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Towards Direct Head Navigation for robot-guided Transcranial Magnetic Stimulation using 3D Laserscans: Idea, Setup and Feasibility

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Abstract

Direct tracking is more robust than tracking that is based on additional markers. 3D laser scans can be used for direct tracking because they result in a 3D data set of surface points of the scanned object. For head-navigated robotized systems, it is crucial to know where the patient's head is positioned relatively to the robot. We present a novel method to use a 3D laserscanner for direct head navigation in the robotized Transcranial Magnetic Stimulation (TMS) system that places a coil on the patient's head using an industrial robot. First experimental results showed a translational error < 2 mm in the robot hand-eye-calibration with the laserscanner. The rotational error was 0.75° and the scaling error < 0.001°. Furthermore, we found that the error of a scanned head to a reference head image was < 0:2 mm using the iterative closest point (ICP) method. These results have shown that a direct head navigation is feasible for the robotized TMS system. Additional effort has to be made in future systems to speed up the compution time for real time capability.

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