M2 Internship position in Applied Mathematics at Inria Sophia Antipolis Méditerranée, Team ACUMES

Boundary conditions for non-local conservation laws

January 31, 2016

Scientific Context

The newly created Inria Team ACUMES (`https://team.inria.fr/acumes/`), based in Sophia-Antipolis, South-East France, is looking for an M2 student to join its research activity on systems of conservation laws.

ACUMES focuses on the analysis and optimal control of classical and non-classical evolutionary PDE systems arising in a variety of applications, ranging from fluid-dynamics and structural mechanics to traffic flow and biology. The complexity of the involved dynamical systems is expressed by multi-scale, time-dependent phenomena subject to uncertainty, which can hardly be tackled using classical approaches, and require the development of unconventional techniques.
In particular, non-local interactions at the microscopic level can be described through macroscopic models based on integro-differential equations. Conservation laws with non-local flux of the form

$$\partial_t U + \mathrm{div}_{\mathbf{x}} F(t, \mathbf{x}, U, w * U) = 0$$

appear in models of sedimentation in porous media, granular flows, vehicular traffic and crowd dynamics, supply chains, conveyor belts, etc. For example, non-local traffic flow models are intended to describe the behavior of drivers that adapt their speed to the downstream traffic conditions. This can be expressed by a non-local velocity function depending on a weighted integral of the downstream density [2].

Job Description

The intern will focus on the analytical and numerical study of boundary conditions for conservation laws with non-local flux function in one and several space dimension.

Requirements

- Last year of MSc (Master 2) in Mathematics, Engineering or related disciplines.
- Scientific background on Partial Differential Equations analysis, numerical analysis and computer simulations.
- Matlab programming.
- Experience in hyperbolic systems of conservation laws and finite volume schemes is considered an additional plus.

Salary Range

Average net salary of 1100 €/month.

Starting date and duration: From April 2016 or later, for 6 months.

Applications

Please send electronic application including CV, a statement of research interests, and contact details of reference persons to:

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References

[1] Aggarwal A, Colombo RM, Goatin P. Nonlocal systems of conservation laws in several space dimensions. *SIAM J. Numer. Anal.*, to appear.
`https://hal.inria.fr/hal-01016784`

[2] Blandin S, GoatinP. Well-posedness of a conservation law with non-local flux arising in traffic flow modeling. Preprint 2014.
`https://hal.inria.fr/hal-00954527`