

Modified Level Set Equation for Gas-Liquid Interface and Its Numerical Solution

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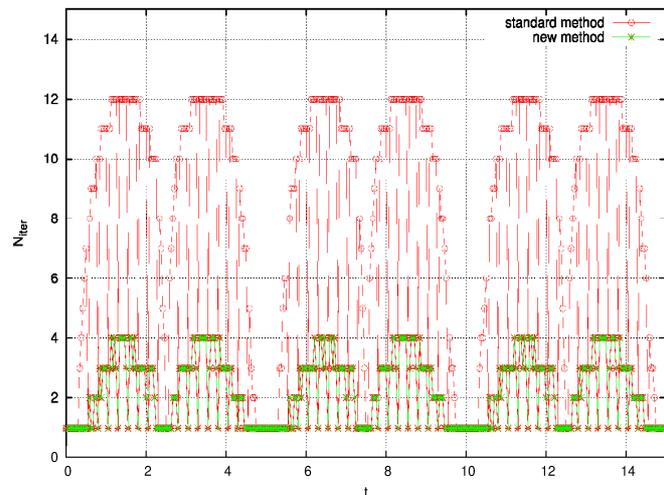
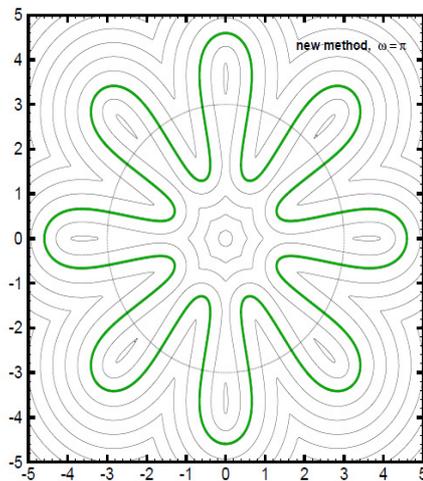
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Abstract.

This paper is devoted to further modification of the Level Set approach, which is well-known for simulation of gas-liquid flows with the interface. In our development, we addressed to the case of a strong velocity gradient at the free interface. This is a typical situation, for example, when this interface interacts with the turbulent flow. In this case, the gradients of the level set scalar, in the vicinity of the interface, increase with time very rapidly. In order to maintain the accuracy of the numerical solution, the Level Set methods are combined usually with the Eikonal equation for a signed distance function from the zero level set. In the standard procedure (Sussman et al., in *J. Comput. Phys.* 114, 1994), in order to be consistent with evolutionary type of the Level Set equation, the non-evolutional Eikonal equation is replaced by quasi-evolutional one, with the artificial time, providing iterations at each time step. Our idea is to modify the Level Set equation, in such a way that the Eikonal equation is satisfied directly by the form of the modified equation. This was done in the proposed paper. The efficiency of the proposed method is demonstrated by using various tests problems with interface.



Isolines of the level set function and the number of iterations for the standard method with reinitialization procedure and new methods proposed in this paper

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