## Post-doctoral position

### Analysis and rejection of mechanical vibrations for drilling

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<td><strong>Location:</strong></td>
<td>GIPSA-lab (Grenoble, France) with stay in CAS, MINES ParisTech (Paris, France)</td>
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<td><strong>Duration:</strong></td>
<td>One year, starting early 2017 (can be renewed depending on the obtained results)</td>
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### Context

Mechanical vibrations along the drillpipe and the drillbit in the oil and gas industry have a triple negative impact: increase of the *Non-Productive Time* (NP), damaging or even failure of the device and decrease of the average drilling velocity. In a context of overall cost reduction, operators are in need of non-intrusive strategies to limit or even suppress these vibrations. Control theory, enabling to analyze and control the drillpipe moves from the surface, offers an ideal framework to meet these needs.

### Post-doc Objectives

Physical phenomena at stake in the context of oil drilling are especially complex. First, interaction laws between the borehole and the drillbit are uncertain and intricate. Second, the physical length of the considered systems (several kilometers) implies the existence of propagating mechanical waves, which have to be explicitly taken into account in the modeling.
The goal of this post-doctoral position is to design, implement and compare suitable control strategies limiting structural vibrations. Among other possibilities, considered solutions include:

- Prediction-based controller for uncertain variable (state-varying) time-delay systems;
- Observer design using only measurements available at the surface of the well;
- Adaptive controller or observer to reduce the impact of modeling uncertainties.

These control laws will be tested numerically in simulation with dynamical models of various complexity. Their relevance will also be evaluated in view of experimental tests produced on a scaled test-bench at GIPSA-lab.

**Application**

The applicant should have a Ph.D. (or graduate with one soon) in control and dynamical systems or closely related areas. A prior experience in the area of Partial Differential Equations or Delay Systems is recommended but not mandatory. She/he should also be familiar with programming in Matlab and real-time experiments.

Application must include a detailed resume, the preprints of the two most significant publications and two references who may be asked to provide letters of recommendation.

**References:**

[1] D. Bresch-Pietri and F. Di Meglio, “Prediction-based control of linear input-delay systems subject to state-dependent state delay – Application to suppression of mechanical vibrations in drilling”, in Proc. of the 2nd IFAC Workshop on Control of systems governed by Partial Differential Equations