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Modeling Physiological Systems in the Human Body as Networks of Quasi-1D Fluid Flows[1] ANNE STAPLES, Virginia Tech — Extensive research has been done on modeling human physiology. Most of this work has been aimed at developing detailed, three-dimensional models of specific components of physiological systems, such as a cell, a vein, a molecule, or a heart valve. While efforts such as these are invaluable to our understanding of human biology, if we were to construct a global model of human physiology with this level of detail, computing even a nanosecond in this computational being's life would certainly be prohibitively expensive. With this in mind, we derive the Pulsed Flow Equations, a set of coupled one-dimensional partial differential equations, specifically designed to capture two-dimensional viscous, transport, and other effects, and aimed at providing accurate and fast-to-compute global models for physiological systems represented as networks of quasi one-dimensional fluid flows. Our goal is to be able to perform faster-than-real time simulations of global processes in the human body on desktop computers.

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