High-tech Solutions for Underwater Applications

From the coast to the deep sea, oceans provide various research challenges and economic forms of use. The Fraunhofer institute presented how these can be developed by means of technology at this year's Oceanology International (OI) in London, UK.

The oceans of the world are a frequently used transport route, high-quality food source, supplier of crude oil and natural gas and also of mineral resources. Technologies to sustainably utilise these resources must meet the highest standards and comply with the special circumstances under water, such as high pressure, visibility conditions and currents. Fraunhofer institute therefore develops high-tech solutions for a variety of underwater applications, from aquaculture to marine mining. The spectrum ranges from sensor technology via the development of prototypes for complete and autonomous underwater vehicles (AUV) all the way to visual computing.

Underwater Monitoring
Monitoring is one requirement for understanding the oceans and indispensable for the safe operation of underwater installations. Flexible and intelligent underwater vehicles are needed: one of the Fraunhofer researchers' fields of activity. Thanks to pressure-tolerant systems, these are suited for deep-sea applications even without special pressure vessels. The exhibited DEDAVE vehicle can operate in a depth of up to 6,000 meters with enough energy for missions lasting up to 20 hours. Various sensor systems, the virtual eyes and ears of the vehicle, are particularly important for the monitoring process. Exhibited are, for instance, innovative sonar systems which are not only used to measure distances on a point-by-point basis but are able to map entire volumes in a high resolution.

Underwater Images
Video is meanwhile standard equipment in underwater vehicles. The video recordings provide assistance in the spatial coverage of the surroundings, the recognition of objects, the detection of leakages or in surveying. Less light, different computing properties, distortions – taking images or recording videos underwater is difficult. Special image processing methods improve the quality of the images, making it possible to utilise them for industrial and scientific applications. In London, Fraunhofer will show results from an R&D cooperation with the company Pinkau.

Visualisation as Man-machine Interface
The collected data constitute the basis for the support in decision-making situations: public approval procedures, investment in the development of mineral resources or risk assessment in the case of maritime disasters. Here, the data volume and the wide spread and heterogeneity of the data amounts represent one challenge – the raw sensor data must be structured and filtered. Interactive visualisations provide the user with a precise image of the various sensor data and facilitate a swift analysis.

Interdisciplinary Cooperation
From the collection of data, their processing, evaluation all the way to interactive visualisation – due to the cooperation of specialised institutes, Fraunhofer offers a broad technology portfolio to its marine technology and marine research customers.