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Hypersonic Air-breathing and Combined Cycle Propulsion (9)

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FUZZY CONTROL OF SHOCK POSITION OF WIDE RANGE RAMJET

Abstract

In order to keep performance of ramjet at optimal state, the closed-loop fuzzy control of a shock position in supersonic wide range ramjet is investigated, based on bleed air flow regulation. Based upon a one-dimensional unsteady nonlinear dynamic simulation model of the ramjet, the dynamic responses of shock position to freestream pressure, freestream velocity and bleed air flow were obtained. The transfer functions of the shock position to freestream disturbances and bleed air flow were identified by curve fit. Furthermore, fuzzy control of shock position is designed. The simulation results show that the designed closed-loop system has a short response time and a small overshoot, compared to conventional PID control, which can suppress freestream disturbances from atmosphere more effectively.