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Station Keeping around Halo Orbits using Differential Algebra

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Abstract. A certain level of approximation always characterizes the dynamical models adopted to design the nominal trajectory of a spacecraft. Dynamical perturbations usually act on the spacecraft in real scenarios, deviating it from the desired nominal trajectory. Thus, a station keeping problem arises, which aims at designing the correction maneuvers to compensate for the dynamical perturbations. This work faces the station keeping problem by formulating it as a two-point boundary value problem. Based on differential algebra, an algorithm is presented which delivers the arbitrary order Taylor expansion of the solution of a two-point boundary value problem about an available nominal solution, with respect to the spacecraft state at the measurement points. The mere evaluation of the resulting Taylor polynomials enables the design of high order impulsive correction maneuvers for the station keeping of the spacecraft. The performances of the algorithm are assessed for the station keeping of a spacecraft around a nominal halo orbit.

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