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Editorial

Advances in CAD/CAM/CAE Technologies

Panagiotis Kyratsis [1,*], Konstantinos Kakoulis [1] and Angelos P. Markopoulos [2]

[1] Department of Product and Systems Design Engineering, University of Western Macedonia, GR50100 Kila Kozani, Greece; kkakoulis@uowm.gr

[2] Laboratory of Manufacturing Technology, School of Mechanical Engineering, National Technical University of Athens, 15780 Zografou, Athens, Greece; amark@mail.ntua.gr

* Correspondence: pkyratsis@uowm.gr

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Computer-aided design, computer-aided manufacturing and computer-aided engineering (CAD/CAM/CAE) technologies find more and more applications in today's industry, e.g., in the automotive, aerospace, and naval sectors. These technologies increase, to a great extent, the productivity of engineers and researchers, while at the same time allowing their research activities to achieve higher levels of performance. A number of difficult-to-perform design and manufacturing processes can be simulated using more methodologies available, i.e., experimental work combined with statistical tools (regression analysis, analysis of variance, Taguchi methodology, deep learning), finite element analysis applied early enough at the design cycle, CAD-based tools for design optimizations, and CAM-based tools for machining optimizations. As the tools available have become more sophisticated, engineers/researchers consider this challenge as an opportunity for more accurate design, manufacturing, and simulations. This Special Issue includes papers that cover a variety of relevant issues and provides an opportunity for researchers to present recent advances in CAD/CAM/CAE technologies.

A set of computer aided engineering (CAE) simulations, including induction hardening, superimposed stroke peening (mechanical post-treatment), and a fatigue assessment considering local material properties, is presented in [1]. The electromagnetic–thermal simulation of inductive heating was performed with Comsol®, the thermometallurgical–mechanical analysis of the hardening process utilized Sysweld®, and the mechanical post-treatment was numerically simulated by Abaqus®. A finite element analysis (FEA) based topology management optimization study on a two-stage spur gear reducer housing body and cover is presented in [2]. The study aims at optimizing the overall weight of the reducer by thinning specific areas of the casted gearbox housing elements. The topology optimization algorithm gives an optimal structural shape of the housing elements of the reducer with the largest stiffness, considering the given amount of mass that will be removed from the initial design space. Solidworks® was used as a tool for this research. In [3], the ball-burnishing technique was used to investigate the effect of input parameters of processes on selected surface layer features, i.e., surface roughness and residual stresses on 42CrMo4 steel and, as a result, to improve its tribological properties. Apart from experimental research, the development of accurate and efficient models is considerably important in the field of manufacturing processes. In [4], a comparison between the performance of various neural network models (multilayer perceptron, radial basis function neural network, adaptive neuro-fuzzy inference system) and the performance of a multiple regression model was done. Data from drilling experiments on an Al6082-T6 workpiece for various process conditions were employed, and the performance of models related to thrust force (F_z) and cutting torque (M_z) was assessed. It was concluded that the multilayer perceptron models were superior to the other neural network models and the regression model. In [5], a method applied with the aim to improve the friction behavior of machine elements is electrostatic coating of the surfaces of interest with polyester layers that include particles of solid lubricant. Grey analysis was employed to identify sets of

input factors that would lead to the most convenient values of the lifetime and energy friction losses, when using polyester layers that incorporate molybdenum or graphite particles. Most universities have included computer-aided design (CAD) pattern-making system education and training in their clothing technology courses in recent years to respond to the actual needs of the fashion world for high-skilled fashion designers and clothing engineers. The authors of [6] compared two commercial licensed CAD systems for pattern design (Polypattern and Create) to an open source software, Seamly2D, and to Wild Ginger's Caveo V6 program, which runs within an open source software (OSS). The results obtained from the evaluation of a set of open source and licensed CAD systems are presented and critically discussed. In [7], an experimental investigation was conducted during the finishing of impeller blades, using Taguchi L16 orthogonal array. After the analysis of surface roughness was conducted for the 16 experiments, it was found that the most important parameters were the spindle speed and feed. Furthermore, the optimum settings were determined as the maximum spindle speed and the lowest feed per tooth value, and a regression model correlating process parameters with surface roughness was established with a high degree of accuracy.

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