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SHORTER ROTATION PATH DESIGN IN UNDER-ACTUATED WHEEL SPACECRAFT

Abstract

In the event of control failure on an axis of a spacecraft, the target attitude can be approached by several sequential rotations around the remaining live axes. In wheeled spacecraft, the form of each sub-maneuver should be a pure single axis rotation since the failed axis should not be perturbed. The path length in sequential sub-maneuvers, however, increases very much, otherwise short under normal conditions. Finding a shorter path length is important because it guarantees less energy consumption. It is shown in this paper that the path length can be reduced dramatically by increasing the number of sequential sub-maneuvers, especially for the target attitude rotation around the failed axis. Numerical optimization is suggested for finding the shortest path. The optimal solutions are confirmed by simulations to consume less energy.