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Particle Swarm Optimizer for Accurate Modeling of the Arterial Blood Flow in Health and Disease[1] DRAGANA SAVIC, University of Oxford, YASSER ABOELKASSEM, San Diego State University — Cardiovascular diseases includes a restriction to the blood supplying the body and are the leading cause of death in the world. Therefore there is a need to model arterial blood flow accurately. Blood flow is normally described using the Windkessel model, but it requires an accurate estimation of the total arterial compliance, resistance and inertance, these are usually described using the non-linear square fit (NLSF), which can be a complex process if the parameter space is large. The particle swarm optimization (PSO) was used to describe the lumped parameters and compare them using NLSF. A 6-element Windkessel (WK6) model was defined and data from both healthy and diseased subjects were used to validate both methods. Both solutions replicated the experimental dicrotic notch and the pressure waveform throughout the cardiac cycle. Even though both methods predicted the magnitude of the input impedance, the PSO method outperformed the NLSF method in capturing the impedance phase angle. The P-RMS value was smaller for the PSO compared to the NLSF method. The PSO method shows for the first time to better describe the model parameters of blood flow compared to the NLSF method in a WK6 model.

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