Brain Image Motion Correction: Impact of Incorrect Calibration and Noisy Tracking

The application of motion tracking is wide, including: industrial production lines, motion interaction in gaming, computer-aided surgery and motion correction in medical brain imaging. Several devices for motion tracking exist using a variety of different methodologies. In order to use such devices a geometric calibration with the coordinate system in which the motion has to be used is often required. While most devices report a measuring accuracy and precision, reporting a calibration accuracy is not always straightforward. We set out to do a quantitative measure of the impact of both calibration offset and tracking noise in medical brain imaging. The data are generated from a phantom mounted on a rotary stage and have been collected using a Siemens High Resolution Research Tomograph for positron emission tomography. During acquisition the phantom was tracked with our latest tracking prototype. The combined data set form a good basis for a quantitative analysis of calibration accuracy and tracking precision on motion corrected medical images and scanner resolution.