Research on Advanced Mobility and Robotics

Prof. Ikuo Yamamoto

Organization for Marine Science and Technology, Nagasaki University, Nagasaki, Japan

In this keynote, I will introduce our long term research on advanced mobility and robotics and how these technologies contribute to the ocean, the environment, medicine, and renewable energy. Our work consistently aims to connect theory with real world practice.

The author has developed a wide range of autonomous systems, including underwater robots (AUV and ROV), surface vehicles (ASV), robotic fish, and medical robotic devices. Early developments such as deep sea exploration vehicles and long range AUV laid the foundation for modern marine observation technologies. A major milestone was the fuel cell AUV that achieved a 317 kilometer autonomous cruise, demonstrating the potential of long distance ocean mobility.

Biomimetic robots especially life like robotic fish have opened new possibilities in both marine science and medicine. Their mechanisms inspired non slip surgical tools and robotic hands designed to improve safety and precision in medical procedures.

More recently, our autonomous systems have been applied to environmental and energy challenges, including monitoring floating offshore wind turbines, collecting ocean plastic, predicting red tides using IoT and AI, and visualizing CO_2 absorption and blue carbon processes. By linking ASV and ROV, we can observe seaweed beds and measure CO_2 concentration simultaneously, deepening our understanding of the ocean's role in climate regulation.

The authors are also contributing to the social implementation of floating offshore wind energy through a national industry academia consortium focused on human resource development, education, and international collaboration.

Overall, our research shows how advanced mobility and robotics can support a sustainable future by enhancing ocean observation, environmental protection, medical technology, and renewable energy systems.

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Experience:

40+ years in marine robotics, including AUV, ROV, ASV, and biomimetic systems.

Led deep sea vehicle projects and the 317 km fuel-cell AUV autonomous cruise.

Work in medical robotics, environmental monitoring robotics, and various mobilities.