6th European Conference on Computational Mechanics (ECCM 6)
7th European Conference on Computational Fluid Dynamics (ECFD 7)
11 – 15 June 2018, Glasgow, UK

HYPERBOLIC MODEL OF THERMAL INTERACTIONS IN A SYSTEM BIOLOGICAL TISSUE – PROTECTIVE CLOTHING SUBJECTED TO AN EXTERAL HEAT SOURCE

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Key Words: *Tissue Heating, Cataneo-Vernotte Equation,Numetical Modeling, Control Volume Method, Voronoi Tessellation.*

The problem of biological tissue heating in the presence of protective clothing is considered. The heat trabsfer in the tissue sub-domains (skin, fat, muscle, bone) is desribed by the sytem of hyperbolic Cataneo-Vernotte equations [1]. Recently, there is a view that this type of equation in comparison to the well known Fourier equation (or rather the Pennes one [2]) better reproduces the conditions of heat exchange in the tissue. It results from its specific inner structure. For the layers of fabric the transient temperature field is determined by the parabolic Fourier equations supplemented by the term (internal volumetric heat source) resulting from the absorption of thermal radiation. The trapped air between the surface of skin tissue and the internal surface of fabric is treated as a solid body (there are no convection effects in the air gap) and the thermal processes are also described by the Fourier equation in which the substitute thermal conductivity is introduced (in order to take into account the radiative heat transfer).
This rather complex mathematical model of tissue heating is supplemented by the appropriate boundary-initial conditions. It should be pointed out that the mathematical form of the typical boundary conditions in the case of the Cattaneo-Vernotte model is more complicated than in the case of the well known Fourier one (see: [3]).
In this work a cross section of the male thigh insulated with a layers of protective clothing is analyzed (2D problem). At the stage of numerical computations the authorial version of the Control Volume Method using the Voronoi polygons is used [4].

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The paper and research are financed within the project 2015/19/B/ST8/01101 sponsored by the National Science Centre (Poland) and Project PB3/2013 (University of Occupational Safety Management in Katowice).