综合报告会

Lecture

国家数学与交叉科学中心

Time: 09:00-10:00 am/10:30-11:30 am, May 13, 2013

Venue: Conference Hall, Siyuan Building

Variational Methods in Materials and Image Processing

Speaker: Prof. Irene Fonseca

President of SIAM

Abstract:

Several questions in applied analysis motivated by issues in computer vision, physics, materials sciences and other areas of engineering may be treated variationally leading to higher order problems and to models involving lower dimension density measures. Their study often requires state-of-the-art techniques, new ideas, and the introduction of innovative tools in partial differential equations, geometric measure theory, and the calculus of variations.

In this talk it will be shown how some of these questions may be reduced to well understood first order problems, while in others the higher order terms play a fundamental role.

Applications to phase transitions, to the equilibrium of foams under the action of surfactants, imaging, micromagnetics, thin films, and quantum dots will be addressed.

Formulations and Solution Algorithms for the Minimum 2-Connected Dominating Set Problem

Speaker: Prof. Nelson Maculan

President of IFORS

Abstract:

Let G = (V,E) be a connected undirected graph with a set of vertices V and a set of edges E. For a given $W \subseteq V$, let $\Gamma_W \subseteq V$ be the subset of vertices of V formed by W and those vertices that share an edge with a vertex of W. If $\Gamma_W = V$ holds, W is called a dominating set of G. Furthermore, denoting by E(W) = {{i, j} ∈ E : i, j ∈ W} the subset of edges of G with both end vertices in W, let $G^W = (W, E(W))$ be the subgraph W induces in G. A dominating set W is 2-edge connected (resp. 2-node connected) for G if G^W is 2-edge-connected (resp. 2-node-connected), i.e., if for every pair of distinct vertices u, v ∈ W there exists two edge (resp. node) disjoint paths in G^W connecting them. The Minimum 2-Connected Dominating Set Problem is to find a 2-connected dominating set W of minimum cardinality.

Applications involving minimum connected dominating sets can be found in the design of ad-hoc wireless sensor networks, in the design of defense strategies against the attack of worms in peer-to-peer networks, in the design of fiber optics networks where regenerators of information may be required at some network vertices, and as models to investigate protein-protein interactions. Reliability is frequently a key issue in the design of some of these networks, particularly for telecommunications. When that applies, requiring that the dominating sets be 2- connected is a natural next step to take. In this presentation, we will describe three mixed integer programming formulations, valid inequalities, a primal heuristic, and Branch-and-Cut algorithms for the M2CDSP, in its 2-edge and 2-node connected variants.