

# Evolving Takagi-Sugeno-Kang Fuzzy Models and Applications

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## PLENARY LECTURE

**Abstract**—This plenary lecture highlights a part of the results obtained by the Process Control Group of the Politehnica University of Timisoara, Romania, in the development of evolving fuzzy models and some representative applications. The presentation is focused on representative and fresh applications, implemented in our labs, with real-world validation using experiments.

The results outlined in this plenary lecture are related to several laboratory equipment as pendulum-crane systems, twin rotor aerodynamic systems, magnetic levitation systems, anti-lock braking systems, and shape memory alloy systems.

**Keywords**—*applications, evolving fuzzy models, lab equipment, Takagi-Sugeno-Kang fuzzy models*

### SHORT BIO

Radu-Emil Precup (M IEEE '03 - SM IEEE '07) was born in Lugoj, Romania, in 1963. He received the Dipl.Ing. (Hons.) degree in automation and computers from the "Traian Vuia" Polytechnic Institute of Timisoara, Timisoara, Romania, in 1987, the Diploma in mathematics from the West University of Timisoara, Timisoara, in 1993, and the Ph.D. degree in automatic systems from the "Politehnica" University of Timisoara, Timisoara, in 1996.

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He is the author or coauthor of more than 300 papers published in various scientific journals, refereed conference proceedings, and contributions to books. His research interests include mainly development and analysis of new control structures and algorithms (conventional control, fuzzy control, data-based control, sliding mode control, neuro-fuzzy control, etc.), theory and applications of soft computing, computer-aided design of control systems, modeling, optimization (including nature-inspired algorithms), and applications to mechatronic systems (including automotive systems and mobile robots), embedded systems, control of power plants, servo systems, electrical driving systems.

Prof. Precup is a corresponding member of The Romanian Academy, a Doctor Honoris Causa of the Óbuda University, Budapest, Hungary, a Doctor Honoris Causa of the Széchenyi István University, Győr, Hungary, a member of the Task Force on Autonomous Learning Systems within the Neural Networks Technical Committee (TC) of the Institute of Electrical and Electronics Engineers (IEEE) Computational Intelligence Society, the TCs on Computational Cybernetics, and Cyber-Medical Systems of the IEEE Systems, Man, and Cybernetics Society, the Task Force on Adaptive and Evolving Fuzzy Systems within the Fuzzy Systems TC of the IEEE Computational Intelligence Society, the TCs on Data-Driven Control and Monitoring, and Control, Robotics and Mechatronics of the IEEE Industrial Electronics Society, the International Federation of Automatic Control (IFAC) TC on Computational Intelligence in Control (previously named Cognition and Control), the IFAC TC on Linear Control Systems, the Working Group WG 12.9 on Computational Intelligence of the Technical Committee TC12 on Artificial Intelligence of the International Federation for Information Processing (IFIP), the European Society for Fuzzy Logic and Technology (EUSFLAT), the Hungarian Fuzzy Association, and the Romanian Society of Control Engineering and Technical Informatics. He founded in 2015 and is the chair of the IEEE Systems, Man, and Cybernetics Society

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