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Evolving Systems for Practical Adaptive Control & Diagnostics



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Abstract: Emerging trend of increasing flexibility, adaptation, and autonomy of the embedded control and information systems is one of the driving forces behind the idea of evolving systems. Evolving systems paradigm is based on the concept of flexible (expanding or shrinking) model structure that is capable of adjusting to the changes in the objects that cannot solely be represented by parameter adaptation. Evolving intelligent systems develop their structure and knowledge representation through continuous learning from data and interaction with the environment. They are synergies between two powerful concepts – real time granulation and machine learning - with no limitations on the types of the model structure that may include regression models, neural networks, fuzzy, and stochastic models. Practical applications include wide range of systems with variable parameters and structure, and various operating modes. This presentation provides a summary of the multiple facets of evolving systems and focuses on some of their applications to adaptive process control, auto calibration, and anomaly detection for machine health monitoring and driver state estimation.

Biography: Dr. Dimitar P. Filev is a Senior Technical Leader - Intelligent Control & Information Systems, Ford Research & Advanced Engineering. He is conducting research in modeling and control of complex systems, intelligent control, fuzzy and neural systems, and their applications to automotive engineering. He is recipient of the 2008 Norbert Wiener Award of the IEEE SMC Society, the 2007 IFSA Outstanding Industrial Applications Award, and the highest Ford Motor Company corporate awards – he was awarded 5 times with the Henry Ford Technology Award and the 2010 Inaugural Haren Gandhi Research & Innovation Award for development and implementation of advanced automotive technologies and his long term research contributions. He has published 4 books and over 200 articles in refereed journals and conference proceedings, and holds over 50 US and foreign patents. He is past president of North American Fuzzy Information Processing Society (NAFIPS) and serves presently as VP of the IEEE Systems, Man, & Society. Dr. Filev is a Fellow of IEEE and IFSA. He received his PhD. degree in Electrical Engineering from the Czech Technical University in Prague in 1979.