A new 3D Slicer plug-in for the interactive annotation and segmentation of liver anatomy
Jonas Lamy, Thibault Pelletier, Guillaume Lienemann, Benoît Magnin, Bertrand Kerautret, Nicolas Passat, Julien Finet, Antoine Vacavant

To cite this version:
Jonas Lamy, Thibault Pelletier, Guillaume Lienemann, Benoît Magnin, Bertrand Kerautret, et al.. A new 3D Slicer plug-in for the interactive annotation and segmentation of liver anatomy. EASL Liver Cancer Summit (LCS), 2022, En ligne, France. hal-03503706

HAL Id: hal-03503706
https://hal.archives-ouvertes.fr/hal-03503706
Submitted on 31 Jan 2022

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Background & Aim

Annotation plays a key role in the creation of reference datasets that are useful to evaluate medical image processing algorithms and to train machine learning based architectures. RVXLiverSegmentation is a 3D Slicer plug-in aiming at speeding up the interactive annotation and segmentation of liver anatomy from medical images (e.g. CT or MRI).

Method

RVXLiverSegmentation provides 7 main tabs:
- loading and managing medical imaging data;
- liver segmentation;
- annotation of portal veins and segmentation;
- annotation of hepatic veins and inferior vena cava and segmentation;
- editing hepatic veins and inferior vena cava segmentation;
- tumor segmentation.

Once the medical image data is loaded into 3D Slicer:
- the liver can be segmented either by interactive tools or by automatic a MONAI deep learning-based algorithm (CT only);
- the user places the nodes of important branches and bifurcations;
- reconstructions of hepatic vessels are based on graph structures built from those nodes;
- a VMTK (Vascular Modeling Tool Kit) module segments the vessels by using graphs as initialization;
- the user can edit this segmentation;
- the last tab allows the user to segment interactively possible tumors with dedicated tools and export the scene.

Conclusions

RVXLiverSegmentation is a promising tool for the creation of annotated datasets, and the faithful 3D reconstruction of liver anatomy from medical images. We first would like to integrate advanced deep learning models for liver and hepatic vessels segmentation into our RVXLiverSegmentation plug-in, in order to provide automatic reconstructions that can be then edited by the user. Another important work concerns the VMTK module, which needs more adaptations for MRI processing. Finally, a more complete evaluation protocol will be conducted by considering larger patient cohorts.

Acknowledgements

This work was funded by the French Agence Nationale de la Recherche (grant ANR-18-CE45-0018, project R-Vessel-X), http://tgi.ip.uca.fr/rvessel-x.

References


Contact Information

Antoine Vacavant, antoine.vacavant@uca.fr