

# PROFESSOR SONIA MARTINEZ



## ANALYSIS AND DESIGN OF LARGE MULTI-AGENT SWARMS THROUGH CONTINUUM APPROXIMATIONS

### ABSTRACT

Self-organization is a pervasive phenomenon in nature, which has inspired the development of multi-robot systems that can mimick their biological counterparts. As we consider larger groups of robotic swarms, new theoretical challenges appear that are associated with both their size and robotic-system limitations. In this talk, we outline recent work on complementary problems related to the control of large swarms. First, we consider a deployment objective by which robots are to be shaped into certain density profile. Under the assumption that agents can obtain measurements of the local density, but do not have access to absolute position information, we propose a PDE-based feedback control strategy that includes the distributed computation of diffeomorphisms. Then we discuss how to handle complementary set of limitations such as lack of access to position information, noisy actuation, or deployment under constraints via gradient flows. To finish, we present results on the identification of subsets of nodes that are critical for the performance of spatial consensus algorithms in large groups.

### BIOGRAPHY

Sonia Martínez is a Professor at the Department of Mechanical and Aerospace Engineering at the University of California, San Diego. Prof. Martínez received her Ph.D. degree in Engineering Mathematics from the Universidad Carlos III de Madrid, Spain, in May 2002. Following a year as a Visiting Assistant Professor of Applied Mathematics at the Technical University of Catalonia, Spain, she obtained a Postdoctoral Fulbright Fellowship and held appointments at the Coordinated Science Laboratory of the University of Illinois, Urbana-Champaign during 2004, and at the Center for Control, Dynamical systems and Computation (CCDC) of the University of California, Santa Barbara during 2005. From January 2006 to June 2010, she was an Assistant Professor with the department of Mechanical and Aerospace Engineering at the University of California, San Diego. From July 2010 to June 2014, she was an Associate Professor with the department of Mechanical and Aerospace Engineering at the University of California, San Diego.

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