

Research Project

Knowledge Based Interactive Shape Editing for Automated Segmentation in Radiotherapy Planning

Third-party funded project

Project title Knowledge Based Interactive Shape Editing for Automated Segmentation in Radiotherapy Planning

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Status Completed

Knowledge-based Interactive Shape Editing for Automated Segmentation in Radiotherapy

This project aims at building next generation editing and QA software tools for segmentation in radiotherapy. The segmentation of targets and surrounding organs in computer tomograms is a critical task in radiotherapy planning and follow-up. Although automation is available in today's products, tedious manual drawing work is still inevitable. Statistical shape models trained on real clinical data are the basis for making shape editing more efficient, more robust, and safer.

One of the primary goals of the project is to provide users with a segmentation method that achieves good segmentation results while requiring less effort than traditional approaches. The average wall-clock time for producing a segmentation should therefore be reduced by 30% or more, compared to a purely manual segmentation, while the segmentation quality should remain on par, i.e. below the inter-observer difference of different physicians. The inter-observer difference measures the disagreement between manual segmentations of several expert users. The difference in overlap can be as high as 15% of the organ volume for some organs. ä

In terms of software performance, the calculation of the confidence regions should happen in real time (at most a few seconds), to avoid lengthy waiting periods for the user.

The challenges of the project can be divided into several parts, which are addressed in different work packages. In a first work package (WP1), Our partner will be collecting the data required for the project, and preparing their software system for the subsequent integration activities. In parallel, the University of Basel will be working on developing a first complete prototype version of the shape editing tools (WP2). As WP2 is partly based on already existing components, a first version of the algorithms can already be made available for integration after the first half year. While our partner is integrating these algorithms into their system (WP3), the University of Basel will continue with the development of advanced methods that exploit the statistical information given by the models, to improve the user guidance and reduce the required manual interaction (WP4). At this stage, the conceptual work regarding the user interaction is mostly finished, resulting in a functional prototype for automated and interactive segmentation using statistical shape models. This prototype can then be ported to our partner's software base (WP5). However, the resulting system will still rely on existing (i.e., already built) statistical shape models. The goal of the last research work package (WP6) is to make the same functionality available without this restriction, by

allowing users to create shape models from their existing segmentations. We expect the results of this work package to affect mostly the internal (algorithmic) parts of the system, and to require only few user interface modifications, so that the effort for integration into our partner's system should be minimal.

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Add documents

Specify cooperation partners

ID	Kreditinhaber	Kooperationspartner	Institution	Laufzeit - von	Laufzeit - bis
3344530	Vetter, Thomas	Haas, Benjamin, Project leader	Varian	01.01.2014	31.10.2016