CMM
Center for
Mathematical
Modeling

cmm.uchile.cl

Beauchef 851, Edificio Norte, piso 7
Santiago, CHILE
CP 837 0456

tel +56 2 2978 4870

AGCO Seminar

Speaker: Iván Rapaport, DIM - CMM, U Chile.

Title: Energy-Efficient Distributed Algorithms for Synchronous Networks.

Abstract: We study the design of energy-efficient algorithms for well known distributed models of computation: the LOCAL and CONGEST models. Specifically, as a measure of complexity, we consider the maximum, taken over all the edges, or over all the nodes, of the number of rounds at which an edge, or a node, is activein the algorithm. We first show that every Turing-computable problem has a CONGEST algorithm with constant node-activation complexity, and therefore constant edge-activation complexity as well. That is, every node (resp., edge) is active in sending (resp., transmitting) messages for only O(1) rounds during the whole execution of the algorithm. In other words, every Turing-computable problem can be solved by an algorithm consuming the least possible energy. In the LOCAL model, the same holds obviously, but with the additional feature that the algorithm runs in O(poly(n)) rounds in n-node networks. However, we show that insisting on algorithms running in O(poly(n)) rounds in the CONGEST model comes with a severe cost in terms of energy. Namely, there are problems requiring Ω(poly(n)) edge-activations (and thus Ω(poly(n)) node-activations as well) in the CONGEST model whenever solved by algorithms bounded to run in O(poly(n)) rounds. Finally, we demonstrate the existence of a sharp separation between the edge-activation complexity and the node-activation complexity in the CONGEST model, for algorithms bounded to run in O(poly(n)) rounds. Specifically, under this constraint, there is a problem with O(1) edge-activation complexity but Ω(n1/4) node-activation complexity.

(Joint work with Pierre Fraignuiaud, Pedro Montealegre and Ian Todinca)

When: June 28, 3:00 pm.

Where: Sala de Seminario John Von Neuman, CMM, Beauchef 851, Torre Norte.