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PRECISION LANDING POINT CONTROL TECHNOLOGY FOR ROCKET CORE STAGE

Abstract

Under the increasing frequency of rocket launches, the safety of rocket core stage landing zones has become prominent. To ensure the life safety and property adjacent rocket trajectories, controlled landing of the rocket core stages is imperative. This paper first analyzes the overall scheme and aerodynamic configuration of the Lihong-1 rocket equipped with grid fin systems. A real-time trajectory planning and guidance algorithm based on convex optimization and proportional navigation is then designed, achieving precise core stage landing zone control through accurate landing point prediction and trajectory reshaping. Finally, Monte Carlo trajectory simulation is carried out under various flight deviation conditions. Numerical simulations demonstrate that this algorithm significantly reduces the landing area, ensures landing zone safety, and play an important supporting role in the engineering application of vertical takeoff-vertical landing (VTVL) reusable launch vehicle.

Keywords: Lihong-1; Grid fin system; On-line trajectory planning; Proportional navigation; Landing point control