

# Team Information

Picture of vehicle:



Name of vehicle: Kutusow



Name of vehicle: Suworow



Name of vehicle: Scharnhorst



Name of vehicle: Gneisenau



Picture of team leader:

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# Team Information

## Team Description:



## Company Description:

The FKIE employs currently 300 staff members, who perform studies in computer science and ergonomics with application to diverse research area of command & control, communications, intelligence, surveillance, and reconnaissance (C3ISR).

There is a broad spectrum of single research topics. We deal among others with the development of modern target tracking procedures in a network of different sensors, with the selection and design of communication systems, with problems of information dissemination in radio networks – also over long distances - with the reconnaissance of location and property of transmission devices, with the condensed processing (fusion) and consistent distribution of data in complex Communication and Information Systems (CIS) up to the design and implementation of intelligent user interfaces.

Premises and challenge of our work is the fast progress of information technology which offers a huge potential to improve systems.

Single steps of our approach are to identify those potentials, to develop methods and procedures to transfer this into applications, and to conduct feasibility studies and cost estimates based on experimental work.

The robotics group within the FKIE has more than twenty years of experience in research and technology of unmanned mobile systems. Our key competence is in the development and evaluation of complex human-robot systems. One

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particular application area we are working at is the improvement of RSTA missions carried out using heterogeneous multi-robot systems consisting of UGVs and UAVs.

The interaction with such multi-robot systems is a highly complex task for the operator, because already a single system has several different sensors and actuators available, which have to be controlled.

Our approach to deal with these intricacies is to develop intelligent assistance functions on all level of functionality, from low level navigation of single robots to higher levels like multi-robot planning. We do this on the one hand to increase the level of autonomy of the systems, and on the other hand to highly improve the situational awareness of the operators. Examples for such assistance functions are autonomous navigation algorithms like collision avoidance techniques for dynamic environments and methods for providing condensed and optimised information to the operator.

Our aim is to develop innovative tools for human robot interaction and co-operation. Therefore, we continuously transfer newly developed results into experimental systems and system demonstrators in collaboration with the Combat Development Branches of the Bundeswehr service schools.

## **The Unmanned Systems department:**

The Research Group Unmanned Systems as part of the FKIE develops innovative techniques for the efficient guidance of human-multi robot systems within military applications.

Remote-controlled unmanned mobile systems have high demands on the operator's concentration and cognitive abilities, especially if the control is to be maintained over long time periods. In order to increase the efficiency and the available deployment options, the research group develops assistance functions which enable the operator to guide the mobile systems on a high level of abstraction, while the robots execute the required low-level commands autonomously. Additionally, the research group serves as consultant and evaluator for the German army.

The booth presents an overview of the current activities of the FKIE regarding Unmanned Systems, in particular

- The experimental CBRNE Reconnaissance Platform
- NEC techniques for multi robot systems
- Mobile 3D world model generation
- Autonomous outdoor navigation
- European Land-Robot Trials (ELROB)

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Examples:

## ***CBRNE Reconnaissance Platform***

The experimental CBRNE reconnaissance system has been developed in cooperation with the Bundeswehr NBC protection school, and employs the army's standard sensor hardware together with other COTS components.



## ***Robust Outdoor Navigation and 3D World Model Generation***

For the deployment of reconnaissance robots, the research group has developed algorithms for fast and reliable navigation based on 3D laser distance measurements, as well as techniques for the automated generation of 3D world models from the same data.



## **Contact:**

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*ELROB and experimental systems*

Dr. Dirk Schulz (schulz@ fkie.fraunhofer.de)

*Algorithms and software development*

Sponsors:

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Selection of scenario:

Reconnaissance and surveillance

Transport – Mule

Camp security

Autonomous navigation