

NUMERICAL SIMULATION CIRCULATORY AND RESPIRATORY SYSTEM OF HUMAN BODY INCLUDING THEIR INTERACTION AND EXTERNAL FACTORS INFLUENCE

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Software complex of numerical models for simulation most important survival systems of human body including their interaction and external factors influence was developed. Main attention is focused on numerical simulation of the physical processes inside the respiratory and circulatory systems of all human body, such as distribution of discontinuous waves through the vascular system, hydrodynamical flows inside the tissues and organs including their real anatomical structure, global transport of substances by the circulatory and respiratory systems and others.

To solve correspondent multidimensional equations of elliptic, parabolic and hyperbolic types where developed high order accuracy monotonic difference schemes [3]. Then these schemes were adapted to solve the problems in complex domains on unstructured mesh as well as on complex graph's systems.

This software complex lets us to solve wide class problems arising in modern physiology and medicine. First of all these are the problems of response forecasting for different medical influences, external actions and stresses on human body.

Presented the results of simulation some global processes taken place in to a human body, namely blood flow inside the greater (systemic) circulation and lesser (pulmonary) circulation, air flow inside tracheobronchial section including interaction of respiratory and circulatory systems and convection-diffusion matter transport and others [1,2]. Figure 1 shows averaged velocity field of arterial blood inside different organs of human body. Figure 2 shows time dependence of oxygen concentration inside different parts of respiratory system (a) and circulatory system (pulmonary circulation – b, systemic circulation – c).

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