

AUV^x

Miniaturized underwater vehicle

System Description

The autonomous underwater vehicle AUV^x is designed as a miniaturized exploration and research vehicle. Its shape is particularly adapted to the requirements of the EurEx project: with its small diameter it fits into the underwater vehicle Leng. In the EurEx context, the AUV^x must be able to locate the μ Gliders, which act as reference points, and subsequently return to the starting point. Furthermore it is supposed to do near field exploration. Therefore the vehicle is equipped with a variety of different sensors. In addition, a camera allows to use image recognition algorithms under water. These properties make the system perfectly fit for its tasks in the EurEx mission scenario. Furthermore, in the project DAEDALUS the AUV^x serves as a demonstrator for using the Trackingtag in a robotic context. To maintain a high degree of energy efficiency while doing underwater locomotion, the hull was hydro-dynamically. Another unique feature are the magnetically coupled thrusters which ensure that the electronics inside the thrusters is hermetically protected against the surrounding water. The AUV^x can also be operated remotely as a hybrid ROV (Remotely Operated Vehicle) with an optical communication or copper wire cable.



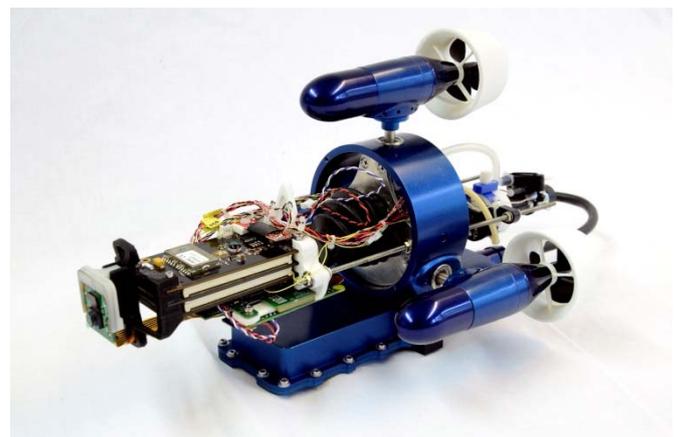
Application: Underwater robotics, Space robotics

Projects: **DAEDALUS**
Architectures and sensor data processing for energy-efficient control of self-powered tracking systems
(08/2013 - 01/2017)

EurEx
Europa-Explorer
(12/2012 - 04/2016)

Technical details

- **Weight:** 2120 g
- **Size:** 393 x 188 x 200 mm³ (15 x 7.5 x 7.8 in³)
- **Maximum diving depth:** 7.8 m (25 feet)
- **Propulsion:** 3 by 180 ° turnable thrusters which were developed at DFKI; all equipped with magnetic coupling; the propulsion is achieved with Maxon gearmotors
- **Maximum velocity:** 0.5 m/s (20 in/s)
- **Vertical movement:** Besides a thruster driven vertical movement, the AUV^x can hover statically in the water column with the help of a ballast tank without wasting energy.
- **Ballast tank volume:** 30 ml
- **Battery runtime:** 4 h
- **Batteries:** 9 NiMH Eneloop accumulators, 11.2 V / 2.3 Ah
- **IMU:** ADXL345 accelerometer, HMC5883L magnetometer, ITG3200 gyroscope
- **Pressure sensor:** Freescale MPX5100DP, sensitivity 45 mV/kPa, range: 0 to 100 kPa (4.5 mV/cm)
- **Camera:** 8 MP Pi camera
- **Underwater communication:** Optical or by wire
- **Control and processing power:** Custom FPGA board, DAEDALUS BaseBoard including a STM32 and Pi Zero



Contact:
DFKI GmbH & University of Bremen
Robotics Innovation Center

Director: Prof. Dr. Frank Kirchner
Phone: +49 421 - 178 45 - 6633
E-mail: robotik@dfki.de
Website: www.dfk.de/robotics