100% independent diving robots to come to life

European Commission

The team is working on creating a new generation of diving robots that will be totally independent and free of the constraints of existing autonomous underwater vehicles (AUVs). The latter can collect data independently or take samples before they return to their starting points, but 'for the time being, the technology is too expensive to carry out routine work, such as inspections of bulkheads, dams or ships' bellies,' explained Dr Thomas Rauschenbach from the Fraunhofer Institute's Application Center System Technology in Germany.

However, he believes that these limitations may soon become a thing of the past as researchers under his leadership are working to create autonomous underwater robots which will be smaller, more robust and cheaper than previous models. They will be able to find their bearings in all types of water, from clear mountain reservoirs to turbid harbour waters, and will be equally at home on the deep sea floor or, for example, inspecting the shallow concrete bases on which offshore wind power stations are mounted, according to the team.

Scientists from various branches of the Fraunhofer Institute are designing different parts of the robot. One group of engineers is working on the 'eyes' — optical perception is based on a special exposure and analysis technology that will even permit the robots to orientate themselves in turbid water, the researchers pointed out.

The 'eye' will first determine the distance to an object, before a camera emits a laser impulse which will be reflected by the object, such as a wall. Then, microseconds before the reflected light flash arrives, the camera will open the aperture and the sensors will capture the incident light pulses.

Another group of experts is developing the robot's 'brain'. According to the researchers, this is a control programme that will keep the AUV on course even in strong currents. Meanwhile, a fourth team of engineers is designing the silicone encapsulation for the pressure-tolerant construction of electronic circuits as well as the 'ears' of the new robot. These will be ultrasound sensors that will allow the robot to inspect objects. The researchers explained that contrary to the previously-used conventional sonar technology, they are now using high-frequency sound waves which are reflected by the obstacles and registered by the sensor.

Scientists from the Fraunhofer Institute for Environmental, Safety and Energy Technology have developed a special energy management system that saves power and ensures that all data are saved in an emergency before the robot runs out of energy and has to surface.

A torpedo-shaped prototype robot two metres long that is equipped with eyes, ears,

a brain, a motor and batteries will go on its maiden voyage this year in a tank in Germany. The tank is only three meters deep, but 'that is enough to test the decisive functions,' said to Dr Rauschenbach. The autonomous diving robot will put to sea in autumn 2011 for the first time from the research vessel POSEIDON; several dives up to a depth of 6 000 metres are scheduled to be performed.

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