Abstract: Miniaturized hand-held navigation system for medical applications: recent results

Bruno Knobel, Naviswiss AG, Laufen, CH

INTRODUCTION: A novel approach of an optical navigation and measurement system for computer-assisted surgery (CAS) is presented. The main features of the miniaturized hand-held system include clip-on abilities to a handle, instruments or a tool, an integrated optical surface scanner, and miniaturized tags attachable to the patient.

State-of-the-art optical navigation systems for supporting CAS incorporate more than 20 years of experience. Nevertheless, there are many limitations like line-of-sight problems, clumsy optical locators, a substantial number of the required instrumentations and its logistics, time consuming registration procedures, or related complex workflows with the CAS.

The novel approach reduces or avoids many of those limitations do to a miniaturized hand-held system. The system includes a stereo camera and at least one patterned tag. The tags are attachable to the patient. The identifications, the positions and the orientations of the tags are measured (6-dof, degrees of freedom). A clip-on mechanism permits attaching the camera to a handle, an instruments or a tool. An integrated optical surface scanner measures the surface topology of implants or body parts.

The position and angular accuracies (RMS) of the prototype is smaller than 50 **m**m and smaller than 0.5° within the measuring volume, respectively.

The novel approach of the miniaturized optical navigation and measurement system is widely accepted by surgeons and has the potential for more economic or new CAS workflows especially towards soft tissue surgery.

Key Words: Miniaturized oand-held optical navigation system, clip-on mechanism, mounted on surgical tool, surface scanner.