Section: **Qualitätssicherung, Workflow, Ergonomie**

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Abstract-Title:
A SIMPLE NEW METHOD FOR VISUALIZING THE ACCURACY OF NAVITATION SYSTEMS EINE EINFACHE NEUE METHODE ZUR DARSTELLUNG DER GENAUIGKEIT VON NAVIGATIONSSYSTEMEN

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Abstract-Text:
Purpose
This article describes a simple new method for the intraoperative visualization of the overall error of a computer assisted intervention system. Medical assistant systems for interventions are widely used in clinical environment. These systems use different input values and display important information to the surgeon. All these input values are error-prone. The different error values (position tracking, tool calibration, patient calibration, rounding errors, etc.) can either be calculated or approximated. Thus the current overall error can be determined while using the system. Most of the existing navigation systems display information by visualizing an instrument within the patient image data. This lets the surgeon assume a precision that is not present. In this article a simple method is presented, that enables the surgeon to recognize the current system error and to prevent wrong assumption of instrument positions. Method
An existing navigation system for ENT-surgery (NaviBase ENT, RoboDent) was used to integrate the new method. The simple functionality of this system is as follows. This system tracks the patient and a pointer instrument. The preoperative patient image data are matched to the current patient situation using the anatomical landmark registration method. Once the image data are registered orthogonal slices intersecting the pointer tip are visualized. The pointer is blended into each image slice. Additionally the 3D model of the patient skin and the instrument is displayed. This system was extended to calculate or approximate an error of each relevant input value. In detail these are the position tracking errors of the instrument and the patient, the instrument calibration error and the patient registration error. These errors were combined to approximate the current total system error. The determined total error is used for a visualization of the pointer tip that includes the position probability. Results
A new method for visualizing the system error was presented. The determined total error is displayed using circles in 2D views and spheres in 3D views around the pointer tip. The circle radius is determined by the total error. Additionally the pointer inside this error sphere is not drawn. First experiments show, that surgeons seem to have a better impression of the spatial error dimension. They do not overrely on the visualized information. Conclusion
An simple new method was presented to enable the surgeon to take care about the systems accuracy automatically. Only information is displayed, which can be guaranteed by the navigation system. The danger of misinterpretations of the visualized data by the

surgeon is reduced. This is reached first, by visualizing the total system error as a sphere around the pointer tip and second, by not displaying the pointer inside the error sphere.