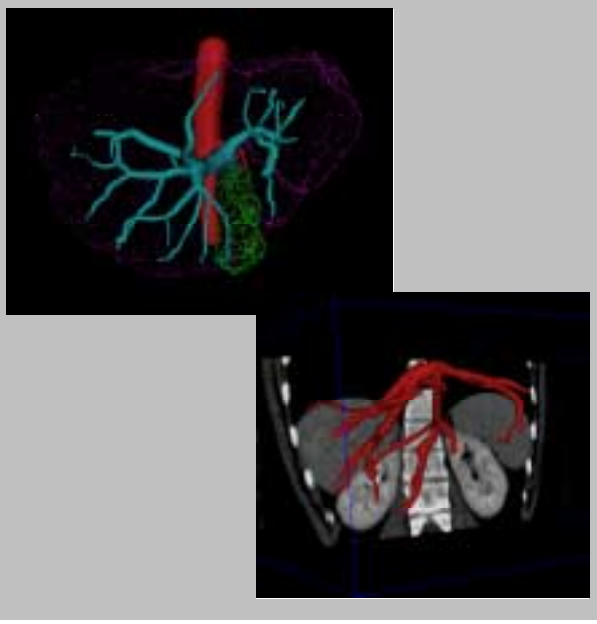
Computer-Aided Diagnosis and Display Lab
Department of Radiology, UNC @ Chapel Hill

3D Vessel Visualization for Living-Donor Liver Transplant Planning

Above: A 3D visualization of liver parenchyma (orange dots), portal and hepatic vessels (red tubes), and the right liver lobe (gray object). The right lobe was delineated from the rest of the liver by a simulated surgical cut path.

Below: The upper image shows the structures (liver, gallbladder, aorta, portal veins, and hepatic artery) that are extracted from a portal-phase contrast CT image. The lower image shows the structures extracted (hepatic veins) from a hepatic-phase contrast CT image. Both sets of representations must be fused to simultaneously visualize all of the anatomy that is critical to surgical path planning.



The goal of this project is to simplify donor evaluation and surgical path planning for living-donor liver transplantation. We are developing software methods for creating 3D representations of a donor's liver and its vasculature from MR and CT scans. Radiologists and surgeons use those representations to assess liver volume, identify vascular abnormalities, and specify and evaluate surgical paths for liver lobe resection.

Our system builds upon methods we developed for brain tumor resection planning. Additionally, we are developing novel software methods for the fusion of arterial and venous-phase contrast images and novel software and hardware solutions for the interactive specification of surgical cutting paths in 3D.

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This research is being lead by Drs. Sue Weeks and Stephen Aylward. Significant contributions are being made by the research assistants: Andrew Mackelfresh and Julien Jomier; the transplant surgeons: Jeff Fair and Mark Johnson; and Drs. Diane Armeo, Elizabeth Bullitt, and Richard Semelka.

For more information, please see the CADDLab web pages at

http://caddlab.rad.unc.edu

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