



Distinguished Seminar Computer Science



Function block architecture for bringing intelligent automation into industry

Dr. Valeriy Vyatkin, University of Auckland

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Computer Science 209

Abstract - There has been impressive research effort towards making industrial automation more intelligent. Examples include multi-agent systems with reasoning capabilities and semantic knowledge driven, self-organizing systems in such areas, such as manufacturing, energy and transportation. However, penetration of these results to industrial world is not great. Practitioners oppose that all technical systems need to implement concrete requirements respecting various constraints, and it is hard to ensure those with “intelligent” automation. Another obstacle is the lack of engineering methods which convert requirements to the intelligent automation solutions. All these trends are observed in power systems automation and SmartGrid, as well as in other industrial sectors.

In this talk we will present the concept of Cyber-Physical Component architecture that is being developed in the speaker’s group in Auckland. This architecture addresses several design software and system engineering challenges: right equilibrium between abstract representation and “executability”, round-trip engineering and ability to exhibit emergent behaviour. It offers ability of self-verification thanks to employing the concept of multi-closed-loop modelling. CPC exhibit such properties as portability, interoperability and configurability thanks to the reliance on open standards. The use of synchronous execution paradigm adds determinism and predictability at the run-time.

The CPC architecture has been successfully applied in modelling and implementation of systems in such domains as manufacturing, logistics, power systems and building automation. It is being used as “underlying canvas” for generative programming.

Brief Bio - Valeriy Vyatkin is Associate Professor at the Department of Electrical and Computer Engineering, University of Auckland, New Zealand. Research interests of are in the area of dependable distributed automation and industrial informatics, including software engineering for industrial informatics systems, distributed architectures and multi-agent systems applied in various industry sectors: SmartGrid, logistics and transportation, material handling, building management systems, reconfigurable manufacturing, etc. Prof Vyatkin and his group are involved in joint research projects with companies in the U.S., Canada, Austria, New Zealand and Germany. He has been a Principal Investigator of research projects in the FREEDM program, funded by the National Science Foundation (USA). He is New Zealand delegate to the standardization committees of the International Electrotechnical Commission (IEC) on standards 61131 and 61499. Prof Vyatkin held visiting professor positions at University of Cambridge (UK), University of New Brunswick (Canada), University of Paris-Sud (France), Tampere University of Technology (Finland) and Martin-Luther University of Halle-Wittenberg (Germany).