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Hypersonic Air-breathing and Combined Cycle Propulsion (9)

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DYNAMIC MODELING OF RAMJET ENGINE BASED ON SIMULATED ANNEALING ALGORITHM

Abstract

The dynamics of the ramjet engine differ greatly at different operating points. Establishing a versatile and robust model identification method is beneficial to improve the modeling efficiency of the ramjet linear dynamic model and reduce the cycle of control system modeling. Based on the response of the nonlinear dynamic model of ramjet engine, the rational polynomial transfer function is used as the model class. Furthermore, the simulated annealing algorithm is used as the parameter identification algorithm to get the linear dynamic characteristic model of the ramjet engine. The simulated annealing algorithm is verified using typical optimization problems. The model identification algorithm is used to obtain the transfer function of inlet pressure, shock wave and effective thrust to fuel flow. The dynamic responses of linear model agree well with that of nonlinear model. The results show that the transfer function achieves high modeling accuracy, which lays a solid foundation for the ramjet adaptive control and optimal control.