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A Method for Wall Shear Stress Estimation with Navier Stokes Equation Correction

Flow-physics-based algorithm improving vascular stress estimates by 100% over current methods.

Researchers at Purdue University have developed a method for estimating the wall shear stresses (WSS) caused by fluid flow through the vascular system. This method uses 3D velocity data collected via 4D flow MRI and uses flow physics to estimate the instantaneous wall shear stresses at selected locations. Wall shear stresses within the vascular system are associated with changes to the blood vessel walls linked to aneurysms and aortic dilation. This technology can be integrated into clinical 4D flow MRI environments in order to improve understanding of a patient's individual situation and predict progression of cardiovascular diseases.

Advantages:

- More accurate estimation of wall shear stresses in the vascular system

- Can be used with existing or in vivo 4D Flow MRI data

- Capable of monitoring blood vessel remodeling and progression of cardiovascular diseases

Applications:

- 4D Flow MRI

- Aneurysms and other cardiovascular conditions

- Fluid Mechanics

Technology Validation:

This technology has been validated using synthetic and in vivo 4D flow data in cerebral aneurysms and thoracic aortas. This method showed reliable estimation of mean and relative distributions of WSS with as much as 100% improvement over current state of the art methods.

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