

Knowledge-based system control in an intraoperative navigation system

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Introduction: Intraoperative navigation systems have mainly been developed to aid in neurosurgery operations. These systems are a step forward in the process “diagnosis – indication – surgical planning – surgery“. It allows the surgeon to visualize the actual position of his instrument during surgery on the monitor. The technology of virtual or augmented reality is used more and more. All these systems are based on CT and on MRI data. The actual network technology makes it now possible to transport the digital information of such navigation systems in real-time through the net. It becomes possible that other medical experts are able to fully observe the ongoing operation and directly provide suggestions for the operating surgeon. To reduce the administrative load of the surgeon in the operating theater a knowledge based navigation server is used in this tele-navigation scenario. This knowledge based server checks and filters the information as an additional expert of the other outstanding surgeons.

Methods: The ARTMA Virtual Patient[®] system is used for intraoperative navigation and visualization. The knowledge-based navigation server, NAVIExpert communicates with the navigation system and the other network clients. It is additionally linked to the medical expert system MedFrame. This expert system interprets all incoming information and represents together with the knowledge-based server an independent expert.

Results: The different parts of the project are currently linked together. The ARTMA Virtual Patient[®] is used at the Vienna General Hospital at the Department of maxillo-facial surgery. MedFrame[®] is a powerful system with excellent knowledge representation and inference strategies created at the Department of Medical Computer Sciences. Necessary steps creating and linking such a system together are retrieving knowledge for the specific navigation (operation) situation and designing interfaces.

Conclusion: Checking continuously the actual surgical situation and proving permanently the accuracy of the navigation system is doubtless an advantage of such an expert system. The communication possibility caused now by the actual network technology is another advantage.