Prediction of the parameters of a system from the distribution of physical fields at an earlier moment of time in the context of Rayleigh-Taylor problem

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Direct numerical simulations performed by the NUT [1] code within the framework of a problem of Rayleigh-Taylor instability development have revealed that the finite values of integral parameters of a mixing process fully depend on its initial state. Note that the simulations differed only by the initial perturbation of the interface boundary.

The revealing of such dependencies is quite a difficult task due to the presence of a large number of the parameters, which influence the evolution process. The present paper describes an algorithm for the approximation of a multidimensional scalar function based on the Bayes approach [2].

As the points of an approximated space the authors used the parameters obtained from the preprocessing procedure (wavelet transformation and linear analysis of the main components) of 2D density fields and velocity at the time moment t=500 mks. For t=1250 mks the corresponding value of the mixing zone width was calculated.

A comparable analysis was made of the results obtained using the velocity field parameters in combination with (or without) the parameters of the density field. A conclusion has been made about the improvement of the prediction quality, and this is not in contradiction with physical considerations.

References

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