

Effiziente Operationsplanung durch Vernetzung und Steuerung

Networking and Control for Efficient Operation Planning

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Operation planning is necessary for the application of complex surgical systems like robots or navigation based surgery. It consists of a set of sequential and parallel tasks for image acquisition or processing as well as planning in advance of an operation. Unfortunately, the applied planning tools often provide complex functionality and are complicated in use. Moreover, most commercial systems are isolated products with moderate interoperability. In order to guide the surgeon through the planning procedure, so that he does not need to have additional knowledge about the dependencies between planning data, our approach is the application of a guidance system for operation planning. With a centralized database it prohibits loss of data and assures that planning steps are executed in their correct order.

In order to provide support by guidance, complete procedures for preoperative planning and intraoperative application of computer assisted surgical systems need to be provided. For standardized surgical interventions these procedures are accessible on a database as workflows. These workflows consist of activities, which are executed by a so called workflow engine. Hereby, each activity contains information about necessary data to read and to write, participants needed and tools involved in the planning step. Moreover, information about the patient is accessible.

For interaction with the workflow engine we implemented a so called worklist. This worklist shows all tasks to be done next. After selection of a planning task by the surgeon, the required planning tool is started and necessary data is retrieved from the database and put into the tool. If the surgeon has finished the step, he notifies the worklist by clicking on a dialog box. The worklist hereafter reads the resulting newly created data from the tool and transfers it to the database. Then the following tasks are displayed in the worklist.

As different tools for planning of surgical procedures are needed, we developed a flexible interface for integration of different applications. Commercial tools with source code not accessible are supported by data exchange via files. Filter modules are used for conversion from and to proprietary file formats. Additional textual guidance information about how to use the tool for the current task can be displayed in a special dialog box on the screen. If planning tools support invocation by parameters, these parameters are provided to the tool during the start up process.

Much more support is possible for workflow enabled applications like our planning system KasOp. A library can be linked which contains the necessary network and database functionality. It enables the program to directly communicate with the corresponding worklist. The worklist on the other hand can send requests to the program. The requests directly invoke the desired methods and modules of KasOp - the planning tool is partially remote controlled. After creation of the resulting data KasOp transfers it to the database and sends a response to the worklist.

The planning process at our institution is much more simplified by the new approach. The guidance system can prepare each step by automatically retrieving the required data for the surgeon and starting the necessary planning tools. The system is platform independent and runs on SGI, Linux as well as Windows. Besides the simplified process, another advantage of our approach is its automatic documentation of each step.