(SD2020-238) Blood Flow Velocimetry via Data Assimilation of Medical Imaging

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BACKGROUND

Cardiovascular disease (CVD) is a tremendous burden on the population in terms of morbidity and mortality, as well as on the healthcare system in terms of cost. Various forms of CVD including atherosclerosis, valve and ventricular dysfunction, aneurysms, and thrombogenesis can be identified by measuring localized abnormalities in blood flow. Accordingly, the ability to noninvasively interrogate physiological flows enables identification and diagnosis of disease, monitoring of the effects of therapy, and research on the hemodynamic nature of CVD and its associated interventions. In the clinic, blood flow measurements are primarily made using phase contrast magnetic resonance imaging (PC-MRI) and ultrasonic color Doppler imaging. Certain limitations of these techniques for patients who have contraindications or suffer from arrhythmias, as well as the desire for volumetric flow information necessitate the development of a new modality for blood flow velocimetry.

TECHNOLOGY DESCRIPTION

Researchers from UC San Diego leveraged data assimilation techniques to measure flow from changes in intensity in an image. This technology conveys a strategy for optimal integration of measurements from contrast-enhanced X-ray CT scans with flow solvers in the context of a simplified flow model. The invention teaches how to process a series of images to measure flows.

The inventors' initial findings provide insight into the theoretical foundations of the proposed technique and lay the groundwork for further research on the use of X-ray CT for blood flow velocimetry.

APPLICATIONS

Primarily measurement of cardiovascular flows via various imaging modalities. Potentially non-medical applications and medical applications outside of cardiovascular flow

ADVANTAGES

Conventionally, CT fluid dynamics use the image to determine boundaries of vessels or objects and then flows are estimated based on user-defined boundary conditions. In this invention, the boundary conditions and flows are solved for by observing changes in intensity in the image due to flow.

STATE OF DEVELOPMENT

Initial working prototype being extended to clinical work.

INTELLECTUAL PROPERTY INFO

The invention is patent-pending and is available for licensing and collaborations.

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OTHER INFORMATION

KEYWORDS

X-ray computed tomography, imaging, measurement of blood flow, cardiovascular disease, noninvasive diagnosis

CATEGORIZED AS

- **Imaging**
  - Medical
- **Medical**
  - Diagnostics
  - Disease: Cardiovascular and Circulatory System
  - Imaging
  - Research Tools

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