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Editorial

Special Issue on Bio-Inspired Algorithms for Image Processing

Sándor Szénási [1,2,†] and Gábor Kertész [1,3,*,†]

1 John von Neumann Faculty of Informatics, Óbuda University, 1034 Budapest, Hungary; szenasi.sandor@nik.uni-obuda.hu
2 Faculty of Economics and Informatics, J. Selye University, 945 01 Komárno, Slovakia
3 Institute for Computer Science and Control (SZTAKI), 1111 Budapest, Hungary
* Correspondence: kertesz.gabor@nik.uni-obuda.hu
† These authors contributed equally to this work.

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In the field of image processing, there are several difficult issues that do not have exact solutions due to incomplete or imperfect information and limited computation capacity. Some of the methods in the different subfields (classification, feature extraction, pattern recognition, segmentation, etc.) are based on the process of natural selection, the behavior of living creatures, or, especially, on the mechanisms of the brain. This Special Issue comprises six articles on original research or results of practical applications in the area of bio-inspired algorithms in the field of image processing.

The first paper by Jin Xu et al., titled Oil Spill Monitoring of Shipborne Radar Image Features Using SVM and Local Adaptive Threshold [1], introduces a solution for oil spill detection. The shipborne radar transmits electromagnetic waves to the surface, where the smooth oil film surface reduces the backscatter. The collected data are transformed from a Cartesian to Polar coordinate system, and a Support Vector Machine is applied as a binary classifier in order to detect possible oil spills.

Feiyang Chen et al. present their work, PUB-SalNet: A Pre-Trained Unsupervised Self-Aware Backpropagation Network for Biomedical Salient Segmentation [2]. Three modules are used in the presented solution for biomedical image segmentation: pretraining on a rich dataset for salient detection (P); a segmentation method that is based on the U-Net structure (U); and, an unsupervised self-aware back propagation method to update the U-Net (B). The authors reported state-of-the-art performance regarding unsupervised methods for the stated problem.

The paper, which is titled Metric Embedding Learning on Multi-Directional Projections [3] by Gábor Kertész, introduces a novel, memory efficient approach for object re-identification by learning representations in a compressed projection space. The methods are validated by applying Siamese and Triplet structured metric learning models.

Krishnamurthy V. Vemuru published the paper, titled Image Edge Detector with Gabor Type Filters Using a Spiking Neural Network of Biologically Inspired Neurons [4], which presents a model that is based on the bio-inspired Hodgkin–Huxley model. In the manuscript, an SNN that is built from these elements is introduced, and Gabor filter-based edge detection capabilities are evaluated.

In Biologically Inspired Visual System Architecture for Object Recognition in Autonomous Systems [5], the authors Dan Malowany and Hugo Guterman present the brain-inspired Visual Associative Predictive model. The attention-based method imitates the human perception mechanism, with high classification performance. The reinforcement learning-based method of training on an unsupervised stream also shows great potential.

Last but not least, in the paper of Roland Lõuk et al., titled Pavement Defect Segmentation in Orthoframes with a Pipeline of Three Convolutional Neural Networks [6], a novel ensemble neural network structure is proposed for highway pavement defect detection. The input data are masked orthoframes, which are processed in a pipeline of three models: road segmentation is followed by defect detection and, finally, defect segmentation. The paper also contains a short description of the design and development of the annotation tool.

In conclusion, we would like to thank the authors who contributed to this Special Issue. We are grateful to the reviewers for their contributions that were made to increase the overall quality of the included papers. All of the papers included in this issue went through multiple rounds of peer-review before acceptance.

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