



Mathematical Modeling of the Hydro-Mechanical Fluid Flow System on the Basis of the Human Circulatory System

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Abstract: The primary objective of this study is to examine a human/mammal circulatory system. Considering structures and operating rules of a natural, biological circulatory system one can easily state that it is possible to create an analogous hydromechanical dynamic system. Noting the similarities and taking into account blood and vessels features there is a mathematical model given that includes differential equations of the fluid mechanics. Additionally a stand/analog consisted of hydraulic and electronics elements is presented. A prototype of the circulatory system is proposed with a construction of the heart as a bicapsular pumping unit powered by external pneumatic system. Solving the equations describing biological system, gives opportunities to examine some external and internal risk factors, model input signals and activity under different conditions.

Keywords: *mathematical modeling; fluid flow; circulatory system; biomechanics.*

Mathematics Subject Classification (2010): 93A10, 93A30.

1 Introduction

Considering anatomy and operating principles of biological human/mammal circulatory system (cardiovascular system) one can state that structurally it should be regarded as a hydro-mechanical closed-loop system. Because of the fact that anatomically, considered system is well-examined structure with application of a wide range of fields of science devoted to it (see [4-6]), we are able to exploit available knowledge combining with

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