AbstractID: 9032 Title: Improving the utility of in-room video camera systems for continuous surveillance of patient motion during radiation treatment

Purpose: To improve the utility of in-room video-based system for continuous quantitative monitoring of patient motion independent of environmental changes in lighting and geometry.

Method and Materials: A video-based tracking system was developed using a webcam with 600 by 450 pixels and Microsoft Visual C++. It is mounted at the end of the treatment couch to constantly view a specified region on the patient's torso of 50 cm by 30 cm at 55 degrees viewing angle. Small high contrast "sticky" markers are placed within the viewing region for easy detection. Environmental disturbances such as changes in machine positions and lightings are minimized through appropriate real-time image subtraction and processing techniques. An alarm is activated when the patient movement is deemed out-of-tolerance. For validation, a lead ball phantom and a flat "sticky" marker of 1 cm diameter each were used to determine detectable target displacements. Each tracking session was automatically recorded for further data analysis. Pre-clinical evaluations were performed on two subjects.

Results: Target displacements of (2, 2, 5) mm for the lead ball phantom and (4,4,7) mm for the flat phantom are readily detected in the lateral, superior-inferior and vertical directions respectively. Most importantly, the system detects these changes in the presence of environmental disturbances which include large changes in room lighting, and couch and gantry positions. The system fails when the camera's view is obstructed.

Conclusion: Our system provides an effective approach to track and monitor patient position after highly accurate setup, such as using cone-beam CT. It is considerably lower in cost relative to existing commercial tracking systems. The use of more optimal markers and 2 cameras are under investigation to improve detection resolution. With further refinement, the system can be adapted for routine clinical use that is superior to present in-room video-monitoring systems.