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Cooperative Mobile Systems for Ocean Floors

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The objective of our work is to enable robotic exploration of unknown, remote areas of the Earth's seafloor as well as for conjectured seafloors on other planets of our solar system like on the Jupiter moon Europa. We expect that the combination of vehicles with different mobility concepts will significantly enhance the capabilities for detailed mapping of geological and biochemical properties in entirely unexplored regions. The two vehicle concepts presented here are differing in their mobility range and speed, their climbing and obstacle management performance and, through this, form a complementary team for the described task.

A dedicated development of a mobile ocean-floor platform has been implemented by the University of Bremen and the German Aerospace Center DLR, exploiting synergies between deep sea technologies on the one hand and planetary rover systems on the other. Overall mass of this vehicle is in the 600 kg range with a weight in water of approximately 400 N (adjustable by buoyancy bodies). The main innovation in the chosen mobility system is the use of four flexible metallic wheels which offer increased ground contact with low slip approaching the performance of tracked systems, being superior to competing solutions involving rigid wheels. Results from vehicle trial deployments will be reported.

Based upon a technology demonstrator of a walking robot, the 'Scorpion', again at the University of Bremen, a much smaller and more agile mobile system is being developed to be used in conjunction with the larger, wheeled vehicle, forming a community of cooperating robots. Whereas the wheeled system can be used to explore relatively large areas of flat ground, the legged system - initially deployed by the wheeled ve-

hicle - will explore rough terrain integrating the various spatial structures into one picture. The representation of the environment in the wheeled vehicle will include mainly metric data, whereas the representation in the legged robot will be more based on topological data from categories the system can learn on the basis of its proprioceptive data. It is expected that a complete representation of the environment, combining these different views, provides a more complete picture and can be used to refine the exploration strategy of each vehicle, such as needed for e.g. a detailed mapping of a specific part of the seafloor.