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Author: Mr. Fabrizio Paita
Universitat Politecnica de Catalunya (UPC), Spain

Prof. Gerard Gomez
University of Barcelona, Spain
Prof. Josep J. Masdemont
Universitat Politecnica de Catalunya (UPC), Spain

ON THE CUCKER-SMALE FLOCKING MODEL APPLIED TO A FORMATION MOVING IN A CENTRAL FORCE-FIELD

Abstract

The Cucker–Smale (CS) flocking model is an interacting particles control system where every element adjusts its dynamics according to a weighted average between its velocity and those of the other elements of the flock. Under this model, a rigid body configuration can be achieved exponentially fast for suitable initial configurations. Furthermore, as shown by J. Shen, if the dynamics of the formation is driven by the presence of a free willed leader then similar asymptotic results can also be obtained. In the present paper we extend the CS control law in the context of a multi–spacecraft system moving around a central body. Some new analytical results are given, as well as the results of the extensive numerical experimentations that have been done to evaluate the performances of the control law, with particular attention to its interaction with a central gravitational field. These performances have been evaluated mainly through the use of two indicators: the evolution of the relative spacecrafts distances and the total fuel expended to maintain the formation.