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Optimization of low-thrust spiral trajectories using evolutionary neurocontrol

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Low-thrust electric propulsion has been an interesting option not only for near Earth mission but also for deep space mission. Recently, all-electric propulsion has been used to perform the complete mission, especially for the orbit transfer from GTO to GEO for the geostationary satellite platform, for its significant mass saving to achieve higher payload capability or lower launch mass. However, the optimization of Low-thrust orbit transfer which is characterized by long powered arcs and a large number of orbital revolutions is a challenge problem. Many tools based on numerical optimal control theory exhibit time-consuming and poor convergence behavior when dealing with planetocentric spiraling trajectories, while the Evolutionary Neurocontrol is a novel method to determine the optimal low-thrust transfer trajectories without an initial guess and an expert in astrodynamics and optimal control theory, and has been used to solve interplanetary low-thrust transfer successfully, is introduced to solve low-thrust planetocentric spiraling trajectories optimization problem. In addition, planet shadow and other forces such as gravitational harmonics, third-body effects, solar radiation pressure, and drag are considered, modified equinoctial elements are introduced to avoid the singularities and orbital averaging technique is introduced to reduce the computational load. Numerical results obtained by evolutionary neurocontrol are compared to those given by SEPSHOT to demonstrate the effectiveness.

Biography

Yang Da-lin is devoting himself to doctor degree in Nanjing University of Aeronautics and Astronautics, his major is Navigation, guidance and control, his research focuses on the spacecraft dynamic and control, nonlinear control. He has published more than 5 papers in reputed journals and related conference.

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