International Workshop in honour of life and works of
PROF. BILL FITZGERALD
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Title of the contribution: Computational Intelligence in Biomedical Signal and Image Processing
(Subtitle: Detection and Classification of Object Features in Neurology, Motion Analysis and 3D Modelling)

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A short CV:
Ales Prochazka received the Ph.D. in 1983 and was been appointed as a professor in Technical Cybernetics by the Czech Technical University in 2000. Since 1980 he has been the Head of the Digital Signal and Image Processing Research Group with interests in computational intelligence, human-machine interaction, mathematical methods of multidimensional data analysis, 3D modelling, and image processing. His research interests include segmentation, feature extraction and classification in biomedical and engineering applications. Further activities are related to his memberships in scientific boards of the Czech Technical University and international scientific societies (IEEE, IET, EURASIP).

Abstract:
Computational intelligence and digital signal processing methods form an integrating platform for many diverse research branches. The paper presents in its initial part a very brief historical background to this area and the scientific contribution of Professor Bill Fitzgerald in these historical links. The interdisciplinary role of multidimensional and multichannel signal processing is then demonstrated for specific case studies related to biomedical applications and human-machine interaction. A specific interest is devoted to the mathematical methods used in polysomnography, analysis of brain activities, classification of muscle disorders, motion analysis using MS Kinect, detection of gait disorders, analysis of retina images, applications in orthodontia, 3D modelling and GPS data processing. A common mathematical background interconnecting all these applications includes detection of object features, their classification by cluster analysis and Bayesian statistical methods and cross-validation of final models. Selected results point to the growing importance of digital signal processing methods forming the interdisciplinary platform for many applications of information engineering. This point of view allows to present the area of the digital signal processing as a general platform contributing to integration of sciences.

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