German Research Center for Artificial Intelligence

YEMO 1.1

Semi Autonomous Micro Rover for Underwater Applications

System Description

YEMO is an underwater micro rover that features extraordinary mobility and agility at the seafloor. It was engineered based on the already successfully deployed ASGUARD robot of DFKI. This allows the employment of the robot in difficult environments, both ashore and under water – without having the need to perform additional modifications. The installed power supply facilitates remotely controlled and semi autonomous applications; when using the robot under water, the communication with the user is established using a buoy. Beyond that, a camera with a 360-degrees-field of view enables quick exploration and mapping of the seafloor and offers a solid sensor base for autonomous execution of tasks.

Underwater test drive on seaweed field (June, 2015)

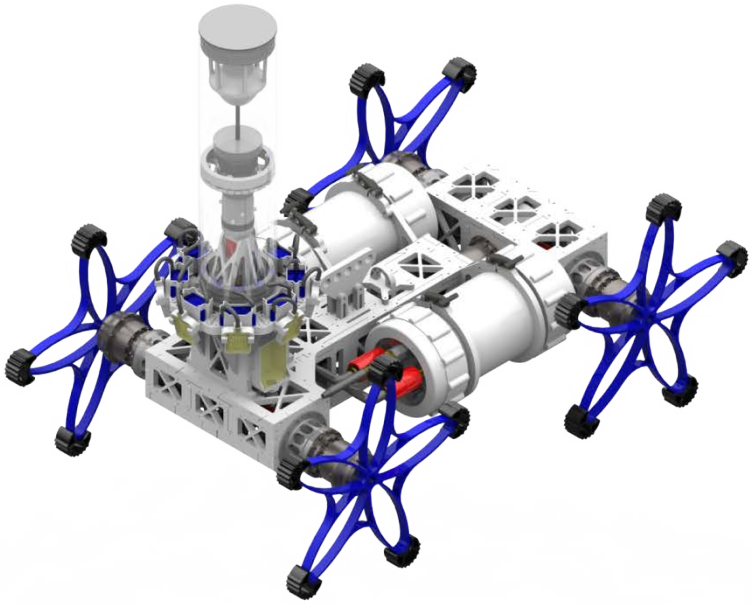
The rover is already prepared for conduction of long term applications: exclusive use of non-corrosive materials facilitates deployment in salt water environments; usage of an umbilical cord gives a reliable permanent power supply.

Technical Details

- **Size:** 1,10 m x 0,70 m x 0,90 m
- **Weight:** approx. 27 kg (w/o payload), immersed: approx. 4 kg (w/o payload) (10 kg payload capacity)
- **Runtime:** up to 120 min
- **Speed:** 0,7 m/s
- **Diving depth:** 50 m
- **4 wheels drive:** Robodrive ILM50x14 BLDC motor with Harmonic Drive gear (50:1)
- **Wheels:** star shaped (5-legged)
- **Camera:** AVT Mako (2048 x 2048 px, 10 fps), facing hyperbolic mirror for 360-degrees-panoramic view
- **IMU:** iNEMO-M1
- **GPS:** Ublox NEO-6
- **Communication:** 2,4 Ghz Wi-Fi access point, 802.11b/g/n under water: 55 m 1 GBit Ethernet cord
- **Power supply:** lithium polymer primary battery: 29,6 V, 7 Ah (opt. additional batteries in the surface buoy or external power supply)
- **Drive:** passive rolling joint at the rear axis (limited to +/- 30 degrees)
- **Structure:** optimized for corrosion endurance
  - Water jet cut plastic plates for bearing structure, connected using stainless steel screws
  - Titanium pressure housings for the motors
  - Pressure housings for electronics made from PVC and acrylic
- **Floodlights:** 8 x 13,1 W LED (1416lm each, dimmable)
- **HMI:** 48 full color LED in a ring for status displays (individually controllable)

Applications: Space Robotics, Underwater Robotics

Projects: **MOONWALK**
Technologies and Human-Robot Collaboration for Surface EVA Exploration Activities and Training in European Analogue Environments (09/2013 - 08/2016)



CAD Model of YEMO with features planned for the project MOONWALK (as of December, 2015)

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