Vision-Based Patient Body Tracking in Helical Tomotherapy

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Radiation therapy using state-of-the-art helical tomotherapy treatment is largely automatic after the doctor creates the dosage plan. The system currently has no method to detect if the patient moves out of alignment during treatment, a capability that could improve treatment accuracy. This cross disciplinary project combines the fields of computer vision with medical physics. The creation of a minimally invasive, vision-based, total-body tracker that can interact with the helical tomotherapy system to detect when a patient becomes misaligned has been explored. The tolerances are tight, by measuring when the patient moves just 5 mm out of alignment, the uncertainty in radiation dose delivery can be greatly reduced. A stereoscopic vision system uses infrared reflective markers to track the patient. Using these data points, boney structures, such as the head, can be tracked independently, providing roll, pitch, and yaw information about their pose. Initial results compared vision-based patient-positioning tolerances with those of traditional megavoltage CT-scans. Simulation-based results have explored the efficacy of tracking large portions of the patient's body.