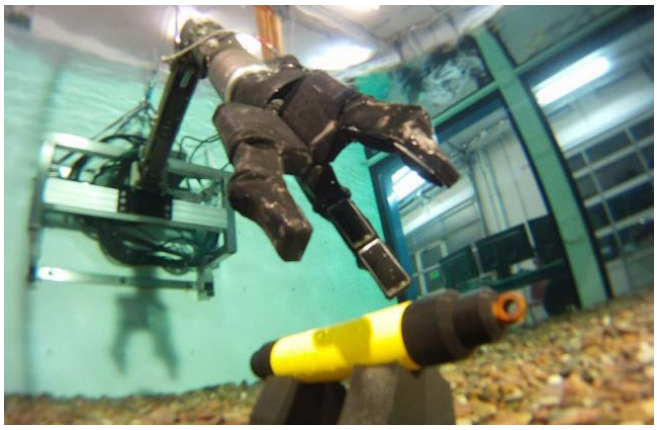
German Research Center for Artificial Intelligence

SeeGrip

A deep-sea fine-manipulation system with a sense of touch

System Description

The SeeGrip manipulation system is a three-fingered manipulator with seven degrees of freedom. The system is designed to be working in deep-sea, at depths of up to 6000 m. A variety of tactile sensors of different modality equip this gripper with a sense of touch, which is one of the specialities of this gripper.



Technical Details

- **Dimensions**: 450 mm x 120 mm x 120 mm
- **Power supply:** 12 V DC, 2 A nominal, 7 A peak
- **Weight:** 9.5 kg (in air)
- **Maximum operating depth:** 6000 m
- **Degrees of freedom:** 7
- **Gripping force: 100 N**
- **Actuation:** 32 x Nano-Dosing valve for hydraulic actuation of the finger modules, BLDC motor for rotating the two outer fingers
- **Communication:**
  - 100 MBit Ethernet via SubConn-Deepsea Connector
- **Sensors:**
  - 3 x 6-axis force-torque-sensor
  - 6 x piezoelectric sensor-arrays, each with 20 sensor elements
  - 6 x fiber-optic sensor-arrays, each with 72/324 sensor elements
  - 6 x absolute-angular encoders
  - 1 x inertial-measurement-unit
  - 12 x relative pressure sensors for the hydraulic circuit
  - 3 x absolute pressure sensors for the hydraulic circuit
  - 26 x temperature sensors for monitoring the System state and the environment
  - 1 x humidity sensor
- **Processing electronics**
  - 11 x Xilinx Spartan 6 FPGA
  - 12 x CyPress PSoC 5
  - 1 x analog devices Blackfin DSP
- **Perceived amount of data with tactile sensor information:**
  - ~ 300 MB/s

Application: Underwater Robotics

Projects: **SeeGrip**
Autonomous underwater gripper with tactile feedback for form- and force closed object manipulation.
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