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TRAJECTORY,PROPULSION&GENERAL PARAMETERS OPTIMIZATION FOR SUBORBITAL LAUNCH VEHICLE

Abstract

This paper is concerned with optimization design for Suborbital Launch Vehicle (SLV), particularly for matured launch vehicle designed for orbital missions adapt in suborbital missions. The integrated optimization conception for trajectory, propulsion parameter, and general parameters is proposed according to the characteristics of the Suborbital mission profile. This highly constrained multi-coupling nonlinear issue is consisting with trajectory optimization and static parameter optimization. Conventionally this problem is solved by sequential decoupled method and algorithm, and suboptimal solution is obtained usually, due to the problem complexity and difficulty in algorithm adaptability. In order to obtain the general optimal solution and improve the performance of launch vehicle for suborbital mission, the hierarchical optimization strategy, an algorithm handle with this multi-coupling nonlinear issue directly is proposed in this paper, which combined with modified genetic algorithm and adaptive collocation method. An application of this new algorithm is conducted using the vehicle model of the Long March-II Launch Vehicle (China) as the initial state of this optimization problem. Extensive simulations are conducted, the results show the vehicle general parameters modified compared with the initial states (Long March-II), and the mass of payload raised effectively compared with sequential decoupled method solution. This algorithm in this paper offer a possibility way of adjustment for Long March-II designed for orbital missions adapt in suborbital missions.