Section: **Mechatronik**

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Abstract-Title:
HEXAPOD-BASED COCHLEOSTOMYHEXAPOD BASIERTE COCHLEOSTOMIE

Authors:
C.-C. Ngan[1], K. Felix[2], S. Jörg[2], K. J.[3], R. Jörg[1], W. H.[1], K. Thomas[2]
[1] Institute for Process Control and Robotics, University of Karlsruhe, Germany
[2] Department of ORL & HNS, University Hospital, Freiburg, Germany
[3] Department of Radiology, University Hospital, Freiburg, Germany

Abstract-Text:
Introduction
In the last two decades cochlear implantation has been established to help severely to profoundly deaf patients and is an indispensable component in the rehabilitation of these patients. The location and the orientation of the opening of the bony inner ear have crucial influences on the subsequent positioning of the electrode and the associated trauma in cochlear implant surgery. This trauma can yet mean invisible long-term damage with the loss of neural structures and also with that, it could make inapproachable for further medical developments over the cochlea with such remaining sensory cells and neural structures. A highly precise cochleostomy is required to preserve existing inner ear functions. A hexapod-based cochleostomy and navigated instrument guidance could represent a feasible solution for the desirable accuracy. If the atraumatic function-preserving precise surgery of the inner ear is accomplished, it could serve as an example showing how the robot can operate in the sub-millimetre range at the temporal bone.

In this presentation, the technical details like hardware and software architectures and transformation matrices calculations will be illustrated. Methods
On three human temporal bones a regular mastoidectomy with a posterior tympanotomy was performed preserving the chorda tympani. Four titanium screw markers were mounted into the bone for registration. These screws\' coordinate in CT spatial system as well as the path-planning data determined by surgeon were stored in XML files which were used as data exchange. After the registration, individual transformation matrix was concatenated in proper sequence forming the resultant matrix and the trajectory in the robot coordinate system was computed. Following this, simulation was performed prior to the physical intervention for previewing the outcome. Finally, a drill fixed onto the hexapod has been used for the cochleostomy via the posterior cochleostomy.Results
In the experiments, the evaluated target registration error (TRE) ranging from 0.10 to 0.15mm. Hexapod performed the cochleostomy after the simulation and the scala tympani was disclosed.Conclusion
Parallel-kinematic surgical system could offer the possibility of a highly precise and navigated cochleostomy, In the future, patients with severe hearing loss may be able to benefit from both the electrical stimulation by the electrode at the inner ear and the reception of the conventional amplification over the hearing aid. In addition, it could give optimal conditions for patients and physicians for future possible
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