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Manipulating Rayleigh–Taylor Growth Using Adjoints ALI KORD[1], PhD Student, JESSE CAPECELATRO[2], Assistant Professor — It has been observed that initial interfacial perturbations affect the growth of Rayleigh–Taylor (RT) instabilities. However, it remains to be seen to what extent the perturbations alter the RT growth rate. Direct numerical simulations (DNS) provide a powerful means for studying the effects of initial conditions (IC) on the growth rate. However, a brute-force approach for identifying optimal initial perturbations is not practical via DNS. In addition, identifying sensitivity of the RT growth to the large number of parameters used in defining the IC is computationally expensive. A discrete adjoint is formulated to measure sensitivities of multi-mode RT growth to ICs in a high-order finite difference framework. The sensitivity is used as a search direction for adjusting the initial perturbations to both maximize and suppress the RT growth rate during its non-linear regime. The modes that contribute the greatest sensitivity are identified, and optimized perturbation energy spectrum are reported.

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