SEMINARIO

OPTIMIZACIÓN Y EQUILIBRIO

Expositor
Prof. Ivora Benjamin
Universidad Complutense de Madrid, España

Title

Modeling, Simulation and Optimization of a Polluted Water Pumping Process in Open Sea.

Abstract:

Oil spill contamination in open sea has provoked some of the major environmental disaster in history. The ecological and economic impacts of such hazards are generally important and should be controlled as quickly as possible. One of the major cleaning techniques for these hazards is the use of skimmer ships. Those ships use various pumps distributed along the vessel perimeter to suck the oil from the surface of the water directly into storage units.

In this work, we are interested in improving this process. To do so, we first introduce a mathematical model to simulate the effect on the evolution of given oil spill of: the diffusion, the transport by wind and sea currents and the physical phenomena associated with the action of the pumping ship, assuming that it follows a given trajectory. This model is based on a split non-linear second order finite volume approximation of an advection-diffusion-reaction equation.

In a second part, we design the trajectory of a skimmer ship in order to minimize the amount of the remaining pollutant in the computational domain after a given time. This problem is solved by considering a hybrid global optimization method based on the combination of a particular Genetic Algorithm (GA) and a Semi-Deterministic Secant Method to improve the GA performance. This methodology is validated by considering various numerical examples inspired from real hazards, such as the Prestige accident (2002, Spain), and by comparing the obtained results with those given by a classical GA. For each case, our algorithm has exhibited much better results with significant improvements.

This work is joint with Susana Gomez (Universidad Nacional A. de Mexico, Mexico), Angel Manuel Ramos (Universidad Complutense de Madrid, Spain) and Roland Glowinski (University of Houston, USA).

Miércoles 30 de Julio del 2014, a las $16:30$ hrs, Sala de Seminarios CMM, séptimo Piso.