

Röntgen-C-Bogen Simulator Fluoroscopic C-Arm Simulator

Robert Groß¹, Norbert Binder¹, Prof. Dr.-Ing. Achim Schweikard¹

¹Institut für Robotik und Kognitive Systeme, Universität zu Lübeck

INTRODUCTION

To test new applications for c-arms and intra-operative medical imaging, a simulator software for c-arms was developed. Our system simulates a fully motorized c-arm fluoroscope. It is thus possible to evaluate ideas for future applications in a safe environment, i.e. without ionizing radiation. Additionally it includes an interface which allows for access to a real c-arm.

METHODS

The simulation is based on JAVA and JAVA3d which allows for platform independent usage. The construction data for a common commercial c-arm form the basis for the simulation. Additionally an operating table and a patient were included into the OR environment. Basic functions such as manual movement were included. Further on, new modules for more complex movements can be applied. To allow for real tests, we can obtain x-ray images from a virtual patient. A new very fast 3D reconstruction software from 2D fluoro-images, based on the ART-algorithm was developed.

A first application was to find the a.-p. position of a vertebra during spine surgery. The coordinates were calculated from two radiographs taken from different points of view. The virtual c-arm can now be moved to the computed position to prove the correctness.

RESULTS

The virtual c-arm can be moved like a real device. Depending on the model of the skeleton, the quality of the x-rays is not as good as a real image but allows acquisition of landmarks

for 3d reconstruction. The calculated position can be evaluated by an additional radiograph.

CONCLUSION

This simulation tool helps to plan and control complex movements of a fluoroscope and allows for extend its functionality by applying new modules for motion-planning or other applications. Currently a planning system for finding optimal imaging directions in spine-surgery is included.





