Lancaster University
MANAGEMENT SCHOOL

Department of
Management Science
Research Seminar

Combinatorial Optimization Approach to the Design of a Large-Scale Radio Telescope

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Date: Wednesday, February 6th, 2008
Time: 12 pm
Room: Lecture Theatre 11

Abstract: Modern large-scale radio telescopes usually consist of many antenna systems spread over a large geographical region, linked up using high-speed fiber optic cables. The relative location of these antenna systems is critical for the imaging performance of the telescope. Since each pair of antenna systems receives a wavelength from the celestial source under study, the number of different distances and angles are directly related to both the sensitivity and resolution of the telescope. On the other hand, this implies that the study of optimizing the performance of a radio telescope is in fact a Combinatorial Optimization Problem.

Given a certain performance value, we present an algorithm that determines a radio telescope topology with the smallest number of antenna systems. The algorithm will be applied to the LOFAR situation, which is a radio telescope of 132 antenna systems currently built in the Netherlands with future extensions to Germany. The topology provided by the algorithm will be compared with the design that is currently considered for LOFAR.

Bio: Gerard Sierksma studied mathematics and physics at the University of Groningen, Netherlands, where he also obtained his PhD-degree in mathematics. Since then his attention is shifted towards practical applications of mathematical techniques, especially to logistics. During the last five years he specialized in the design of decision support computer systems for industry, radio astronomy, and (top)sports. Since 2000, he is a full professor of Quantitative Logistics at the Faculty of Economics and Business at the University of Groningen.