KEY NOTE LECTURE:

Complex Networks and Systemic Structures: Synergies of Control, Communications and Computing via Šiljak's Dynamics Graphs

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Abstract: By the end 19th Century, when Physical Sciences recognized solely Energy & Matter constitute the universe, genius of Alexander M. Lyapunov had his vision to comprehend where within the differential equations of rigid-body motion, equilibrium and orbit steady-state motion the Information on Stability of Motion is naturally encoded or being hidden. At the beginning of the 21st Century, when Physical Sciences recognize well synergies of Energy & Matter with Information, genius of Dragoslav D. Siljak had his vision to comprehend how and where within General Algebra Physics of the Generalized Motion Dynamics (i.e. evolution) mathematical isomorphism of weighted directed graphs and associated isomorphic concept of ***N***x***N*** adjacency (i.e. interconnection) matrix carry hidden information on Evolution Dynamics, consistently compatible with Lyapunov Stability Theory. Thus, he created new Theory of Dynamic Graphs and their application to synthesize Complex Networks and Systemic Structures by designing coherent Coordination & Control infrastructure during period 2006-2008.

These long sentences summarized the most outstanding value by means of which Prof. Dragoslav D. Siljak, Science Grandmaster of Large-Scale and Interconnected Complex Systems theories, has placed the unique crown of life-long endeavors in Systems Engineering Science & Multidisciplinary Applications. In this way indeed he fulfilled his ideas first put forward in 2005 article "Control of Complex Systems: Beyond Decentralized Feedback". This keynote lecture shall to highlight the essentialities of sound systematic development of very many fundamental discoveries Prof. Siljak has contributed Systems & Cybernetics Sciences and also to demonstrate the continuous complementing theoretical consistency of his concepts and ideas have been materialized with profound mathematical rigor. Shiljak's dynamic graphs have been conceptualized in a specific linear space as one-parameter group of transformation mappings of graphs space into itself. On the grounds of the isomorphism of graphs and adjacency matrices, via methodology of qualitative theory of differential equations, a new concept of Lyapunov dynamic connective stability for complex systems was introduced. Furthermore, a dynamic interaction coordinator was added to complex network system to ensure the needed level of interconnections between subsystems is preserved as connectivity stable equilibrium or steady-state orbit of the overall networked plant system despite uncertain structural perturbations. Finally certain confluence parallels between Siljak's coordinator and Chen's random-pinning supervisory controls shall be revealed.

Short Bio:

Prof. Georgi Dimirovski holds B.S., M.S., and Ph.D. degrees in Electrical Engineering. He is a retired Research Professor of Automation and Systems Engineering at Doctoral School FEIT, St. Cyril and St. Methodius University in Skopje, North Macedonia. During his career, he taught at universities in Turkey, Hungary, Austria, Belgium, and England. He has published numerous journal articles and conference papers. He served two terms on the Executive Council of the European Science Foundation. Prof. Georgi Dimirovski, among other functions and duties in the professional associations, was the president of the Yougoslavia association for ETAN sited in Belgrade, Serbia (1986-1990), elected President of the Institution of Engineering-Scientific Societies of Macedonia (1994-1997), and President of the Society for ETAI, Skopje N.Macedonia. He is currently an Academician and Vice-President of the International Academy for Systems and Cybernetic Science. Currently, Professor Dimirovski's main research interests are focused on complex dynamic networks and systems, synchronization of complex networks as well as on fuzzy-logic and neural-network topics of computational intelligence for applications in decision and control.