

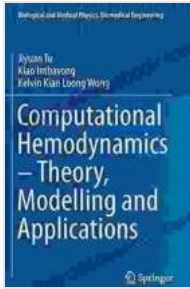
Computational Hemodynamics: Theory, Modeling, and Applications in Biological and Biomedical Systems

Computational hemodynamics is a rapidly growing field that uses computational methods to study the flow of blood in the cardiovascular system. This field has emerged as a powerful tool for understanding the complex interplay between blood flow and the structure and function of the cardiovascular system. Computational hemodynamics has a wide range of applications in biological and biomedical systems, including the diagnosis and treatment of cardiovascular diseases, the design of medical devices, and the development of personalized medicine.

The theory of computational hemodynamics is based on the laws of fluid mechanics. These laws govern the motion of fluids, including blood. Computational hemodynamics models use these laws to simulate the flow of blood in the cardiovascular system. These models can be used to study a wide range of hemodynamic phenomena, including blood flow patterns, pressure distributions, and wall shear stresses.

Computational hemodynamics models can be classified into two main types: lumped parameter models and distributed parameter models. Lumped parameter models represent the cardiovascular system as a network of interconnected compartments. Distributed parameter models represent the cardiovascular system as a continuous domain.

Computational Hemodynamics – Theory, Modelling and Applications (Biological and Medical Physics,



Biomedical Engineering) by Adolph Barr

★★★★☆ 4.6 out of 5

Language	: English
File size	: 21692 KB
Text-to-Speech	: Enabled
Screen Reader	: Supported
Enhanced typesetting	: Enabled
Word Wise	: Enabled
Print length	: 626 pages



Lumped parameter models are relatively simple to develop and solve, but they can only capture the overall behavior of the cardiovascular system. Distributed parameter models are more complex to develop and solve, but they can provide a more detailed representation of the cardiovascular system.

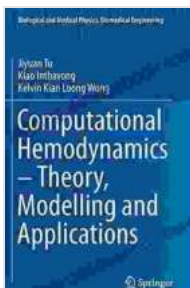
Computational hemodynamics has a wide range of applications in biological and biomedical systems. These applications include:

- **Diagnosis and treatment of cardiovascular diseases.** Computational hemodynamics models can be used to diagnose and treat cardiovascular diseases, such as atherosclerosis, stenosis, and aneurysms. These models can be used to identify the location and severity of these diseases, and to predict the risk of future complications.
- **Design of medical devices.** Computational hemodynamics models can be used to design medical devices, such as heart valves, stents, and grafts. These models can be used to optimize the design of these devices to improve their performance and safety.

- **Development of personalized medicine.** Computational hemodynamics models can be used to develop personalized medicine for cardiovascular diseases. These models can be used to tailor treatment plans to the individual patient's anatomy and physiology.

Computational hemodynamics is a rapidly growing field with a wide range of applications in biological and biomedical systems. This field has the potential to revolutionize the way we diagnose, treat, and prevent cardiovascular diseases.

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- [3] Liu, X., Zhang, S., & Deng, X. (2019). Computational hemodynamics: A review. Computer Methods in Applied Mechanics and Engineering, 344, 127-153.



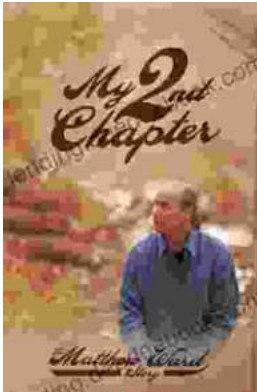
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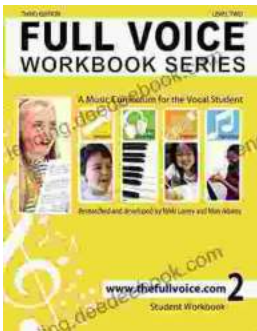
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