

ASTRODYNAMICS SYMPOSIUM (C1)

Attitude Dynamics (2) (9)

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DUAL TENSOR SOLUTION TO THE EXTENDED WAHBA PROBLEM

Abstract

Presented in 1965, Wahba's problem became important for multiple applications of aerospace engineering that typically involves finding an optimal rotation to fit a series of vector measurements. During the last decades, many different methods were proposed to successfully solve this problem. The extended Wahba problem involves optimal finding of both position and attitude to fit a series measurements. This new problem is strongly connected with the parameters that can be used to describe the displacement of rigid bodies. Rigid-body displacement parameterization can be done using multiple algebraic entities. When choosing a parameterization method, a very important criterion is the number of algebraic equations and variables. Orthogonal dual tensors proved to be a complete free of coordinates tool for computing rigid body displacement and motion parameters. Using an isomorphism between the special Euclidean group and the orthogonal dual tensors group, we can develop new techniques for solving problems such as the one we tackle in this research. We give a detailed procedure that evaluates the existence of a solution to the extended Wahba problem, which to the authors knowledge this is a first approach. Regarding the implementation of the proposed solutions, a problem emerges when working with data acquired by different sensors. Thus, in order to deal with real data, filtering procedures are needed. We discuss two SVD based filtering algorithms for dual tensors and then we reveal the algorithm that can be used to put into practice the solutions proposed for the extended Wahba problem.