Prof. Dahai Zhang

Professor Dahai Zhang, Secretary-General of Division of Ocean Technology System, Chinese Society of Oceanography; Deputy Director of the Institute of Advanced Technology, Zhejiang University of (ZJU), received PhD from ZJU of Mechanical and Electronic Engineering in 2010. He worked as a postdoc at Department of Mechanical Engineering at ZJU in 2011 and worked as a postdoc at Department of Engineering in Lancaster University from 2012 to 2013. Afterwards, he joined Zhejiang University, where he is currently a Professor with Ocean College. His research interests include mechatronic systems and ocean engineering. He served as an IET Fellow and IEEE Senior Member respectively, in 2019 and 2020. Professor Zhang has worked with various research projects dealing with modelling, design and measurements of ocean renewable energy electrical machines such as wave energy converter, tidal current turbine and offshore wind turbine. He has published over 80 peer-reviewed journal/conference papers in proposed areas, and chaired 5th China Marine Renewable Energy Conference in 2016, the 3th China Ocean Technology Conference in 2017 and the 6th Asian Wave and Tidal Energy Conference (AWTEC) as organizing president in 2022.

Keynote Presentation 4

Experimental and numerical study of an evolutionary algorithm-based optimization approach for multi-mode wave energy converter

Wave energy technologies have the potential to play a significant role in the supply of renewable energy around the world. One of the most promising designs for wave energy converters (WECs) are multi-mode WECs. In this work we explore the optimization of multi-mode WECs consisting of a floating buoy at the surface and multi-axis power-take-off (PTO) systems. This type of WECs can be optimized for total power generation by adjusting both the geometry of the buoy and also the PTO design. The whole optimization problem is complex and computationally expensive due to multiple and mutually interacting parameters. An optimization approach based on evolutionary algorithms was created, which allows simultaneous optimization of the geometry of the buoys, the damping coefficient of PTOs in each axis and the geometrical layout of the multi-axis structure. For assessing the effectiveness of the proposed approach, numerical

simulations with different objective functions and search space are carried out with realistic wave conditions. Finally, an experimental study with standard models and optimized devices was conducted in order to compare the numerical results with experimentally acquired data. The results identify optimal design and configurations for multi-mode WECs, and demonstrate that the proposed optimization approach can significantly enhance the efficiency.