TEACHING NEWSLETTER

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TEACHING is an EU-funded project that designs a computing platform and the associated software toolkit supporting the development and deployment of autonomous, adaptive and dependable CPSoS applications, allowing them to exploit a sustainable human feedback to drive, optimize and personalize the provisioning of their services.

At a GLANCE

The Industry and society are experiencing transformational impact of the autonomous systems revolution, empowered by automation capabilities offered by Artificial Intelligence (AI). Cyber-physical Systems of Systems (CPSoS) define a multifaceted and dynamic environment where autonomy is fundamental to govern the complexity of interactions between the virtual and physical worlds with minimal human intervention. However, even when the most advanced degree of autonomy is exercised, the human is a variable which cannot be left out of the CPSoS equation, particularly in safety critical scenarios like autonomous transportation. TEACHING addresses the challenge by integrating AI with fundamental concepts of security and dependability stemming from the AI-human-CPSoS interactions, and by considering their impact on the underlying computing system. TEACHING outcomes will fundamentally impact the development of autonomous safety-critical systems, providing means to improve their safety, dependability and overall acceptability. This impact will be demonstrated in autonomous driving and aviation via two pilot cases.

TEACHING CONCEPT

TEACHING develops a human-aware CPSoS for autonomous safety-critical applications, based on a distributed, energy-efficient and dependable AI, leveraging innovative edge computing platforms integrating specialized computing fabric for AI and in-silico support for intelligent cybersecurity solutions. The goal of the TEACHING project is to design a computing platform and the associated software toolkit supporting the development and deployment of autonomous, adaptive and dependable CPSoS applications, allowing them to exploit a sustainable human feedback to drive, optimize and personalize the provisioning of their services. In this respect, TEACHING will provide an environment where the human and the cybernetic entities collaborate synergistically, where the latter provide the former with a comfortable, tailored and dependable interaction driven by the implicit feedback provided by the human throughout his/her physiological reactions to CPSoS operation.

TEACHING OBJECTIVES

- ✓ Provision of High-Level Parallel Programming Framework targeting Heterogeneous Computing Resources for AI-based Applications on CPSoS
- ✓ Establishment of Smart communication paradigms, architectures, and technologies for real-time and energy-aware information exchange on CPSoS:
- ✓ Definition of a CPSoS computing system supporting a cross-platform Cloud-Edge continuum to ease the exploitation of resources, shrink transmission costs and reduce latency between the data and the decision
- ✓ Development of architectural patterns and dependability-engineering framework for runtime adaptive CPSoS:
- ✓ Development of tools for dependable and secure CPSoS:
- ✓ Development of distributed AI-as-a-service toolkit enabling human-driven adaptive applications in CPSoS:
- ✓ Evaluation of the computing, adaptation and dependability functionalities of the CPSoS on safety-critical industrial applications through autonomous driving and aviation demonstration environments:
- ✓ Consolidation of international and European links, raising awareness, collaboration with standardizations bodies and ensuring the transferability of project's results

TEACHING PILOTS

TEACHING will develop tools and technologies targeting dependable and highly secured autonomous CPSoS applications where humans are in close interaction with the system and are directly experiencing consequences of the interactions. Autonomous Driving and Aviation domains are chosen for show of the proof-of-concept.

Aviation: Cyber Black Box

In avionics computer systems, health and usage monitoring systems (HUMS) are quickly evolving. In addition to existing safety regulations, predictive maintenance and cybersecurity are growing requirements for aircraft manufacturers and operators. A Cyber Blackbox is a concept of aggregated monitoring of multiple avionics applications, possibly deployed on several Integrated Modular Avionics (IMA) heterogeneous computing devices, for safety, reliability and cybersecurity concerns. This use case will exercise the support and management of heterogeneous, distributed and highly connected computing devices in the CPSoS, with a specific stress on the aspects related to energy-awareness, dependability and cyber-security of the autonomous applications within the TEACHING CPSoS

Autonomous Driving: A Convoy Function

Convoy function is a complex driving scenario addressing the issues of testability, trust and cyber-security and ensuring the overall reliability and security, even when the components or subsystems are not fully reliable and unforeseen conditions emerge in operation. The use case setting includes a lead and follower vehicles, all of which rely on exact functional operation and user acceptance based on human perception of safety. The perception is the decisive factor for driver's acceptance and ability to take over control from the autonomous driving system. This use case demonstrates TEACHING's innovation aspect through human integration into the loop. Biological changes and their association to the users' emotional status will be monitored providing valuable information for development of AI algorithms that reinforce the dependability of the CPSoS.

TEACHING MEETINGS & EVENTS

The TEACHING kick-off meeting was successfully launched on 15-16 January 2020, in Brussels. It was the first face-to-face meeting of the TEACHING consortium allowing the partners to generate good relationships among them. During the meeting the work packages, administrative, technical, and management procedures have been presented and discussed. The highlighted agenda and fruitful discussions during the meeting helped to achieve a successful start to the project's initiatives and create synergies for effective project implementation.

TEACHING CONSORTIUM

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Key Facts

Project Coordinator: Dr. Davide Bacciu
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Start: 1-1-2020
Duration: 36 months
Participating organisations: 10
Number of countries: 5

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