
Preface

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Structural damage can be considered as weakening of a structure that negatively affects its performance to support loadings and could cause undesirable stresses, displacements or vibrations on the structure. In all cases damage can severely affect safety and serviceability of the structure. There are many examples all over the world from structures that were affected by structural damage including, in some cases, the complete collapse with many people injured.

Consequently, structural monitoring and damage detection are areas of current interest in civil, mechanical and aerospace engineering. Visual inspection has been the most common method used in detecting damage on a structure. However, the increasing in the size and complexity of structures in the last decades reduced the efficiency of the visual inspections. Moreover, visual inspection techniques are inadequate for structures where the damage is invisible to human eyes.

In the last years, localised experimental procedures were developed, such as rebound hammer test, acoustic or ultrasonic methods, magnetic field methods, radiographs, eddy-current and thermal field methods. On the other hand, also appears in the last years global monitoring techniques based on changes in the vibration characteristics or structural response of the structure being analysed. Related to this the inverse problem of identification of dynamic systems appear strongly related to this techniques.

This special issue of *International Journal of Lifecycle Performance Engineering (IJLCPE)* is aimed to bring together a state-of-the-art representation of the recent advances in the methods of determining structural damage and system identification in engineering structures. By sharing the experiences on the successes, challenges, and pros and cons in the development and implementation of the various techniques, it is also hoped to promote the best practice in performing competent detection of structural damage for both investigative and professional purposes.

Contributions to this special issue have been solicited by invitation, and all the papers submitted have been reviewed by at least two experts in the relevant field of studies. Topics covered in this special issue include *determination of structural damage* using different and attractive methodologies like firefly algorithm, artificial neural networks and bilinear stiffness direct estimation; *system identification* via stochastic subspace identification (SSI) and firefly algorithm; as well as *identification of defects in piles*. The origin of the papers is: two from Brazil, one from Argentina, one from Spain/Argentina and one from Italy. This geographic distribution represents very well my role as Regional Editor in South America.

Finally, I wish to take this opportunity to thank all contributors for sharing their research experiences and findings in this special issue of *IJLCPE*. I also wish to extend my thanks to all the reviewers for providing timely review of the papers and valuable comments.