

SERGE NICAISE

**Uniformly exponentially or polynomially stable approximations for
second order evolution equations**

We will consider the approximation of second order evolution equations. It is well known that the approximated system by finite element or finite difference is not uniformly exponentially or polynomially stable with respect to the discretization parameter, even if the continuous system has this property. Our goal is to damp the spurious high frequency modes by introducing numerical viscosity terms in the approximation scheme. With these viscosity terms, we show the exponential or polynomial decay of the discrete scheme when the continuous problem has such a decay and when the spectrum of the spatial operator associated with the undamped problem satisfies the generalized gap condition. Some illustrative examples will be also presented.

This talk is based on a joint work with F. Abdallah (Université de Valenciennes et du Hainaut Cambrésis, France and Université Libanaise, Beyrouth, Liban), J. Valein (Nancy-Université & INRIA (Project-Team CORIDA), France) and A. Wehbe (Université Libanaise, Beyrouth, Liban).