Department Research

CER2EBRAL - Computer Enabled Radiological Resource for Blood flow Rates in Aneurysms using Lattice-Boltzmann

Abstract: Cerebrovascular disorders represent one of the most prevalent and devastating diseases. Our previous work has demonstrated a proof of concept for the use of a specially developed CFD software package ("HemeLB," which uses lattice-Boltzmann methods) to model the flow of blood in Vascular Malformations (VMs). HemeLB can provide the radiologist with estimates of flow rates, pressures and shear stresses in the vascular structures, permitting greater precision in the choice of therapeutic intervention, reducing risk and the need for repeated procedures. The use of real time visualisation and steering allows the clinician to visually interpret the changes in pressure, flow etc, and modify parameters as the simulation progresses, ultimately allowing the code to be used interactively to conduct 'virtual' operations. This proposal aims to: 1) automate CT image segmentation techniques for maximum clinical benefit, and where needed to provide better segmentation methods; 2) enhance clinical decision making via sophisticated models of cerebral blood flow based on patient-specific CT scans, and to demonstrate the validity of the overall process of image-based simulation including its practical usability in the clinical environment; 3) port the HemeLB computational work to GPGPUs and other novel architectures (FPGAs).

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