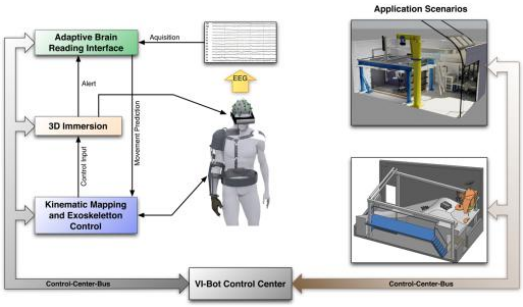
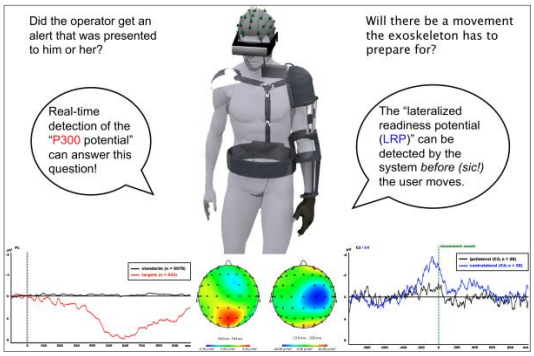
VI-Bot

Virtual Immersion for Holistic Feedback Control of Semi-Autonomous Robots



Cooperation of VI-Bot project components, here: exoskeleton, visualization, and aBRI as well as both demonstration scenarios.



aBRI – adaptive Brain Reading: Single trial EEG analysis for operator state prediction

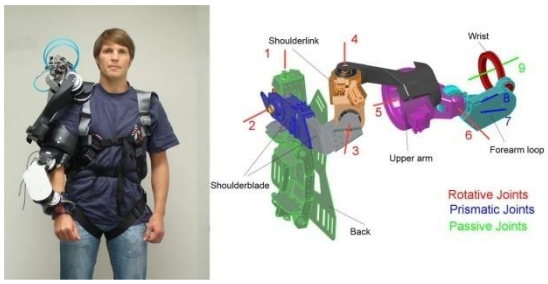


Photo and concept design of the actuated Exoskeleton-Arm.

A New Concept for Teleoperation

The complexity of both mobile robotic systems and their fields of application is continuously increasing. To enable an individual user to control such a complex robotic system, DFKI scientists are currently developing a new concept of robot control which is supported by virtual immersion and thus conveys an on-site feeling to the telemanipulating operator.

A safe exoskeleton, an adaptive user observation, and a robust multi-modal user interface will be acting together. By means of this virtual immersion, remote control of robotic systems will attain the next level and make it possible to virtually dissolve the separation between robot and user and, as a consequence, to bring together man's cognitive abilities and the robotic systems' robustness. The efficiency of this approach will be evaluated by means of a complex manipulation task. At the center of this novel concept is a portable exoskeleton which enables the user to transfer natural movements to commercial robot arms. The exoskeleton is actuated and gives the opportunity to transfer forces from and to the human limb (arm). This haptic feedback makes the teleoperation of robots even more sensitive for the user (operator) and thus improves the manipulation task.

Experiences with current tele-operation environments have demonstrated that both perceptive and motor strains on operators is very high. This is why the aspired mutual control between operator and VI-Bot interface should be direct, dependable, fast, and extremely coordinated. The use of an adaptive "brain-reading" interface (aBRI) still to be developed will enable the VI-Bot interface both to determine whether the operator has noticed the presented warning and to predict the operator's actions in order to prepare the system accordingly.

VI-Bot is the first project of its type which integrates approaches from the areas of robotics, neurosciences, and human-machine interaction into a complete system and thus takes on the challenge of applying as yet mostly theoretical approaches to extremely realistic and application-oriented scenarios.

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