

Session 6 Discussion

Recorded by Kostas Angelopoulos, University of Trento, Italy

Integrated Control and Systems Science for Cyber-Physical Systems: A Research Agenda

Hausi A. Müller (Organizer), University of Victoria, Canada

CPS systems should be part of the self-adaptive systems research agenda. The social impact of CPS is significant, e.g. wireless technologies. A lot of applications of CPS are expected in the future. There are a lot of venues and funding opportunities on the topic. NIST reports on CPS are useful reading on the topic.

CPS are smart systems that integrate physical and computational components. There is need of combination of continuous control for the physical resources and discrete control for the computational components. The target is to enrich the capabilities of the physical systems such as adaptability, autonomy, efficiency, reliability, resiliency etc. Examples of CPS: smarter planet, sustainable cities, industrial internet.

Difference between CPS and Internet of Things (IoT). IoT is just collecting information while CPS collects information and exploits it. CPS systems are networked, distributed, real-time and adaptive. They require models, V&V and requirements specification. CPS are systems require control, feedback etc and have function such as sense monitor and analyse. Examples are smart cities, connected cars, autonomous vehicles. In ICSE there was a keynote about the CPS system of the Ferrari car. The key point is that the driver is the main controller of the system while the CPS is supporting him.

Foundations of CPS: computing, control and communications. Expertise in all the three is required for successful CPS. Engineers and Scientists must be educated in every one of them.

CPS require various types of control such adaptive and predictive control, composition of control and reference models. Optimisation techniques are also useful. Finally, assurances using models and V&V are also critical.

Autonomic computing reference architecture (ACRA). A hierarchy of controllers. On the top there orchestrating components and the 2 layers bellow manage the resources of the CPS using policies that are coming from the top.

Examples of such three layer models is the Kramer Magee adaptation model and Dynamico model and MIAC model.

Next Generation Collaborative Distributed Visualization Systems on the Distributed Cloud

Rick McGeer, SAP, San Francisco, USA

The speaker claims that the distributed ubiquitous cloud is the internet of the future. The Zettaflood: a zettebyte added to the world's disks every 2 years. The network can't handle that traffic. High bandwidth sensors such as iSight cameras flood the networks, programs though reduce data from sensors. Therefore programs are important for controlling the amount of data flowing in the network.

The Big Data visualisation was very expensive, but using Distributed Cloud could be cheaper. Localising servers helped to get the requested data very fast. However in large scale (beyond a city) the speed wasn't good.

Example of a distributed cloud: amazon EC2, PlanetLab, GENI, SAVI, FED4FIRE, Vnode/Flare.

Problems:

Heterogeneous ownership/administration

Location- and context-aware programs can deal with this heterogeneity.

ime (Sabatucci, SEAMS 2015).?