



DEPARTAMENTO DE ESTADÍSTICA
E INVESTIGACIÓN OPERATIVA



Seminar on Uncertainty & Decision Making

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Ghent University and Belgian Nuclear Research Centre

“Soft Computing and Nuclear Reactor Control”

ABSTRACT:

The need for on-line reactor operator support systems and maintenance has become evident after the Three-Mile-Island accident in 1979. Since then and especially from the recent Fukushima event, considerable attention has been paid by the engineering, scientific, economic and political communities and society at large to prevent this type of events. Among the techniques available today, the use of fuzzy control, or commonly known as one of soft computing techniques, as a means of expressing linguistic expressions mathematically, has been recently applied to nuclear reactor control. In this seminar, I will report an R&D project on fuzzy control to the BR1 (The Belgian Reactor 1) for controlling the power level of a nuclear reactor, the study was intended to assess the applicability of fuzzy control in this domain. The final goal was to develop an optimized and intrinsically safe controller. The BR1 reactor is internationally regarded as a nuclear calibration reference. It therefore provides an excellent environment for this type of experiments, because over the years considerable knowledge of the static and dynamic properties of the reactor has been accumulated. During the seminar, I will summarize the added values and technical limits of soft computing techniques in complex systems such as nuclear reactor control applications.

ABOUT THE SPEAKER:

Da Ruan is currently under the program “Visitantes distinguidos e investigadores extranjeros en la UCM-GROPO SANTANDER” at the Faculty of Mathematics from April 4 to June 4, 2011. He obtained his PhD in Math, from Ghent University, Belgium, in 1990. After Postdoc at the Belgian Nuclear Research Centre (SCK•CEN) from 1991-93, he has been the principal investigator for research projects on intelligent control and decision making for complex (nuclear) systems. His major research interests lie in the areas of mathematical modelling, computational intelligence methods, uncertainty analysis, decision support systems to information management, safety and security related fields. He serves as Regional editor for Europe of Int. J. of Intelligent Automation and Soft Computing, Co-editor-in-chief of Int. J. of Nuclear Knowledge Management, Editor-in-chief of Int. J. of Computational Intelligence Systems. He is a full-time research professor at SCK•CEN, Guest Professor at the Dept. of Applied Math. and CS in Ghent University and at the Dept. of Applied Economics in Hasselt University, respectively, in Belgium, and Adjunct Professor in the Faculty of Information Technology at University of Technology, Sydney in Australia.

Organized by Departamento de Estadística and IMI

Jueves, 14 de abril de 2011 a las 13:00 horas

Seminario Sixto Ríos (aula 215)

Facultad de Ciencias Matemáticas, UCM