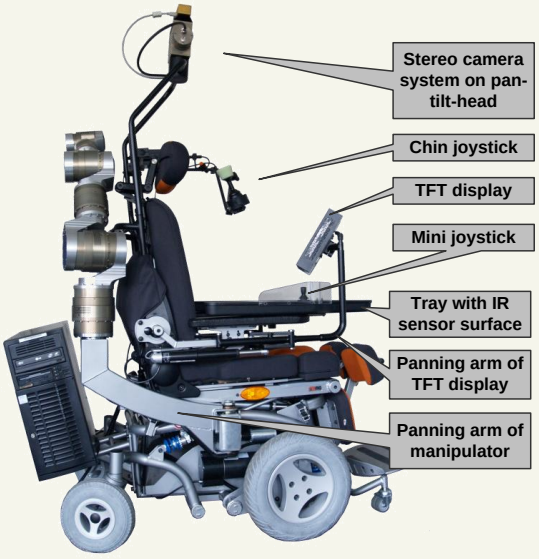
FRIEND

Functional Robot with dexterous arm and user-frIENdly inteface for Disabled people

Institute of Automation



Care-Providing Robot FRIEND

The System

_ Multi-actuator and multi-sensor system, based on a wheelchair-mounted dexterous manipulator
_ Input devices according to the user's impairment (e.g. chin joystick, speech input, brain-computer-interface)
_ Uses own and distributed smart components (e.g. sensor tray, RFID, various camera systems)

Software-Framework MASSiVE

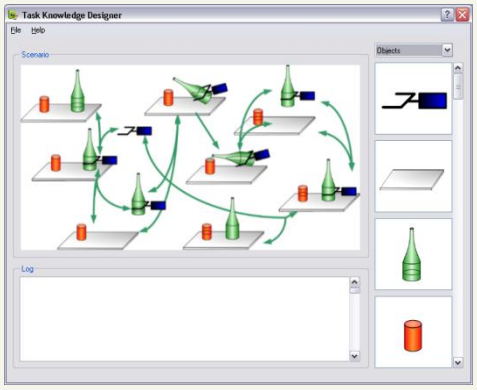
_ MASSiVE – Multilayer Control Architecture for Semi-Autonomous Service-Robots with Verified Task Execution
_ Robust execution due to offline verification of task knowledge
_ Rapid development of feasible systems on the basis of close integration of the user's cognitive capabilities (shared autonomy)
_ Distributed system support and high degree of flexibility by a CORBA-based execution layer framework

Motion Planning

_ Planning is carried out in the Cartesian space which results in smaller calculation times
_ Manipulator avoids obstacles and in the same time has smooth motions
_ Manipulability is increased during the motion with avoidance of joint limits and singularity configurations
_ Algorithm is suitable for real-time applications with moving obstacles

Development Process Model ProDevSSR

_ Scenario + model + tool driven development process to manage its complexity
_ Provide a structured guidance and enforce consistency throughout the whole process
_ Achieve uniform implementations and maintainability
_ Guides through scenario analysis, task knowledge specification and verification as well as development and test of system core functionality (skills)



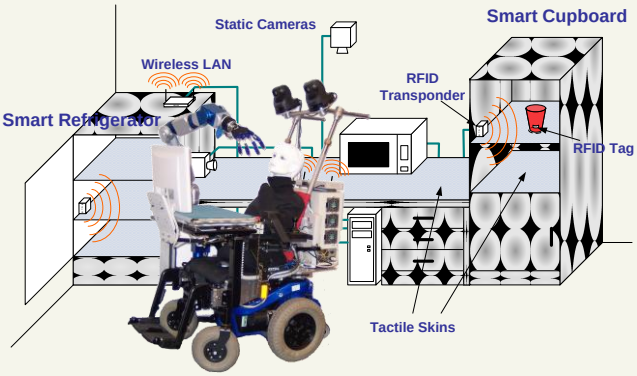
Task Knowledge Specification Tool
(Pour-In-Drink Scenario)

Mapped Virtual Reality

_ Calculates distances between robot and objects/humans
_ Reduced complexity
_ On-line distance observation for safety during manipulations
_ Returns spatial information for motion planning

Human-Machine-Interface

_ Adapts to any input device
_ Context-based mapping of a device's degree of freedom
_ Offers the infrastructure for the integration of user-interactions



FRIEND in Intelligent Environment

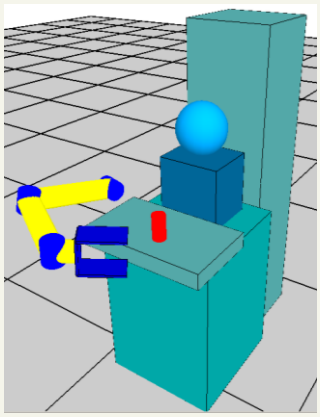
Semi-Autonomous Service Robots with Verified Task Execution

Aim

_ A rehabilitation robotic system to support elderly and disabled persons in daily and professional life situations
_ 1.5 hours independency from care personnel

Research

_ Methods of task knowledge specification and verification
_ Autonomous task planning and semi-autonomous execution under real-time conditions
_ Fast motion planning for safe dexterous manipulation with redundant manipulators in clustered environment
_ Robust image processing methods
_ Human Machine Interfacing



Mapped Virtual Reality

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