PH.D. OFFER:
STABILIZATION AND CONTROLLABILITY OF STEFAN'S PROBLEM

- Subject title: Stabilization and controllability of Stefan's problem
- Keywords: Control, Stabilization, Heat equation, Stefan's Problem, Constrained state
- Thesis directors: Jérôme Lohéac and Takéo Takahashi
- Workplaces: Institut Élie Cartan de Lorraine and Centre de Recherche en Automatique de Nancy
- Start of the Ph.D. thesis: October 2021

Subject description

We are interested in problems of controlling the melting or solidification of a solid. To model this, we can for example use Stefan's problem in dimension 1, which couples two heat equations across an interface whose position varies in time and is unknown. Several recent works deal with the controllability and stabilization of this model and the objective of the thesis will be to refine the results obtained to make them more feasible in practice: stabilizing via a control depending only on a partial measurement of the state, stabilize or control towards a non-trivial stationary state, characterize the minimum controllability time, study multidimensional models. . .

Master internship

A Master internship preceding the thesis is possible. The subject will focus on some questions associated with the thesis topic. For example, one can consider, an adaptation of some results to the case of the heat equation in spherical or cylindrical coordinates or to the exploration of some results using a numerical method.

Candidate profile

This subject requires both automatic and applied mathematics skills. In addition to basic knowledge in automatic control, notions of partial differential equations are desired.

Furthermore, for numerical experiments, it is necessary to have basic notions in numerical approximation as well as a mastery of numerical computation software such as `Matlab` or `Scilab`.

Application form

For anyone interested in this subject, please send your applications to Takéo Takahashi and Jérôme Lohéac (emails: `takeo.takahashi@inria.fr` and `jerome.loheac@univ-lorraine.fr`). The documents required for the application (Ph.D. or Master) are:

- a CV, mentioning in particular if you have already obtained your Master 2 Research or if you are going to obtain it before this summer, as well as the ranking you obtained with your last diplomas;
- last academic transcripts;
- a cover letter;
- some letters of recommendation (sent directly to us) or contact person;
- a copy of your passport indicating your date of birth, place of birth and current address.

A detailed version of the topic is available here.