

## **Blood Flow Simulation in an Entire Circulatory Network with Multicore Parallel Algorithms**

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The multi-scale, closed-loop blood circulation model presented herein includes arterial, venous, and portal venous systems, heart-pulmonary circulation, and micro-circulation in capillaries. Blood flow along the large blood vessels is simulated using one-dimensional (1D) models, whereas zero-dimensional (0D) models simulate blood flow in vascular subsystems corresponding to peripheral arteries and organs. The 1D and 0D models are solved respectively using the two-step Lax–Wendroff scheme and fourth-order Runge–Kutta method. Transmission conditions at bifurcation and confluence nodes are solved using Riemann invariants. The research target is simulating blood circulation in the portal venous system and related organs (liver, stomach, spleen, pancreas, intestine) playing important roles in metabolic system dynamics. In addition, proposed efficient parallel algorithms for multicore environments solve these equations much faster than serial computations.