Mailinglist:  https://accounts.eclipse.org/mailing-list/opengenesis-wg
Summary and Outlook

› openGENESIS, openMobility and OpenADx are Working Groups under the Eclipse Foundation in the automotive area

› Collaboration is done in the form regular exchange and sharing knowledge as well as projects

› Collaboration will be expanded to other working groups and projects

Open Source and Open Technologies helps to Collaborate in a Changing Automotive Market

We invite you!
Thank you!

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Find out more and join us
https://openadx.eclipse.org/
https://openmobility.eclipse.org/
https://wiki.eclipse.org/OpenGENESIS_WG
EVALUATE THE SESSIONS

Sign in and vote using the conference app or eclipsecon.org

-1 0 +1