

SeeGrip

Autonomous Underwater Gripper with Tactile Feedback for Form- and Force Closed Object Manipulation.

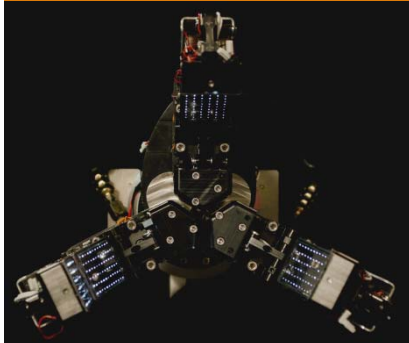


Fig. 1: Front view of the newly developed gripper (without skin)

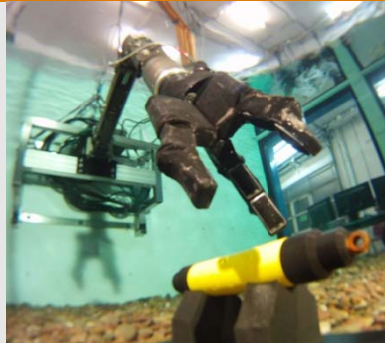


Fig. 2: The Seegrip manipulation system attached to the Orion 7 P

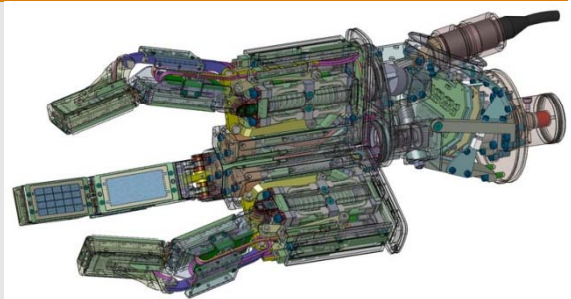


Fig.3: CAD drawing of the Orion 7P Manipulation system

An Underwater Manipulation System of the next Generation

In the SeeGrip project an underwater gripper will be developed that is able to perform form- and force-closed object manipulation by using sensor feedback. The characteristics of this system are its structure consisting of flexible multi-limb end-effectors and the detection of contact-forces applied by gripped objects through tactile sensor elements.

With the increasing shortage of mineral resources near the earth's surface, there is an increasing interest in raw materials production from deeper areas. The oil rigs of the newest generation are anchored in a depth of around 2.400 m. As divers cannot reach those depths, assembly and maintenance of the needed pump systems and pipelines have to be carried out by ROVs.

Conventional manipulation systems for the use in offshore environments consist of a manipulator arm with up to seven degrees of freedom and a parallel gripping end-effector. The present master-slave control of such manipulators has already been enhanced by a semi-autonomous mode during the successful CManipulator project at the DFKI Robotics Innovation Center. Still, manipulation tasks can only be monitored visually by cameras mounted on the manipulator or ROV. Caused by sea currents and the thrusters of the ROVs, sediment from the seafloor is raised, which restricts the view of the operational area. In some cases this even leads to the break-off of manipulation tasks which can

only continue after having waited for many hours for better viewing conditions.

In the SeeGrip project, a new kind of underwater manipulator will be developed that massively supports the demanding tasks of the coming years in the offshore industry as well as in the exploration of the deep sea. Sensitive manipulation tasks will be possible through the flexible multi-limb structure. The integrated tactile sensor elements of the gripper will give direct feedback about objects that are in direct contact with the manipulator. This enables the realization of manipulation tasks even under bad viewing conditions.

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Contact:
DFKI Bremen
Robotics Innovation Center

Director: Prof. Dr. Frank Kirchner
Telefon: +49 - 421 - 17845 - 4100
E-mail: robotics@dfki.de
Website: www.dfki.de/robotics