ARCHES
Multi-robot cooperation

ⓘ Brief description

ARCHES (Autonomous Robotic Networks to Help Modern Societies) is a new Helmholtz Association future research topic that deals with cooperating robots. In future, these should be able to overcome challenges during planetary exploration and deep-sea research in autonomous robotic networks.
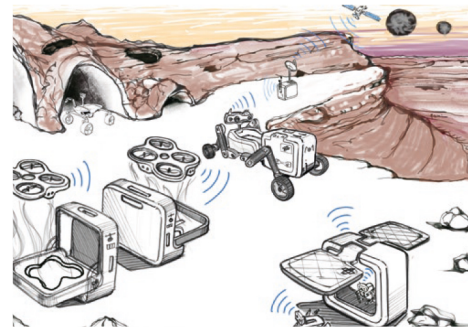
◎ Aims

The use of autonomous, networked robotic systems is the only way to achieve continuous, long-term and long-range data acquisition, as well as the direct manipulation of and interaction with the surroundings. There is therefore an urgent need to develop key robotic technologies and methods that permit large-scale monitoring and object manipulation. Such a robotic network will act as a 'few extra pairs of eyes' and an extended human arm.

Parties involved

DLR, Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI), GEOMAR Helmholtz Centre for Ocean Research Kiel, Karlsruhe Institute of Technology (KIT)

🌍 Applications

- Monitoring hard-to-reach environments using cooperating heterogeneous robots
- Exploration of Earth's marine environment
- Space exploration, installation and maintenance of permanent structures on planetary surfaces

Outlook

- Continuous, long-term and long-range monitoring of difficult-to-reach environments using cooperating heterogeneous robots
- Understanding continuous processes that take place in different ocean levels

📄 Facts and figures

HGF future topic:
Total budget: 10 million euro
Project duration: 01.01.2018-31.12.2021

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Autonomous, networked robotic systems are becoming increasingly important for both industry and science. The aim of the ARCHES consortium is to research cross-domain, interdisciplinary technologies that can provide the basis for solutions to the societal challenges ahead. ARCHES endeavours to combine the various, and as yet, very specific robotic developments of three Helmholtz research areas, thereby developing technological advances in Germany and beyond.

ARCHES will use robot hardware that can meet the characteristically stringent robustness and reliability requirements of two domains: deep-sea and planetary exploration. The adaptation of configurable carrier systems will pursue the aim of optimally exploiting the potential synergies of a competence network. The focus is on researching methods for the joint analysis and interpretation of data by the robots within the network. The intelligent automation and cooperation of the systems will also play a central role. Both aspects are essential, as the independent operation of the robotic network is a basic prerequisite for the missions under consideration. Consequently, the motivation is to research approaches to autonomous navigation in unknown areas, intelligent interaction with the surroundings, self-sufficient energy management and the self-organisation of communication with mission headquarters and within the network. For human interaction, an interface must be created for planning the mission and organising the robots. ARCHES also creates the basis for opening up applications in medicine and therapy, logistics and autonomous urban transport. In the long-term, for example, an autonomous robotic transport network can help to ensure individual independence, as well as the mobility and care of an increasingly ageing society.