Numerical study of converging secondary shocks in neutrally-stable shock waves

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The two-dimensional analysis of the shock wave stability is known to predict the existence of neutrally stable shock waves [1,2]. The property of such waves is a weak attenuation of secondary waves, which are a superposition of acoustic and entropy-vortex perturbations in the space behind the surface of the shock wave, matched with the perturbations of the shape of its surface by relations on the shock-wave discontinuity (see, for example, recent studies of neutrally-stable shock waves [3, 4]. The behavior of converging secondary waves, accompanied by an increase in pressure and temperature in the hot region near the focus, remains outside the scope of two-dimensional analysis. In this work, we study this phenomenon based on the Euler equations in the framework of the three-dimensional formulation of the problem. It is shown that a decrease in the partial derivative of the internal energy with respect to the specific volume at a constant enthalpy for the post-shock state leads to an increase in the effect of cumulation of converging shock waves. Comparison of solutions for stable and neutrally stable shock waves is carried out.

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