

3D Bifurcating Artery (steady) - Pre-Analysis & Start-Up

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Problem Specification

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Pre-Analysis & Start-Up

Pre-Analysis

In the *Pre-Analysis* step, we'll review the following:

- **Governing Equations:** We will review the governing equations that need to be solved in this problem.
- **Boundary Conditions:** We will go into more details about the boundary conditions that are applied in this problem.

Governing Equations

Before starting a CFD simulation, it is always good to take a look at the governing equations underlying the physics. In this case, although we have additional complexities such as pulsatile flow and non-newtonian fluids, the governing equations are the same as any other fluids problem. The most fundamental governing equations are the continuity equation and the Navier-Stokes equations. Here, let's have a quick review of the equations.

Continuity Equation:

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However, since we are considering only the steady case, the time-dependent term is zero. Thus, the continuity equation above can be further simplified in the form below:

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The Navier-Stokes Equation is written as follows:

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Boundary Conditions

Wall:

The easiest boundary condition to determine is the artery wall. We simply need to define the wall regions of this model and set it to "wall". From a physical viewpoint, the "wall" condition dictates that the velocity at the wall is zero due to the no-slip condition.

Inlet:

Here our inlet velocity will be a constant 0.315 m/s. This was chosen to give us a Reynolds number of 600.

Outlets:

The systolic pressure of a healthy human is around 120 mmHg and the diastolic pressure of a healthy human is around 80 mmHg. Thus taking the average pressure of the two phases, we use 100 mmHg (around 13332 Pascal) as the static pressure at the outlets.

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