EDITOR-IN-CHIEF'S WORD

Dear readers,

In its determination to bring you closer to the activities and works of its members the Croatian Academy of Engineering is traditionally publishing our HATZ Bulletin *Engineering Power (Vol. 13/2018)* whose guest editor as a member of our Academy is presenting his achievements in his field of expertise.

As the Academy in its commitment insists on *multidisciplinarity* without which it is difficult to imagine inclusion in the already existing level of Industry 4.0 we have asked our distinguished member of the Croatian Academy of Engineering, Department of Systems and Cybernetics and a distinguished Associate Professor at the Faculty of Electrical Engineering and Computing of the University of Zagreb, that he as guest editor presents some of his achievements in a computer approach to some areas of artificial intelligence.

I believe that you will find appropriate interest and new knowledge in this field.

Editor-in-Chief
Vladimir Andročec, President of the Croatian Academy of Engineering

EDITOR'S WORD

This issue of the HATZ Bulletin Engineering Power continues to present multidisciplinary research activities of the Academy members that are actual and have wide application areas, and thus they synthesise a number of advanced scientific disciplines and exert significant influence on numerous modern living areas. Guest Editor is Tomislav Pribanić, Ph.D., Associate Professor, Faculty of Electrical Engineering and Computing, University of Zagreb, associate member of the Academy and Head of one of the laboratories of the Center for Excellence for Computer Vision (CRV) at the same Faculty.

Editor
Zdravko Terze, Vice-President of the Croatian Academy of Engineering

FOREWORD

A large part of present technological achievements results from research and continuing advances in the field of artificial intelligence (AI). AI is a part of computer science that aims to create intelligent machines, capable of thinking, acting and learning like humans. It is an interdisciplinary field spanning a variety of subfields, among which machine learning (ML) and computer vision (CV) are generally regarded as core parts of AI. CV is a field that aims to give the computer visual understanding of the world from images. ML is a field of study that gives computers the ability to learn how to solve a certain task. It is particularly suited for problems that may seem relatively simple for humans, but are rather difficult to solve by using classical image processing approaches. CV and ML fields have a significant overlap where many CV problems can be solved using ML techniques.

Several papers listed below present a part of CV and related ML research conducted by experts from two laboratories of the Center of Excellence for Computer Vision (CRV) at the University of Zagreb Faculty of Electrical Engineering and Computing and also by CRV collaboration researchers. The first laboratory involved is Human-oriented Technologies Laboratory (HOTLab) led by Prof. Igor S. Pandžić, Ph.D., while the second laboratory involved is Advanced Shape Reconstruction and Registration Laboratory (SHARK Lab) led by Tomislav Pribanić, Ph.D., Associate Prof.

Nowadays one heavily studied ML application is certainly face analysis (FA) presented in one of the papers below. Applications of FA technologies range from marketing and entertainment to automotive industry in which, for instance, the goal is fatigue detection for vehicle driver. Another paper presented discusses two thoroughly researched CV tasks: object localization and semantic segmentation. The former attempts to find objects in the input image, where minimum bounding rectangle of the object and the associated object class are the ideal output. The latter is somewhat more detailed where each image pixel is assigned to the corresponding class label. Interesting applications can be found in traffic control systems and medical imaging. The next paper presents ML in the context of image categorization and image similarity whereby a commercial service was developed, enabling buyers of certain products to find visually similar objects of interest. The camera is the essential tool used in CV. For numerous geometry related tasks the camera requires calibration which affects many applications such as geocoding, as explained in another paper. A geometrically calibrated camera is a basis for the 3D passive and 3D active reconstruction system too. 3D scanning systems are extensively used in fashion design and development and medical applications such as human back surface analyses. The last two papers put emphasis on those two applications.

Guest-Editor
Tomislav Pribanić, University of Zagreb Faculty of Electrical Engineering and Computing