

Use of electromagnetic and video/surface systems for localization and monitoring of treatment

Two technologies have been recently applied to commercial product development for localization and monitoring of treatment. Electromagnetic tracking, quite mature in aerospace and surgical guidance, has evolved to development of implantable markers. Video-based surface mapping systems have been applied to a product that rapidly extracts the anterior surface of a patient as an aid to localization and motion measurement.

These new systems show dramatic promise as aids to initial setup. Precision on the order of 1-2 mm has been described for both technologies. These systems act as surrogates for tumor localization inferring that either a) the patient's skin or b) implanted fiducial locations can be correlated to tumor position. For the prostate, implanted fiducials have shown acceptable accuracy when properly placed. For surface imaging, targets near/at the surface (e.g. breast cancer) should work very well. For other body sites, investigations are ongoing.

In addition to rapid setup, the monitoring capability of these systems presents a paradigm that has been extremely limited to date in treatment rooms. The ability to more directly infer target position to aid in gating and tracking, especially without the use of additional ionizing radiation to the patient, may have dramatic impact on targeting accuracy.

This lecture will overview these technologies, and will discuss core measurements to establish accuracy and compatibility in the radiotherapy environment. Procedures for use will be outlined, as well as potential limitations of these systems

Educational Objectives

Understand the operating principles of electromagnetic and surface localization

Overview systems using these technologies

Understand critical issues for commissioning of such systems