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MOVING INTERFACE PROBLEMS IN COMPUTATIONAL FLUID DYNAMICS

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ABSTRACT

In this minisymposium, we focus on several state-of-the-art numerical methods of solving the moving interface problems in computational fluid dynamics (CFD), which are one of fundamental research topics to understand physical behaviour of multiphase flow and premixed turbulent combustion. For the last 30 years, there have been intensive researches of developing numerical algorithms in moving interface problems based on practical applications such as front tracking method, level set method, conservative level set method, volume-of-fluid, immersed interface method, immersed boundary method, cut-cell method. The governing equations from main applications are usually either incompressible two phase Navier-Stokes equations in multiphase flow or G-equation in combustion community. Since the main governing equations are directly to link to practical examples in CFD industries, numerical researches of the moving interface problems are one of crucial joint research topics between academia and industries. Nevertheless, a gap between academic and industrial researches has been more difficult to be bridged over the time. In a view of developing numerical algorithms, it is often caused by the basic assumptions of problems and limitations of resources. We also would like to discuss about how to bridge the gap between academic researches and industrial research needs. From the industry side, the realistic problems and difficulties are introduced and related solutions are presented. From the academy side, advanced numerical methods are introduced and their advantages and disadvantages are presented. Through the minsymposium, we look for not only possible connections and benefits on both sides but also scientific and mathematical discussions of various numerical paradigms to solve the moving interface problems.