Cyber Physical System (CPS) as it is Realized in Engineering for Robot Systems

Subject leader: László Horváth CSc, PhD, Dr. habil

About the subject

Advanced control and operation of system-based product requires paradigm level change in engineering application of information technology. The new paradigm is cyber physical system (CPS) where the great novelty is higher level communication between cyber and physical units mainly by utilizing intelligent sensor system power. Cyber activities in CPS also require higher level communication between lifecycle servicing model of CPS and operating CPS. Robot system is a main problem area in the world of CPS because of its high complexity and multidisciplinary character. At the same time, robot system which is contextually integrated in its environment have increasing importance and widespread in many industrial areas.

Purpose and objectives

Students understand necessity and means of connections between model and operating forms of CPS systems, familiarize themselves with the relevant elements of the two systems, recognize consistent contexts, and understand CPS model support for CPS operation. In the meantime, related issues in robot systems are also given. Subject helps student at research in driving connection between model and cyber units of CPS robot system.

Issues and topics

Units and contexts in CPS system.
CPS operation related objects in system-based engineering model.
Driving contexts between modeled and operating CPS.
Model definition of robot system
Model structure and representation related issues: robot control, direct and invers kinematics, velocity and acceleration, motion sets, and kinematic relations
Contextual realistic robot simulation.
Situation and event driven communication within virtual CPS and with its operating CPS connection.
Information technology, computing, and mathematical means for relevant knowledge, experience, and expertise representation and communication.
Robot system behavior and its simulation and validation.

Laboratory support

Students understand principles, methods, contextual connections and system issues discussing related issues on most advanced experimental models. These models are developed for this subject in the cloud environment of 3DEXPERIENCE system.

Literature

Students collect, study, and process recent actual and time-honored classical publications about relevant research results considering own research plan then submit results of this work in the form of survey paper. Aim is to support acquisition of knowledge and related research results for own PhD research.