Future Automotive HW/SW Platform Design

Draft Program

Monday: Predictability of HW/SW systems

09h00-10h15 Introduction
45’ Introduction (by organizers and then 1 min per participant)
30’ Dirk Ziegenbein (Robert Bosch GmbH - Renningen, DE)
   Breaking Automotive Traditions - Trends & Challenges

10h45-12h15 Dependability
15’ Albrecht Mayer (Infineon Technologies - München, DE)
   Sorry software, hardware matters for dependability
15’ Alessandra Nardi (Cadence - San Jose, US)
   Design-For-Safety For Automotive IC Design: Challenges And Opportunities
15’ Mark Lawford (McMaster University - Hamilton, CA)
   Domain Controllers, Autonomous Driving and Functional Safety, oh my!
15’ Thidapat Chantem (Virginia Polytechnic Institute - Arlington, US)
   Predictable and Reliable Automated Transportation Systems
30’ Discussion

14h00-15h30 Timing Predictability
15’ Alessandro Biondi (Sant'Anna School of Advanced Studies - Pisa, IT)
   Predictable Heterogeneous Computing for Next-generation Cyber-Physical Systems
15’ Chung-Wei Lin (National Taiwan University - Taipei, TW)
   Formal Verification on Finite-State Machines with Weakly-Hard Fault Models
15’ Zhu Qi (Northwestern University - Evanston, US)
   Leveraging Weakly-hard Constraints in Design and Adaptation
15’ Ignacio Sanudo Olmedo (University of Modena, IT)
   Paving the way towards predictable performance in multi-heterogeneous SoC, industrial
   problems and directions
30’ Discussion

16h00-17h00 Timing Predictability (cont’d)
15’ Masaki Gondo (eSOL - Tokyo, JP)
   Aggregation and integration of next-generation vehicle computing & OS technologies
15’ Rolf Ernst (TU Braunschweig, DE)
   Predictable Low-latency Data Services for Critical Applications – Challenges & Concepts
15’ Maximilian Odendahl (Silexica - Köln, DE)
   Performance testing platform for ROS- & Adaptive Autosar-based Autonomous Systems
15’ Discussion

17h00-18h00 Breakout Session
60’ Breakout Session
Tuesday: Safe Integration of Heterogeneous Software Applications

09h00-10h15 Automotive Software Architecture
15’ Philipp Obergfell (BMW AG - München, DE)
Centralized automotive software and system architectures
15’ Philipp Mundhenk (Autonomous Intelling Driving - München, DE)
Safe and Secure Software Platforms for Autonomous Driving
15’ Sebastian Steinhorst (TU München, DE)
Software Decentralization in Automotive System Architectures
30’ Discussion

10h45-12h15 Automotive Networks / Mobility & Society
15’ Wilfried Steiner (TTTech Computertechnik - Wien, AT)
The Role of Synchronized Time for Safe Integration of Heterogeneous Software Applications
15’ Lulu Chan (NXP Semiconductors - Eindhoven, NL)
Mixed Criticality Communication in Future In-Vehicle Architectures
15’ Baik Hoh, Seyhan Ucar (Toyota Motors North America - Mountain View, US)
Automotive Edge Computing Use-cases Inspired by Societal Problems
15’ Sophie Quinton (INRIA - Grenoble, FR)
Automotive System Design: Challenges of the Anthropocene
30’ Discussion

14h00-15h00 Breakout Session
60’ Breakout Session

15h30-17h00 Automotive CPS
15’ Sabine Glesner (TU Berlin, DE)
Security and Correctness in the Face of Self-Adaptive Learning Automotive Systems
15’ Bart Besselink (University of Groningen, NL)
Towards a contract theory for physical systems
15’ Jyotirmoy Deshmukh (USC - Los Angeles, US)
Specification-driven Design and Analysis for Perception, Decision-Making and Control in Autonomous Systems
15’ Peter Gorm Larsen (Aarhus University, DK)
Possibilities using FMI-based Co-simulation for the Validation of Cyber-Physical Systems
30’ Discussion

17h00-18h00 Breakout Session
60’ Breakout Session
Wednesday: Programmability and Optimization of Emerging Heterogeneous Platforms

09h00-10h30 Programmability
15’ Jerónimo Castrillón-Mazo (TU Dresden, DE)
   The role of programming abstractions in automotive software
15’ Eduardo Quinones (Barcelona Supercomputing Center, ES)
   Parallel programming models for critical real-time embedded systems
15’ Roland Leißa (Universität des Saarlandes, DE)
   AnyDSL: A Partial Evaluation Framework for Programming High-Performance Heterogeneous Systems
15’ Lukas Sommer (TH Darmstadt, DE)
   DAPHNE - An automotive benchmark suite for parallel programming models on embedded heterogeneous platforms
30’ Discussion

11h00-12h15 Breakout Session
75’ Breakout Session

14h00-15h00 Closing
60’ Plenary closing, feedback, next steps

Possible topics for breakout sessions

- Is there a need for specific automotive systems design practices or does one size fit all?
- How to deal with the complexity of (emerging) high-performance hardware platforms in automotive w.r.t. timing predictability?
- How to guarantee correctness and safety for adaptive/evolving applications?
- Will there be approaches abstracting the complexity of modern heterogeneous HW platforms away from the application developer or will we have different development paradigms for each type of compute node?
- ML & autonomous driving challenges under real-time constraints [Frank Mueller]
- How to guarantee the safety of AI algorithms used in the automotive domain? Might it work by itself, by e.g., deploying formal methods? Or do we need redundancy, backup strategies, support from rule-based algorithms, etc.? [Wanli Chang]
- …

Please feel free to send your topics to the organizers. More topics will be identified on the fly during the seminar and we will determine dynamically which topics we want to spend time on during breakout sessions. We also expect to have brief informal summaries of the breakout sessions in the evenings.