Ecole Doctorale des Sciences Fondamentales

Title of the thesis: Resolution of non-linear parabolic equations using Least-squares type methods and application to optimal control.

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Summary :

Least-squares methods have been introduced in the 70's to solve equations and systems through iterative processes. For the equation - E(u)=f – the idea is to minimize with respect to u the functional N(E(u)-f) where N is a norm (see [1]).

Recently, this kind of method has been introduced to solve controllability problems for linear non stationary PDEs. Recall that in control theory, the aim is to drive the solution to a given state through an additional function, the control. Actually, the variational framework proposed by least-squares approach is really convenient to reformulate control problems.

We refer to [2,3,4,5] for some realizations in the linear context and to [6,7] in nonlinear one.

The main of the thesis is to study the potential of least-squares method to solve direct and control problems for non linear system. We have in mind notably the stationary and non stationary Navier-Stokes system [6,7] as well as application to optimal control for the modeling of a road de-icing device by a nonlinear heating, developed with the CEREMA [8]

This thesis requires some skills in functional analysis (PDE Theory, Calculus of Variations), numerical analysis and also in computing.

More information can be found at http://math.univ-bpclermont.fr/~munch/

Interested people are encouraged to contact Arnaud Munch.

References

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