

Title of Project: Integration of a 3D Vision System into an Augmented Reality environment for patient positioning in radiotherapy

Project Number: 275

University Project Leaders/Departments: Dr Juergen Meyer; Physics and Astronomy

Brief outline of project

Exact patient positioning in radiotherapy is crucial for accurate targeting of tumours and sparing of healthy tissues. For radiobiological reasons the total radiation dose to kill the tumour is given in small daily fractions over a period of typically 4-6 weeks. This requires the patient to be positioned on a treatment couch in the exact same position many times. Any geometric deviation from the initial treatment position results in both underdosage of the tumour and overdosage of the nearby healthy tissues. This will ultimately lead to a loss of tumour control and an increase in normal tissue complications, hence quality of life for the patient.

In previous work, a novel augmented reality approach has been developed and validated to visually guide positioning of the patient. One of the drawbacks of this system is that it does not provide quantitative information about positioning errors. In an ongoing project a 3D Vision System is being developed, with cameras and a projector, to address this issue. Through the use of a spatial encoding technique the system is capable of obtaining exact surface contour data in near real-time.

The overall aim of this project is to integrate the 3D Vision surface contour measurement system into the augmented reality environment. This is envisaged to be accomplished in Matlab as this is what is currently being used for both individual systems. However, other programming languages will also be considered. The amalgamation of the two individual components makes it then possible to characterise and test the combined system on simple geometric phantoms and to assess its utility for clinical usage in a hospital environment.

Specific student requirements:

Please indicate below any specific academic requirements you have for the summer scholarship student (e.g., specific level; specific courses, or equivalents, completed)

Good Matlab skills are essential. Familiarity and experience with substantial software projects is an advantage. Previous experience with augmented reality is not necessary but would be an advantage.

Special condition:

Possible that some out of hours work may be required as part of the project. Final measurements in hospital will be after 5pm