AVVISO DI SEMINARIO

Si comunica che

Giovedì 3 novembre 2011 alle ore 11:30 presso la **Sala Conferenze R2** il

Dr. Vladimir Buljak

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terrà un seminario dal titolo:

Inverse analysis – Modern approach

Numerical simulations have been established as a powerful tool used in practically all fields of engineering and science. A large number of commercial codes is developed to solve the so called *direct problems*, which consist of finding the solution in terms of response fields when a complete set of input data defining uniquely the system is known. Since these codes require the knowledge of some parameters on which the solution depends, sometime in engineering practice it is required to solve an *inverse problem*, defined as the one where some of the "effects" (responses) are known but not some of the "causes" leading to them.

Parameter identification in structural mechanics represents a widely growing group of inverse problems with various challenges in computational mechanics. This research is engineeringly motivated both by the need to characterize newly produced materials and to assess the properties of potentially deteriorated structural components in service.

The common denominator of all parameter identification methods is that they represent a synergic combination of computational methods and experiments. The results coming from these two resources (i.e. experiment and its appropriate simulation) are combined together within a discrepancy function that should be further minimized with respect to the sought parameters.

Such minimization (often non-convex and sometimes non-smooth) can be performed either by traditional mathematical programming algorithms, and/or, as a recent development, by soft computing. In this context soft computing includes evolutionary genetic algorithms and artificial neural networks (ANN).

When well established traditional optimization algorithms are used the main computing issue becomes the way the system responses are computed within iterative procedure. Obviously, the need to solve the resulting minimization problem fast and in situ on "small computers" practically excludes the possibility to deal with commonly used FEM procedures.

This lecture intends to outline recently growing advantages of the parameter identification methodology and their applications to real-life engineering problems, investigated by our Milan research team. The approach adopted combines model reduction techniques with mathematical programming in order to obtain fast and accurate models for system response prediction. Such advantages can be achieved in various engineering situations and industrial contexts by the use of reduced basis model that combines "Proper Orthogonal Decomposition" (POD) with "Radial Basis Functions" (RBF).

By combining these two mathematical techniques into a practical procedure it is possible to obtain "light" computational tool capable of computing responses of highly non-linear systems in a time shorter by several orders of magnitude with respect to traditionally used FEM procedure, without any practical loss of accuracy. This consequence contributes to a robustness and huge economical savings of the resulting diagnostic procedure.

Finally, the use of the developed reduced basis model is not confined to the inverse analysis purposes only. The computational burden for the development of such model lies in the preliminary computational phase that may be time consuming depending on the case, but it is done once for all and it can be parallelized. This approach can have significant pay-offs also in some other engineering applications and the possible applications outside of the diagnostic procedures techniques will be presented in the lecture.

Tutti gli interessati sono invitati a partecipare.

Il seminario è organizzato dal gruppo di Scienza delle Costruzioni
(D. Bigoni, L. Deseri, M. Gei, A. Piccolroaz, R. Springhetti)

Il direttore
Prof. L. Deseri