

Automatic Vessel Segmentation for Medical Imaging

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Categories:

- Biomedical Engineering
- Computer Technology

Keywords:

- Angiography
- Biomedical Engineering
- Fluid Dynamics
- Hemodynamics
- Phase Contrast Magnetic Resonance Imaging (PC-MRI)

Researchers at Purdue University have developed an algorithm for segmentation of regions of blood or cerebrospinal fluid flow from medical images. Accurate segmentation is critical for reliably assessing biomarkers of disease like wall shear stress. Existing segmentation methods like pseudo-complex difference (PCD) and high-resolution time-of-flight (TOF) angiography are highly sensitive to error in medical images. The Purdue researchers' standardized difference of means (SDM) segmentation algorithm involves calculating the difference between the time-averaged velocity at each voxel of the image and the mean tissue velocity, relative to the standard error. SDM segmentations are then generated by identifying voxels with significant velocity relative to the mean tissue velocity. The researchers' algorithm then refines the approximation to provide accurate segmentation. The researchers tested their method using a 4D flow MRI image of the cerebral vasculature and compared its performance to PCD and TOF angiography. The researchers' algorithm provided more accurate estimations of the vessel wall location than PCD segmentations across all in vitro phantom scales and in vivo patient measurements. The researchers' algorithm can be integrated with imaging systems to provide the assessment of accurate biomarkers.

Technology Validation: In vitro and in vivo, the SDM segmentations are 49.6% and 71.9% closer to the actual vessel wall than the PCD segmentations as measured by the RMS distance, respectively.

Advantages:

- Automatic
- Can be integrated with imaging systems
- Greater sensitivity and balanced accuracy than PCD method
- Generalizable across biological fluid flow types, vascular territories, and imaging methods

Applications:

- Segmentation of regions of blood or cerebrospinal fluid flow

People:

- Vlachos, Pavlos P (Project leader)
- Rayz, Vitaliy
- Rothenberger, Sean Michael

Intellectual Property:

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Contact OTC:

Purdue Office of Technology Commercialization
The Convergence Center
101 Foundry Drive, Suite 2500
West Lafayette, IN 47906

Phone: (765) 588-3475

Fax: (765) 463-3486

Email: otcip@prf.org