



EDITOR-IN-CHIEF'S WORD

HATZ Bulletin ENGINEERING POWER is published by the Croatian Academy of Engineering and it promotes scientific achievements of our Academy members, especially those dealing with challenging or contemporary research activities in technique and technology at an appropriate publishing level.

The Bulletin is published quarterly on an annual basis. In this issue our guest editor and prominent member of the Academy Stjepan Bogdan and his team have tried to briefly present laboratory achievements in the exploration of robotic systems of special aerial and marine robotics which today presents a future research area.

Editor-in-Chief

Vladimir Andročec, President of the Croatian Academy of Engineering



EDITOR'S WORD

Dear readers,

Mobile robotics, utilizing state-of-the-art artificial intelligence and sensory subsystems, is a 'game-changing' technological field that influences many contemporary industries and research areas.

To this end, it is our pleasure to present in this edition of Engineering Power research activities in the field of autonomous robotic systems that were conducted in three laboratories of the Faculty of Electrical Engineering and Computing of the University of Zagreb.

The Guest-Editor of this issue is Stjepan Bogdan, Associate Member of the Academy and Professor at the Faculty of Electrical Engineering and Computing, University of Zagreb. I am sure that you will enjoy reading presented contributions that cover various topics of this attractive field of modern science.

Editor

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



FOREWORD

A rapid increase in computational power of embedded computers followed by miniaturization of sensors and actuators and development of new, lightweight materials have forever changed the shape and functionalities of robots by providing the basis for the implementation of complex control algorithms, multifaceted decision making processes, perception based on high definition video streams and very precise positioning systems. This in turn provided an unprecedented expansion of robots autonomy. Witnessing this technological rise, it is not strange that societal demand and financial incentive emerged so that estimates predict that by 2025 advanced robotic and autonomous systems could have a worldwide economic impact of \$1.7 trillion to \$4.5 trillion annually with an emerging market value of €15.5 billion per year. Based on these estimates EU formed Robotics in Europe, the largest civilian research and innovation program in robotics, with the main goal of the initiative – called SPARC – to maintain and extend Europe's leading position in this strategic area. This clearly shows that the sector of development, manufacturing and application of autonomous robotic systems capable of operations in dynamic and non-deterministic environments is one of the most progressive sectors in modern economy. We have witnessed an increased interest in self-localization and mapping (SLAM), perception and cognition, and decision making in autonomous robotic systems, especially related to decentralized approaches. In comparison with centralized control, decentralized approach avoids a single point of failure which, in turn, increases overall robustness of the system, allows for inexpensive and simple agents and lowers the implementation cost. In this edition of Engineering Power we are presenting the state-of-the-art research in the area of autonomous robotic systems that was conducted by three laboratories – LABUST-Laboratory for Underwater Systems and technologies, LAMOR-Laboratory for Autonomous Systems and Mobile Robotics and LARICS-Laboratory for Robotics and Intelligent Control Systems of the Faculty of Electrical Engineering and Computing of the University of Zagreb jointly active under the brand name ROBOTICS@FER.HR. The papers presented herein include an overview and results of the cooperative robotics in marine environment through SLAM and mission planning in industrial warehouses to the implementation of robotic manipulators on unmanned aerial vehicles (UAVs).

Guest-Editor

Stjepan Bogdan, University of Zagreb, Faculty of Electrical Engineering and Computing