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A LAMBERT'S PROBLEM SOLUTION VIA THE KOOPMAN OPERATOR WITH ORTHOGONAL POLYNOMIALS

Abstract

Lambert's problem has been long studied in the context of space operations; its solution enables accurate orbit determination and spacecraft guidance. This work offers an analytical solution to Lambert's problem using the Koopman Operator (KO). In contrast to previous methods in the literature, the KO provides the analysis of a nonlinear system by seeking a transformation that embeds the nonlinear dynamics into a global linear representation. Our new methodology to solve for Lambert solutions considers the position of the system's eigenvalues on the phase plane, evaluating accurate state transition polynomial maps for a computationally efficient propagation of the dynamics.

The methodology used and multiple-revolution solutions found are compared in accuracy and performance with other techniques found in the literature, highlighting the benefits of the newly developed analytical approach over classical numerical methodologies.