

Lecture in CSM:

Shape Manifold Learning Approach

Prof. Guénaël LE QUILLIEC

Department of Mechanics and Systems, Polytech Tours, Tours, France

ABSTRACT

In this lecture, the concept of "shape manifold" will be introduced. This concept allows representation of complex "shapes" encountered in some mechanical problems, such as material characterization, design optimization, springback or image correlation. The overall idea is to define the manifold of admissible shapes. The reduced representation is obtained by means of projecting the level set representation of shapes on a set of carefully chosen basis vectors from proper orthogonal decomposition. This allows to identify the intrinsic dimensionality of the problem, independently of the original design parameters. Also, an optimal parametrization may be obtained for arbitrary shapes, where the parameters have to be defined a posteriori. We apply this approach to various examples such as local parameter identification of metallic and elastomer materials from instrumented nano-indentation data.