NONLINEAR COMPUTATION: FUTURE OF NUMERICAL SIMULATION

Liqiu Wang
Department of Mechanical Engineering, The University of Hong Kong, Pokfulam Road, Hong Kong
lqwang@hku.hk

ABSTRACT Attempt to understand the world counts on our understanding of topics like bifurcation and chaos, and features like multiplicity, stability, and sensitivity with methods such as continuation and branch switching. "Nonlinear Computation" is a short name for "computation of something that is nonlinear". It provides a framework for the computational science and engineering of the future and is essential when we try to predict and simulate the dynamics of states in the technical systems we utilize, in the ecological and economical systems we live, and in the biological systems we belong. In this lecture, I will discuss key issues in nonlinear computation and show its capabilities by using examples like (1) convection in microchannels, (2) cooling systems of rotating machinery, (3) microfluidic fabrication of smart materials, (4) thermal control system for the Alpha Magnetic Spectrometer (AMS) on the International Space Station, and (5) causative factors and the clinical applicability of spontaneous regression of malignant tumors.