

ABSTRACT: Halo Orbit Generation Using the Center Manifold .

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In recent years, halo orbits around the Sun-Earth Lagrange points,  $L_1$  and  $L_2$ , have become extremely popular for NASA missions due to the ideal observation environment and low launch energy ( $C_3 = -0.6$ ). Traditional methods for the generation of halo orbits require an initial guess provided by some high order analytic expansion. A separate expansion may be required for different systems due to differences in perturbations and small parameter assumptions. Since periodic orbits and quasiperiodic orbits live on the center manifold of the Lagrange point, approximations of the center manifold provide good initial conditions for halo orbit generation. Such a method relies solely on the dynamics of the three body problem and is uniformly applicable for all Sun-Planet and Planet-Moon systems. The approximation of the center manifold is achieved by linearizing the equations of motion of the circular restricted three body problem at the collinear Lagrange points. Using differential correction, a halo orbit is quickly found. Using continuation, halo orbits with large Z-amplitudes are constructed. Models using JPL ephemeris are also considered.

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