**Introduction**

• Blood dynamics is of multi-scale physical phenomena and multi-scale computational method can predict flow, pressure, and temperature in systemic vessels and different organs.

• Measuring finger skin temperature and blood flow is important for diagnosing blood circulation illness and be helpful for noninvasive measurement of blood glucose.

**Objectives**

• To develop a computational model for the analysis of blood flow and temperature distribution in large blood vessels and biological tissues.

• To simulate the thermal function in the human finger.

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**Modeling the Blood Flow and Heat Transfer**

- Simulation of Blood flow dynamics in large vessels
- Heat transfer in living tissues
- Blood flow in microvessels
- Living tissues
- Geometric modeling
- MR image-based modeling and mesh generation

- One-dimensional equations for pulsatile flow
- Computed Pressure signals in different vessels
- Pressure distribution in the direction of the blood flow in large arteries and veins of the finger

- The theory of porous media for heat transfer
- The fluid phase in porous media
- The solid phase in porous media

- Boundary conditions
- Two-step Lax-Wendroff Method

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**Results**

- The Computed Capillary Pressure (a), Velocity (b) in an image-based model of the human finger.

- Computed and measured blood perfusion in the skin.

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**Current Work**

- Three-dimensional modeling of the human finger

- One cross sectional image of the finger, 256 x256 pixels

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**CONCLUSIONS**

One-dimensional blood flow and porous media coupling model can be applied to predict local capillary pressure, blood perfusion, and temperature by using fewer assumptions as compared to other bioheat models.