

## Actividades del grupo de la Universidad Castilla la Mancha

### **Pablo Pedregal**

TÍTULO. Problemas inversos mediante problemas variacionales vectoriales

RESUMEN. Se mostrarán varios funcionales vectoriales completamente explícitos que pueden ofrecer otra alternativa para la aproximación numérica en problemas inversos. Desde el punto de vista analítico, tales funcionales carecen de las propiedades más elementales necesarias para probar la existencia de soluciones óptimas, lo cual resulta previsible dada la naturaleza de los problemas inversos subyacentes. Lo más sorprendente, desde un punto de vista más práctico, es que a pesar de tales dificultades, los procedimientos de aproximación habituales (descenso, gradiente conjugado, Newton) proporcionan aproximaciones más que dignas, hasta el punto de que no se entiende el por qué del buen comportamiento de alguno de esos funcionales. La situación estudiada hasta ahora es la típica de la conductividad en dimensión 2. Otras situaciones más generales suponen dificultades serias en las que estamos insistiendo. Es trabajo conjunto con Faustino Maestre y Luis Bandeira.

### **Alberto Donoso y Ernesto Aranda**

TÍTULO: Discrete and continuous models for connectivity constraints in topology optimization

RESUMEN: Connectivity is an important issue in topology optimization (TO) that affects in a different way depending on the physical meaning of the phases involved in the problem. In this talk, the authors propose apparently different models to characterize and enforce connectivity in TO-problems, which however show a certain relationship. They are a discrete model inspired by spectral graph theory and two continuous models based on the Neumann-Laplacian and Dirichlet-Laplacian operators, respectively. Those approaches are illustrated with 2d and 3d numerical examples in the contexts of structural design, piezoelectricity and synthesis of compliant mechanisms.

### **José Carlos Bellido**

TÍTULO: Nonlocal optimal design of conducting domains

RESUMEN: We consider the problem of optimal distribution of a limited amount of conductive material in systems governed by local and non-local scalar diffusion laws. Of particular interest for these problems is the study of the limiting case, which appears when the amount of available material is driven to zero. Such a limiting process is of both theoretical and practical interest and continues to be a subject of active study. In the local case, the limiting optimization problem is convex and has a well understood basis pursuit structure. Still this local problem is quite challenging both analytically and numerically because it is posed in the space of vector-valued Radon measures. Surprisingly, the nonlocal counterpart admits solution and convergence to local problem when the nonlocality vanishes holds.