EASCI: Emergent and Adaptive Semantic Composition in IoT Ecosystems

along with ADAPTIVE 2023
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From Internet of Content to Internet of Things

“WWW”
- e-mail
- Information
- Entertainment
- ...

“Web 2.0”
- e-banking
- e-commerce
- ...

“Social Media”
- Facebook
- YouTube
- Skype
- ...

“Machine to machine”
- Identification, tracking, monitoring, prediction ...
- ...

Examples of IoT Application Domains

IoT Ecosystems

- Complex system networks of autonomous and interacting individual systems ➔ ability to adapt
- Through the (emergent) combination of several services of this IoT ecosystem, higher-value goals can be achieved by the overall system
- Challenges:
  - How to design and realize such an ecosystem?
  - How to influence and control such dynamical and autonomous changing system landscapes?
Topics of the EASCI Track

- Semantic integration of services in IoT ecosystems
- Emergent web service composition
- Automated service composition
- Resilience in IoT ecosystems
- Emergence in IoT ecosystems
- Concepts for interaction in an IoT ecosystem
- Runtime behavior and runtime optimization of IoT ecosystems
- Operator models and business models for IoT ecosystems
- Security of IoT ecosystems
- Service interoperability in emergent systems
- Self-organization in decentralized IoT ecosystems
- …
Papers in the EASCI Track

▪ Tailored Digital Twins for LCA & LCM - Stakeholder centered Digital Twin Framework Design for Product Lifecycle Managements and Assessment
  *Dominique Briechle, Marit Mathiszig, Nelly Nicaise Nyeck Mbialeu, Ali Piriyaie, Argianto Rahartomo*

▪ Emergent Software Service Platform and its Application in a Smart Mobility Setting
  *Christoph Knieke, Eric Douglas Nyakam Chiadjeu, Andreas Rausch, Christian Schindler, Christian Bartelt, Nils Wilken, Nikolaus Ziebura*

▪ Towards Transforming OpenAPI Specified Web Services into Planning Domain Definition Language Actions for Automatic Web Service Composition
  *Christian Schindler, Christoph Knieke, Andreas Rausch, Eric Douglas Nyakam Chiadjeu*
Paper: Tailored Digital Twins for LCA & LCM - Stakeholder centered Digital Twin Framework Design for Product Lifecycle Managements and Assessment

▪ Speaker: Dominique Briechle
  - Doctoral researcher at TU Clausthal (Germany), Institute for Software and Systems Engineering, Group of Prof. Dr. Andreas Rausch
  - Research focus:
    - Circular economy
    - Product Lifecycle
    - Digital twin

▪ Content of the Paper:
  - Requirement-based framework for designing a sustainable digital twin to meet circular economy objectives
  - Framework focus: To answer the information requirement that the stakeholders desire
  - Improving the current lifecycle assessment while ensuring the optimization of digital twin design flexibility
Paper: Emergent Software Service Platform and its Application in a Smart Mobility Setting

▪ Speaker: Nils Wilken
  - Doctoral researcher at University of Mannheim (Germany), Institute of Enterprise Systems
  - Research focus:
    - Plan recognition
    - Goal recognition
    - Artificial intelligence

▪ Content of the Paper:
  - Concept and architecture of an Emergent Software Service Platform
  - Platform able to design software services from the set of available software services completely automatically at runtime to provide higher-value services
  - Prototype implementation of the platform demonstrated by a smart parking lot scenario
Paper: Towards Transforming OpenAPI Specified Web Services into Planning Domain Definition Language Actions for Automatic Web Service Composition

- **Speaker**: Christian Schindler
  - Doctoral researcher at TU Clausthal (Germany), Institute for Software and Systems Engineering, Group of Prof. Dr. Andreas Rausch
  - Research focus:
    - Software engineering
    - Software architecture
    - Inductive rule learning

- **Content of the Paper**:
  - Approach to transform web services specified in OpenAPI into PDDL actions
  - Advantage of this approach: Web service compositions can be performed with common PDDL solvers
  - A set of transformation rules are defined and the pseudo code is described