COMPETITION FOR YOUNG RESEARCHERS (age limit 40 years old) AT THE URBINO UNIVERSITY
SUPPORTED BY ACRI "YOUNG INVESTIGATOR TRAINING PROGRAM 2018"

Attachment 1

Application form

The following declarations are given according to articles 46 and 47 of D.P.R. n. 445/2000.

Title: Professor Assistant
Name and Surname: BOUTAAYAMOU IDRISS
Date of Birth:
E-mail:
Phone number:
Home Address (residence):
Languages skills (please specify English, French or Italian):
I carry out research activities in the following areas:

Affiliation:
Role:
Contact Person at the affiliated institution:

Proposed title for the conference talk
Brief Abstract (max 5 lines):

Selected hosting institution (please see the list of host institutions):
1st choice:
2nd choice:
3rd choice:
Proposed visiting period:

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In my thesis supervised by Prof. L. Maniar, we studied the inverse problems for degenerate parabolic systems with the purpose to understand better the phenomena related to the degeneracy of the operator. We considered two types of degeneracy: at the boundary and in the interior of the spatial domain.

The case of degeneracy at the boundary was conducted in collaboration with Prof. A. Hajjaj: we considered a coupled system with two different diffusion coefficients and with one force, then we reconstructed the source term from the observations made on a single component of the solution. The observations are in a positive time and locally distributed.

The case of internal degeneracy is considered in collaboration with Prof. G. Fragnelli: we first studied cascade type systems with two different and general diffusion coefficients and with a single source; appropriate Carleman estimates were proved and then, using the method based on these estimates, we showed the Lipschitz stability of the source term. Secondly, we showed observability inequalities for parabolic problems where the operator is in a divergence or non-divergence form, the originality being two: in addition to degeneracy within the spatial domain, the boundary conditions considered are of Neumann type.

My works during my PhD thesis deal with the one-dimensional case, and a natural continuation of what is realized is the study of the inverse source problems and controllability for a
class of two-dimensional degenerate parabolic systems. The aim is to show Lipschitz stability results and observability inequalities in order to identify the different coefficients acting on the considered models (source terms, potentials, diffusion coefficients and initial-final data). This problem is real and not trivial. We will study two cases of degeneracies: inside and at the boundary of the space domain. The methods of mathematical analysis which we will use are two: Carleman estimates (for which key tools are integration by parts with some "manipulations", a delicate step being the introduction of suitable weight functions that must have certain special properties), and a spectral method, which may play a crucial role for a possible numerical study.

Another subject of research is the cost of control and the time optimal control for the degenerate nonlinear case. In particular, in recent papers on null controllability for linear population models the authors do not consider the positivity of the solution, even if it is clearly interesting. This problem is related to the minimum time, i.e. the time cannot be very small to obtain positive solution.

For these last problems, one can extend the results given by Enrique Fernández-Cara and/or Enrique Zuazua for the non degenerate case.

Place and date: 

Signature:  

Submit your application and enclose as separate files, a copy of your passport/ID card reporting personal details, and a full CV.