Control and Numerics : Continuous Versus Discrete Approaches

Enrique Zuazua
(Basque Center for Applied Mathematics, Bilbao, Spain)

IMAR Monthly Lecture, Bucharest, March 30, 2011

Abstract. Control Theory and Numerical Analysis are two disciplines that need to be combined when facing most relevant applications. This is particularly the case for problems involving Partial Differential Equation (PDE) modelling.

There are two possible approaches. The continuous one, consisting on developing the control theory at the PDE level and, once controls are fully characterized, to implement the numerical approximation procedure. And the discrete one, consisting in doing the reverse, i. e. first discretizing the model and then controlling the resulting discrete system.

In this lecture we shall compare these two approaches in two relevant examples: The control of vibrations and the control of flows in the presence of shocks. As we shall see, a number of unexpected phenomena occur and challenging problems arise both from a mathematical and applicational viewpoint.