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Hybrid Modeling and Optimization of Manufacturing

Combining Artificial Intelligence and Finite Element Method

Springer

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Preface

Neither the finite element method nor the artificial intelligence are new tools in modeling and optimization of manufacturing processes. A big amount of information on these topics can be found in the specialized literature. Nevertheless, the combination of both approaches in not as old and widespread. Only in recent years, this approach is beginning to receive a noticeable attention from the research community.

Combining the capability of the finite element method for computing good approximate solutions of partial differential equations defined on geometrically complicated domains with the advantages of artificial intelligence-based techniques for mapping nonlinear noisy relationships and for obtaining near-optimal solutions in complex problems, results in a more powerful and flexible tool. This hybrid approach has been used for solving some problems in manufacturing modeling and optimization, but it is currently in its birth. It can be undoubtedly expected that, in the next years, the growing of the processing power of computers together with the development of new more efficient methods in both areas, increase the efficacy and efficiency of this methodology.

The main objective of this text is to expose some conceptual ideas on the integration of the finite element method and artificial intelligence tool for solving modeling and optimization problems in the field of manufacturing processes. Also, the main topics on both tools are explained and an illustrative sample of the use of the hybrid approach is presented.

The book is directed to the research community dedicated to the mathematical modeling and optimization of manufacturing processes. It is intended to be employed at postgraduate level but some of its topics can be used also in undergraduate courses.

As in every work, the contribution of many people played an important role. However, we want to highlight the support of our college Professor Marcelino

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