curac2004
3. Jahrestagung der Deutschen Gesellschaft für Computer- und Roboterassistierte Chirurgie e.V.

Erstellung von Testdaten für 4D Patienten Modelle

Production of test data for 4D patient models

Otto Sauer[1], Kajetan Berlinger[2], Dr. Michael Roth[2], Lucia Vences[1], Prof. Dr. Schweikard Achim[3]

[1]Klinik für Strahlentherapie
Universität Würzburg
[2]Informatik IX, Technische Universität München
[3]Universität Lübeck Institut für Robotik und Kognitive Systeme

Introduction

Within the framework of the DFG project „navigated radiotherapy" one subject is the calculation of intermediate breathing states from an inhalation and an exhalation 3D data set by means of a physical model. In order to test different models real data for intermediate states have to be compared with calculated data. In this paper the acquisition and analysis of such date is described.

Methods and materials

For a small number of lung tumour patients a cohort study was performed. With a spiral CT scanner (Philips Tomoscan AV) a volume scan of the thorax was performed with normal breathing of the patient. This data set was also used for our normal treatment planning procedure. In order to record the breathing cycle the position of two infrared emitters, on the patient's belly, was tracked with a 3D IR camera (Flashpoint 5000). With a 3rd emitter the longitudinal position of the patient relative to the CT gantry was measured. The position of the third emitter is correlated to the Z-coordinate of a CT slice and by means of a time stamp to the coordinates of the emitters 1 and 2 i.e. the breathing status. Therefore a breathing state could be assigned to every CT slice. Additionally volume scans at inhalation and at exhalation states were conducted.

Results and discussion

Our method for correlating CT slices to the breathing status is simple and works. The inhalation and exhalation data do not correspond to the minimum and maximum travel of the emitters for normal free breathing. Therefore only a small range of an artificial 4D model could be tested. For navigated radiotherapy, however, this is the relevant range. Adding the treatment volume to the anatomical 4D data will enable us to calculate the control data for a radiotherapy treatment robot.