UNIVERSITÀ DEGLI STUDI DI GENOVA

Dottorato in Fluidodinamica e Processi dell'Ingegneria Ambientale
Progetto Marie Curie EST "FLUBIO"

AVVISO DI SEMINARIO

"Pulse wave propagation in the cardiovascular system: Simulation, validation and applications"

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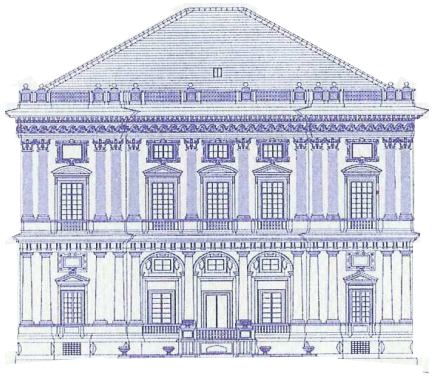
Facoltà di Ingegneria,
Aula A11
Villa Giustiniani Cambiaso



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Abstract

The volume of blood ejected in the aorta when the left ventricle contracts produces continuous changes in blood pressure and ow that propagate in the arterial system in the form of pulse waves, which carry information on the functionality and morphology of the cardiovascular system. A good understanding of the mechanics of pulse wave propagation in normal conditions and the impact of disease and anatomical variations on the propagation patterns provides valuable information to improve prevention, diagnosis and treatment of disease.
We have simulated the problem using the nonlinear one-dimensional (1-D) equations of blood ow in compliant vessels, which offer a good compromise between accuracy and computational cost when a global assessment of the arterial system is required. This formulation allows us to answer haemodynamic questions that cannot be addressed in vivo for technical and physiological reasons, such as the inaccessibility of many of the vessels and the inability to isolate variables without eliciting reex compensations.
Moreover, we have carried out a time-domain analysis of the linear 1-D equations to investigate the mechanisms that produce the main features in the in vivo pulse waveforms in normal conditions. The 1-D formulation has been validated by comparison against pressure and ow measurements in an experimental 1:1 replica of the left ventricle and the systemic human circulation, and has been applied to provide valuable insight into the development of methods for the diagnosis of disease and the identification of anatomical variations by wave analysis..

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