Data Assimilation procedure applied to cardiovascular problems in 3D domains

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In the context of cardiovascular problems, we propose a Data Assimilation procedure to solve a non linear optimal control problem of Dirichlet type. In this procedure, real data is included in numerical blood flow simulations to obtain more realistic and accurate results. The goal is to reconstruct the blood flow profile using known data in the cost functional, available at certain parts of the 3D computational domain while assuming blood as non-Newtonian homogeneous fluid. We propose two types of control imposed at the inlet boundary: as a first step, we consider the control to be a parameter in the inlet boundary profile expression; after, we control the inlet profile assuming perpendicularity with respect to the inlet boundary. To solve this problem we propose a Discretize then Optimize (DO) approach, based on stabilized finite element methods. Some relevant work about this issue can be found for example in [1], [2], [3], [4].

Keywords: Data Assimilation; Optimal control; non-Newtonian fluids;
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