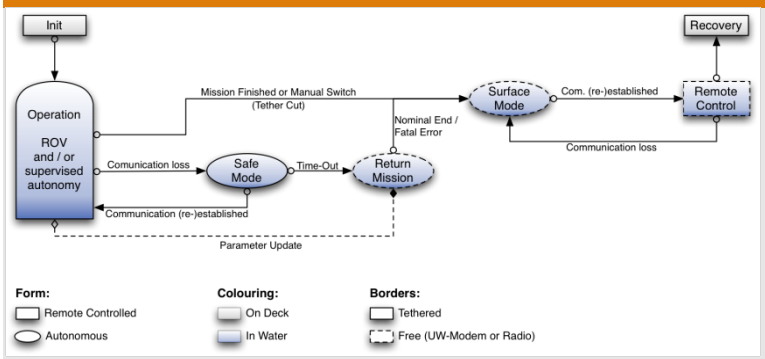
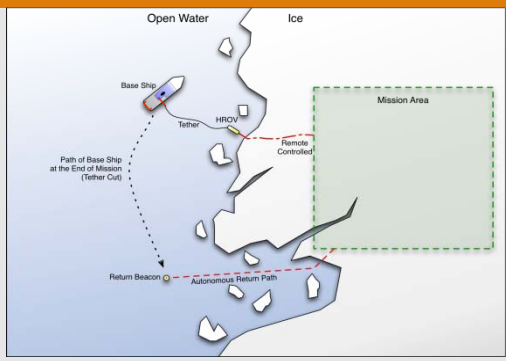
German Research Center for Artificial Intelligence GmbH

HROV - Arch

Control Architecture for a Hybrid-ROV



The different system states of the new architecture



A typical profile of a final HROV mission

The goal of this project is the software design of the control architecture of the HROV (Hybrid Remotely Operated Vehicle) system. This project is the initial project of the MarTech virtual institute (a collaboration of MARUM, DLR-RY and AG Robotik/DFKI Robotics Innovation Center). The operative goal of the HROV is the operation under ice, where the system is controlled by a human operator via a fiberglass link most of the time, and switched to full autonomy when contact is lost on accident or the vehicle has to return to the mother vessel. The HROV system is designed and integrated by MARUM, the control architecture concepts and the framework are developed by DFKI.

Designing the control system of a hybrid ROV/AUV is a challenge. Such a system has to be able to switch from human control to a complete autonomous recover mission within instant. This implies a thoroughly designed multi-mode control architecture with a reliable and adaptive fault detection and fault response system.
The primary goals for DFKI are:

Development of a Multi-Mode Control Architecture
The architecture must be a mixture between reactive execution, interactive task execution and execution of pre-defined mission plans. It is absolutely mandatory that at any time a control task is active, which keeps the HROV in a safe mode of operation while performing. The case of the vehicle being dead in the water has to be avoided under all circumstances. The basic idea, which will be used to solve this problem, is by using a component-based approach with a top-down specification and a bottom-up implementation.

Development of Fault-Detection and Fault-Response System
For the operation of an AUV as well as a ROV fault detection and fault response systems (FDFRS) are an absolute necessity. In the case of HROV, this system is even more important: the loss of communication via the fiberglass in ROV mode has to be detected, and the HROV must return to its mother ship by itself in a safe manner. It is planned to design a hierarchical FDFRS, which is tightly integrated into the control architecture.

Extension of ROCK
The robot construction toolkit (ROCK), designed by DFKI, is the base system for the implementation of the HROV control architecture. Within the HROV project ROCK will be extended by drivers for typical maritime sensors and actors (DVL, Sonar etc.) and hardened for long term autonomy and control.

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Partner:

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Sponsor:

Bremen

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