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Multi-objective Evolutionary Optimisation for Product Design and Manufacturing
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State-of-the-Art Multi-Objective Optimisation of Manufacturing Processes Based on Thermo-Mechanical Simulations

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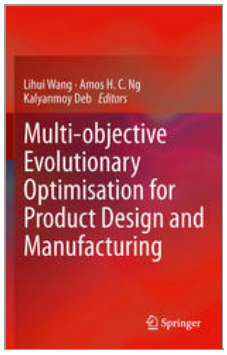
Abstract

During the last couple of decades the possibility of modelling multi-physics phenomena has increased dramatically, thus making simulation of very complex manufacturing processes possible and in some fields even an everyday event. A consequence of this has been improved products with respect to properties, weight/stiffness ratio and cost. However this development has mostly been based on “manual iterations” carried out by the user of the relevant simulation software rather than being based on a systematic search for optimal solutions. This is, however, about to change because of the very tough competition between manufacturers of products in combination with the possibility of doing these highly complex simulations. Thus, there is a crucial need for combining advanced simulation tools for manufacturing processes with systematic optimisation algorithms which are capable of searching for single or multiple optimal solutions. Nevertheless, despite this crucial need, it is interesting to notice the very limited number of contributions in this field and consequently this makes us wonder about the underlying reasons for it. The understanding of the physical phenomena behind the processes, the current numerical simulation tools and the optimisation capabilities which all mainly are driven by the industrial or academic demands as well as computational power and availability of both the simulation and the multi-objective optimisation oriented software on the market are the main concerns to look for. These limitations eventually determine what is in fact possible today and hence define what the “state-of-the-art” is. So, seen from that perspective the very definition of the state-of-the-art itself in the field of optimisation of manufacturing processes constitutes an important discussion. Moreover, in the major research fields of manufacturing process simulation and multi-objective optimisation there are still many issues to be reserved.



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