STOCHASTIC CONTROL OF VARIATIONAL INEQUALITIES FOR RANDOM MECHANICS (SCARMEC)

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- Primary scientific domain : Applied Mathematics
- Secondary scientific domain : Probabilistic Engineering Mechanics

Goal of the project

In an extremely wide range of applications, mechanical systems are fundamentally affected by vibrations. For instance, components (such as pipes) in a power plant must be designed to be structurally robust under seismic vibration. The latter also cause mechanical systems to accumulate fatigue and eventually fail. The importance of these issues has motivated a lot of effort in engineering mechanics. From the modeling point of view, keeping track of the impact of past vibrations requires a specific description of the mechanical systems under consideration. The state of the system must be described by a randomly forced dynamical system with memory. Random forcing here expresses the stochastic nature of the vibrations that apply to the mechanical structures. In this framework, the difficulty is to handle dynamical systems with memory. A huge engineering literature has been devoted to this topic. The project mainly focuses on an important model, referred to as the elasto-plastic oscillator, which appears in various applications. Some members of the team already started to cooperate on the so-called elastic-perfectly-plastic oscillator. In this context, they identified stochastic variational inequalities as the right mathematical tool to deal with the model. Our objective in this proposal is to extend the research to the analysis of a new class of Free Boundary Problems and Hamilton-Jacobi-Bellman (HJB) Equations related to stochastic control methods in earthquake engineering.

References

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