Patient motion tracking

The primary aim of computer-integrated surgical systems is to provide physicians with superior surgical tools for better patient outcome. Robotic technology is capable of both minimally invasive surgery and microsurgery, offering remarkable advantages for the surgeon and the patient. Current systems allow for sub-millimeter intraoperative spatial positioning, however certain limitations still remain. Measurement noise and unintended changes in the operating room environment can result in major errors. Positioning errors are a significant danger to patients in procedures involving robots and other automated devices. We have developed a new robotic system at the Johns Hopkins University to support cranial drilling in neurosurgery procedures. The robot provides advanced visualization and safety features. The generic algorithm described in this paper allows for automated compensation of patient motion through optical tracking and Kalman filtering. When applied to the neurosurgery setup, preliminary results show that it is possible to identify patient motion within 700 ms, and apply the appropriate compensation with an average of 1.24 mm positioning error after 2 s of setup time [1].

1)
Haidegger T, Benyó Z, Kazanzides P. Patient motion tracking in the presence of measurement errors. Conf Proc IEEE Eng Med Biol Soc. 2009;2009:5563-6. doi: 10.1109/IEMBS.2009.5333737. PubMed PMID: 19964394.