Zhizun Xu

PhD

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About me

Dr. Xu is the kind of a tech enthusiast who is eager to study and develop cutting-edge technologies. His doctoral dissertation is about the visual navigation and control for underwater vehicles. Currently, his research mainly focuses on the visual-inertial sensors' fusion to improve the accuracy of underwater conventional navigation systems. He is skilful at C/C++ coding, and ROS(Robot Operating System). Simultaneously, he has many engineering experiences on robots fabrication and building data collection devices. In addition, he is a really ambitious and the person who enjoy working in team.

Skills

C-C++

Robot Operating System

Python

(*)[The skill scale is from 0 (Fundamental Awareness) to 6 (Expert).]

Education

2017-2021 Newcastle University — UK
Doctor of Philosophy, Marine Technology

2014-2016 Mokpo Maritime University — South Korea
Master of Science, Electric & Control Engineering

2010-2014 Shanghai Maritime University — China
Bachelor of Engineering, Marine Engineering

Working Experiences

2023-Today Research Associate — Newcastle University
Underwater Glider Software Development, Underwater Positioning, Underwater VO/SLAM

2021-Today Lecturer — Guangdong Ocean University
Underwater Robotics, Visual-Inertial SLAM, Probabilistic Robotics, Marine Engineering English

Projects

2022-2025 Research on Maritime Ship Meteorological Navigation Method Driven by Uncertain Space-Time Information
General Program Granted by National Natural Science Foundation of China, No.51879024
Amount:500,000 RMB

2021-2024 Research on Signal Detection of Man Overboard Based on Dynamic Deep Learning Network
Supported by Educational Commission of Guangdong Province of China, No.2021ZDZX1008
Amount:300,000 RMB

2021-2024 Multi-degree-of-freedom Motion Attitude Control and Energy Consumption Analysis of Underwater Robot in Multi-velocity Mode
Supported by Zhanjiang Science and Technology Bureau, No.210826094540239
Amount:100,000 RMB

2021-2026 Underwater Comprehensive Perception System Based on Optical Sensors
Supported by Scientific Research Foundation for Returned Scholars, Guangdong Ocean University
Amount:800,000 RMB

Awards

2022 Best Paper
The 8th Ai-MAST Conference, China

2021 Second Prize
National Underwater Robotics Competition, China

2020 Second Place for Presentation
SAg Faculty PGR Conference, Newcastle University, UK

Publications

- Xu, Zhizun, et al. "A Comparison of Functional Control Strategies for Underwater Vehicles: Theories, Simulations and Experiments." Ocean Engineering 215 (2020): 107822.
- Xu, Zhizun, et al. "An Integrated Visual Odometry System for Underwater Vehicles." IEEE Journal of Oceanic Engineering 46.3 (2020): 848-863.
- Xu, Zhizun, et al. "An Underwater Visual Navigation Method Based on Multiple ArUco Markers." Journal of Marine Science and Engineering 9.12 (2021): 1432.

- Xu, Zhizun, et al. "A Low-Cost Visual Inertial Odometry System for Underwater Vehicles." 2021 4th International Conference on Mechatronics, Robotics and Automation (ICMRA). IEEE, 2021.
- Yang, Hongbo, Zhizun Xu, and Baozhu Jia. "An Underwater Positioning System for UUVs Based on LiDAR Camera and Inertial Measurement Unit." Sensors 22.14 (2022): 5418.
- Xu, Zhizun, et al. "An Integrated Visual Odometry System With Stereo Camera for Unmanned Underwater Vehicles." IEEE Access 10 (2022): 71329-71343.
- Xu, Zhi-Zun, et al. "Design of a Sliding Mode Control-Based Trajectory Tracking Controller for Marine Vehicles." Journal of Navigation and Port Research 42.2 (2018): 87-96.
- Xu, Zhizun, et al. "UGSim: Autonomous Buoyancy-Driven Underwater Glider Simulator with LQR Control Strategy and Recursive Guidance System." arXiv preprint (2025).
- Merveille, Fomekong Fomekong Rachel, et al. "Enhancing Underwater SLAM Navigation and Perception: A Comprehensive Review of Deep Learning Integration." Sensors (Basel, Switzerland) 24.21 (2024): 7034.
- Merveille, Fomekong Fomekong Rachel, et al. "Enhancing Underwater SLAM Navigation and Perception: A Comprehensive Review of Deep Learning Integration." Sensors (Basel, Switzerland) 24.21 (2024): 7034.

