The German Research Center for Artificial Intelligence (DFKI GmbH) is the world’s largest research center in the field of artificial intelligence, with facilities in Kaiserslautern, Saarbrücken and Bremen, and a project office in Berlin. One of its best-known units is the Robotics Innovation Center (RIC) in Bremen, headed by Prof. Dr. Frank Kirchner. He represents the scientific link to the University of Bremen. The Center’s objective is to rapidly translate the results of basic research into real-world applications. Its research group develops mobile robot systems which are able to solve complex tasks on land, under water, in the air or in space. These design concepts benefit from the variety of forms that are found in nature: its climbing/walking four-, six-, or eight-legged robots, snake-like underwater vehicles and two-armed transport robots are modelled on patterns drawn from the natural environment. New materials are combined with successful forms of locomotion that have evolved in nature.

On the one hand, the center receives industrial orders directly; on the other, it has to compete for publicly-funded joint projects. And the latter is how we became acquainted with each other. At the end of January, we received a call from Ms. Kirchner inviting us to the RIC in order to discuss a project they had in mind. It sounded interesting, and so we, Alex Svojanovsky and Birgit Trogisch, travelled to Bremen on 27 January 2011. We were given a hearty welcome and shown around the research facilities, including the electronics lab, the mechanical workshop, the space exploration hall and the underwater test bed. The space exploration hall offers a unique opportunity to rate various robotic systems experimentally. It provides several conditions to perform mobility tests: in a horizontal position, on inclined plane, or in midair. Standing in a totally darkened room, we were really impressed to see nothing more than some spots wandering across the moon-like landscape – lonely robots finding their way. Another highlight was the e-lab, because it contains all the equipment necessary for designing and building specialized electronic circuits. Thanks to its excellent instrumentation and in-house storage capabilities, the lab is able to produce ad hoc solutions for the unique requirements that characterize the robotics field. From a distance we admired the robotic test track with its tunnel, stairs and grassland littered with obstacles like rails, cattle grids, rocks and tree trunks. Last but not least, we saw some of the strange-looking metal constructions that were the actual robots.

After our tour we met with a group of scientists, and Ms. Kirchner presented her research idea. Her expertise is the field of brain reading\(^1\), and she has been using Brain Products’ EEG equipment for several years for this purpose. She now proposed a joint project to develop an intelligent human/robot support system based on an exoskeleton that was recently designed and built at RIC. It did not take much time to reach agreement on a cooperation venture and applying for funding from the Ministry for Education and Research (BMBF). So we began to write up the proposal. In the beginning the proposal was directed at the rehabilitation of patients following neuronal or muscular impairments. It is a fact that nowadays robots are playing an increased role in rehabilitation. They represent a way for patients to train in a highly precise and repetitive manner, and they assist the patient only as much as needed. Robots can be used to activate central pattern generators that facilitate the relearning of specific movements. The general advantage of robots over manual handling is their precision, endurance and the scope for applying virtual reality. This is also valid for other application areas.

Ultimately, we changed our project objective to the development of a system for the remote control of manipulators because it seemed a more suitable response to the BMBF call for systems of human-technique cooperation. With the help of an adaptive exoskeleton, an operator can control manipulators for many hours without getting tired because the exoskeleton effectively makes the manipulators lighter and easier to handle. Virtual immersion and forced feedback enable the operator to work from a great distance and in hazardous environments.

At the moment we are waiting to learn the result of our submission in response to that call. We would be pleased if the joint project could begin at the end of this year. If our proposal is not approved for funding, we hope to have a new opportunity for collaboration with the Robotics Innovation Center in Bremen.