Seminario de Análisis Numérico y Modelación Matemática

GIMNAP-Departamento de Matemática, UBB
Centro de Investigación en Ingeniería Matemática (CI^{2}MA), UDEC

Expositor:

Paulo Amorim

Universidade Federal do Río de Janeiro, Brasil

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Ant foraging dynamics: reaction-diffusion and individual-based models

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Resumen

Ant foraging is among the most interesting behaviors in the animal kingdom, and a prime example of individuals following simple behavioral rules based on local information producing complex, organized and "intelligent" strategies at the population level. One of its main aspects is the widespread use of pheromones, which are chemical compounds laid by the ants used to attract other ants to a food source. We consider first a continuous description of a population of ants and simulate numerically the foraging behavior using a system of PDEs of chemotaxis type. We show that, numerically, this system reproduces some observed foraging behavior, such as trail formation. Furthermore, in collaboration with R. Alonso (PUC-RJ) and Th. Goudon (INRIA), we present a mathematical analysis of a version of the model. After a critical analysis of this model, we propose an individual-based model of ant movement which takes into account the rules for individual response to pheromones. For this model, we present some mathematical results and collective simulations showing spontaneous trail formation.

Informaciones: royarzua@ubiobio.cl / dmora@ubiobio.cl / ggatica@ci2ma.udec.cl