Research Experiences

- Study of the Visual-Inertial Odometry System for Underwater Vehicles
  The proposed algorithms fusing data from a camera, a sonar, and a gyroscope, localise underwater vehicles in sparse environments, whilst being at low cost. Practical experiments illustrated that such methods have a high accuracy in the KITTI benchmark Ranks.

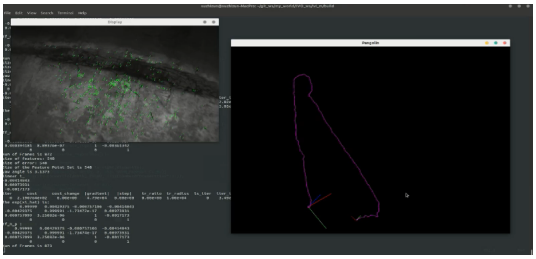

Figure 1: Visual-Inertial Odometry System Fusing the Sonar Information

- Underwater Navigation with Multiple ArUco Markers
  The multiple ArUco markers are set out beforehand. With the knowledge of the computer vision, such markers may be detected by a camera. Simultaneously, the pose of the camera related to markers is calculated without suffering from the accumulative error.

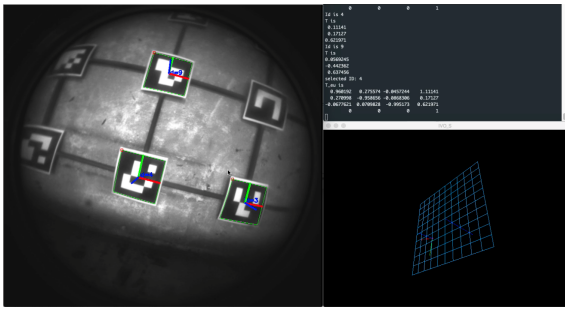

Figure 2: Pose Estimation by Multiple ArUco Markers

- Using LiDAR Camera with IMU to Localise Underwater Vehicles
  The LiDAR camera, benefiting from the laser scanning techniques, could generate the associated depth maps. With the altitudes provided by the IMU, the positions of underwater vehicles can be estimated.

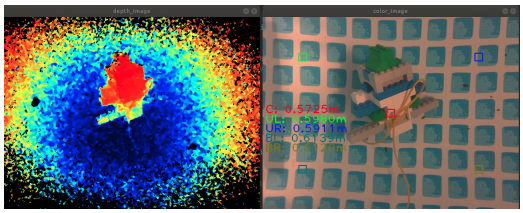

Figure 3: LiDAR Camera Generating the Depth Map for Objects in Water

- Design & Fabrication of Multi-Function ROV
  In order to collect data and evaluate proposed navigation and localisation algorithms, the multi-function ROV is built. It is of open-frame type, and has a modular design, with extra functionality loaded on demand.

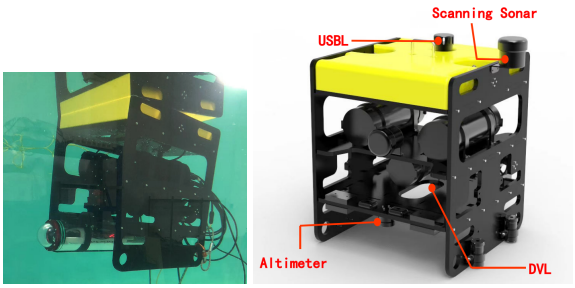

Figure 4: ROV Testing(Left) and 3D Rendering Model of ROV(Right)

- Autonomous Buoyancy-driven Glider Simulator
  We proposed the UGSim, a simulator for buoyancy-driven gliders. It is designed to address unique challenges that come from the complex hydrodynamic and hydrostatic impacts on buoyancy-driven gliders, which conventional robotics simulators can't deal with.

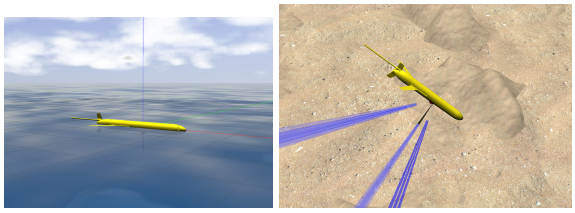

Figure 5: The Glider Floating and Descending