

**Working Certificate**  
**Chongyu Zhang**

This is to certify that Mr. Zhang, born on 12.04.1997, worked as a student research assistant in the SeaClear project for the underwater autonomous robots development at our chair from 01.12.2021 – 30.06.2022 (9 hours/week).

The research focus of the Chair of Information-oriented Control (ITR), Department of Electrical Computer Engineering, Technical University of Munich, is control and optimization of cooperative, networked, and distributed dynamical systems.

Mr. Chongyu Zhang was engaged in the SeaClear project "SEarch, identificAtion and Collection of marine Litter with Autonomous Robots". The content of the project is the development of autonomous robots for underwater litter collection. Thereby, the modelling of the overall robot dynamic system, the modelling of the control units as well as the simulation with software and hardware are need to be mastered.

The task of Mr. Chongyu Zhang consists of the following activities:

- Literature retrieval and implementation methods
- Modelling the robot dynamic system with Matlab/ Simulink and C++ for ROS, Modelling the control units with Matlab/ Simulink and Check the control units in ROS
- Help with the construction of underwater environments by using C++ and Gezebo
- Simulation with Gazebo and Real-time Simulation
- Tasks about IMU/ DVL data processing and computer vision

Mr. Chongyu Zhang is always well motivated. As a research assistant, he has good knowledge in the field of modelling for underwater autonomous robots and simulation with ROS. He works safely and independently, and always delivers the results in a very good quality in the proper timing. Even if it is a new technology, he tries to study by himself and figure out the answer.

We thank Mr. Chongyu Zhang for his successful and productive cooperation and would employ him at any time again.

Munich, 05.07.2022

(S. Hirche)  
 Univ.-Professor



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