

Modeling and Simulation of a Blood Pump for the Development of a Left Ventricular Assist System Controller.

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Abstract: A mathematical model describing the pressure-volume relationship of the Novacor left ventricular assist system (LVAS) was developed. The model consisted of lumped resistance, capacitance, and inductance elements with one time-varying capacitor to simulate the cyclical pressure generation of the system. The ejection and filling portions of the pump cycle were modeled with two separate functions. The corresponding model parameters were estimated by least squares fit to experimental data obtained in the laboratory. The model performed well at simulating pump pressure of operation throughout the full cycle. Computer simulation of the pump with a cardiovascular model demonstrated the interaction between the LVAS and the cardiovascular system. This model can be used to incorporate on-line cardiovascular parameter estimation and to design a new controller for the LVAS.

Keywords:

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