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Development of portable high-mobility ROV for inspection of underwater structure

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Background: Underwater structures such as renewable energy port and dam are required to inspect cracks and damages periodically. The author developed portable high-mobility ROV (Remotely Operated Vehicle) for inspection and successfully tested in the sea and in the deep dam. The ROV has features of small scale, stable and light weight. Also, it has underwater compact camera, led light, tether cable and GPS in the body and base monitor and operation station in the small case. In addition, small tidal velocity sensor is equipped for sensing current speed and used for its feed forward control. The ROV won the best ROV in techno-ocean world competition of underwater robotics in 2012 and Okinawa offshore robotics contest in 2014, 2015 and 2016.

Methodology & Theoretical Orientation: The frame of ROV is first designed by CAD to be a structure based on the principal of upper float and lower weight which provides a well-balanced body. The ROV is controlled by thrusters and a micro-computer is utilized as a controller. The size of ROV is small whose specifications are length 60 cm, width 40 cm, height 20 cm and weight 6 kg. The depth of cruising is 100 m. The frame is made of an impact-resistant polyvinyl chloride pipe.

Findings: The ROV is designed to be light (portable) and high maneuverability (stable and quick response of moving) in the sea. The cruising tests have been successfully conducted in the sea.

Conclusion & Significance: The ROV can cruise in strong tidal current condition (2.0 m/s) and record moving precise target and 2D barcode in the sea.

Recent Publications

1. Ikuo Yamamoto, Development of High-Mobility Unmanned Remotely Operated Underwater Vehicle, Proc.BIT's 6th Annual World Congress of Ocean-2017, Shenzhen, China, Session 5 Advanced Offshore and Underwater Technology, pp:066,2017
2. Ikuo Yamamoto, Development of Bio-inspired Robotic Fish Technology for the Next Generation Machinery, Proceedings of BIT's 3rd Annual World Congress of Smart Materials-2017,Bankok,Tailand ,pp.281,2017

3. Masahiko Mizui, Ikuo Yamamoto, Shunsuke Kimura and Masato Maeda (2017) Research on hammering test system by unmanned aerial vehicles for infrastructure surveillance. Springer Proceedings in Advanced Robotics 1:25-32.
4. Ikuo Yamamoto (2017) Robotic fish development for the next generation underwater vehicle. Advances in Science and Technology 101:95-103.
5. Ikuo Yamamoto, Practical Robotics and Mechatronics: Marine, Space and Medical Applications, IET(The Institution of Enginnering and Technology,UK,ISBN 978-1-84919-968-1, PP 1-192.

Biography

Ikuo Yamamoto is a Professor of Nagasaki University, Japan and has developed many world-class practical examples of robotics and mechatronics during his 30 years of experience as an Engineer and a Professor. His experience comprises of working with Mitsubishi Heavy Industries Ltd., JAMSTEC and as Professor at Kyushu, Kitakyushu and Nagasaki University. He was leader of AUV Urashima, which established the world record for autonomous cruising and developed Kaiko and Seabot, which was crowned champion remotely operated vehicle at 10000 m depth cruising and at the world convention 2012, 2014, 2016 and his robotic fish swam in the International Space Station in 2009. He first successfully flied multi-rotor flight robotics with real-time monitoring and environmental sensor systems in Japan, 2008. International awards for developing medical robotics in 2014 and 2015. He is nominated for Global Scot, Scotland Government and UK in 2017. Most of the developed robotics and mechatronics continue to be used safely in real-world environments.

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