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## Plenary Lecturer II

# Swarm Intelligence Optimization Algorithms in Image Processing

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Image processing is one of the most applicable scientific areas; it has been widely used in medicine, astronomy, quality control, security etc. Image processing is a large collection of very different techniques. The only common element is the digital image itself, while low level signal processing, medium level morphological processing and segmentation for feature detection and high level artificial intelligence algorithms for object recognition, information extraction, representation and understanding, belong to completely different areas. On these different stages of image processing some hard optimization problems occur. For example, multilevel image thresholding is a step in segmentation, but even though this problem at first sight seems to be simple, to determine optimal  $n$  numbers in the range 0-255 is NP-hard combinatorial problem. Such hard optimization problems have been recently successfully solved using nature inspired metaheuristics. Swarm intelligence is an important branch of this class of nondeterministic optimization methods. Here we present successful application of the latest swarm intelligence algorithms: Firefly algorithm, Cuckoo search and Bat algorithm to multilevel image thresholding.

**Brief Biography of the Speaker:** Milan Tuba is Professor of Computer Science and Provost for mathematical, natural and technical sciences at Megatrend University of Belgrade. He received B. S. in Mathematics, M. S. in Mathematics, M. S. in Computer Science, M. Ph. in Computer Science, Ph. D. in Computer Science from University of Belgrade and New York University. From 1983 to 1994 he was in the U.S.A. first as a graduate student and teaching and research assistant at Vanderbilt University in Nashville and Courant Institute of Mathematical Sciences, New York University and later as Assistant Professor of Electrical Engineering at Cooper Union Graduate School of Engineering, New York. During that time he was the founder and director of Microprocessor Lab and VLSI Lab, leader of scientific projects and supervisor of many theses. From 1994 he was Assistant Professor of Computer Science and Director of Computer Center at University of Belgrade, from 2001 Associate Professor, Faculty of Mathematics, and from 2004 also a Professor of Computer Science and Dean of the College of Computer Science, Megatrend University Belgrade. He was teaching more than 20 graduate and undergraduate courses, from VLSI Design and Computer Architecture to Computer Networks, Operating Systems, Image Processing, Calculus and Queuing Theory. His research interest includes mathematical, queuing theory and heuristic optimizations applied to computer networks, image processing and combinatorial problems. He is the author or coauthor of more than 150 scientific papers and coeditor or member of the editorial board or scientific committee of number of scientific journals and conferences. Member of the ACM since 1983, IEEE 1984, New York Academy of Sciences 1987, AMS 1995, WSEAS, SIAM, IFNA.