

A novel optical flow method for intravascular blood velocimetry: A validation study

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Intravascular blood velocity map can be obtained by applying optical flow method (OFM) in processing fluoroscopic digital subtracted catheter angiographic images, however, there are still challenges with the accuracy of results from OFM. In the present study, an improved OFM, in which a non-zero divergence of velocity is assumed due to the finite resolution of the image, was explored and applied to the digital subtraction angiography (DSA) x-ray images. The objective of the present study is to examine the applicability and accuracy of the divergence-compensatory optical flow method (DC-OFM) in assessing the velocity of blood flow in vessels. First, an Oseen vortex flow was simulated on the standard particle image to generate an image pair. Then, the DC-OFM was utilized to recover the velocity field for validation from the particle image pair. Second, DSA images of intracranial arteries were used to examine the accuracy of the current method. For each set of images, the first image is the in vivo DSA image, and the second image is generated by superimposing a given flow field. The recovered velocity map from the DC-OFM agrees well with the exact velocity distribution for both the particle images and angiographic images. In comparison with traditional OFM, the present method can provide much more accurate velocity estimation. It is also found that the accuracy of the velocity estimation can also be improved by implementing pre-process techniques including image intensification, Gaussian filter and “image -shift”.

Biography

Zifeng Yang has completed his PhD and Post-doctoral studies from Iowa State University Department of Aerospace Engineering. He is an Assistant Professor at Wright State University. He has published more than 20 papers in reputed journals and has been serving as an Editorial Board Member of *Journal of Coastal Life Medicine*.

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