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INTERFACE CAPTURING AND APPLICATION TO THE SIMULATION OF THE WATER ASSISTED INJECTION MOLDING PROCESS

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ABSTRACT

In this paper, we present a 3D finite element approach to compute multiphase flows, in particular during the Water Assisted Injection molding (WAIM) process.
Polymer's behaviour is supposed non-newtonian, non-isothermal, whereas water is treated as a low viscosity fluid.
Pressure, velocity and temperature are obtained through the usual conservation equations in the multiphase form. These equations are solved in the discretized domain (using simplex-based elements) by the mixed finite element method. Special attention is given to capture the water/polymer interface.
We propose an improvement of interface capturing techniques by using an h-adaptation method to improve computation of the multiphase flows. An anisotropic mesh adaptation technique based on variations of the level-set function allows a better capture of the discontinuities of the physical parameters that characterize the strongly heterogeneous flows.
This method allows an accurate observation of the evolution of the various phases (water/liquid polymer, water solid polymer) as well as their interactions.
A direct application of this improvement is the simulation of complex multiphase problems involved in the manufacturing processes of hollow parts such as the water assisted injection process.

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