Guest Editorial _____
Special Issue on Cyber Systems in the field of Aerospace, Robotics, Mechanical Engineering, Manufacturing Systems, Bioengineering, Power Energy, Materials Technology and Neurorehabilitation

Guest Editor:
Prof.univ.Ph.D.Eng. Adrian Olaru
University Politehnica of Bucharest
Machine and Manufacturing Systems Department

The development of automatic analysis & optimization tools is a continuous concern and challenge for the research in the field of mechanical systems design. Important publications reveal a growing interest in analysis & optimization methods for multi-body systems (MBS), which may facilitate the self-formulating algorithms. Such methods are intensively used to develop powerful virtual prototyping software environments.

The stages to create a virtual prototype mirror to the physical model as follows: modeling (create parts, restrictions, and forces generating elements), simulation (analysis/testing), validation (compare virtual and experimental data), refining (improve the fidelity of the virtual model in relation to the physical one, e.g. add friction, flexible parts, actuating & control systems), optimization (improving the behavior of the mechanical system, usually from - but not limited to - functional point of view). The physical (hardware) prototyping is a support activity for the virtual (software) prototyping, providing the experimental results used in the validation stage of the virtual model. The basic principle for a successful virtual prototyping process is to manipulate the simplifying assumptions in a way that reduces the complexity of the virtual model, but without altering the accuracy of the results.

Modeling and optimization (MOO) means finding the best solution for a problem under given circumstances by using the complex mathematical models, some algorithms and some software. Mathematical optimization means that the problem to have solving must be respect one objective function, the constraints for all imposed parameters and one iterative algorithm that was validated by the experimental assisted research.

Many contradictory problems in aerospace, robotics, mechanical engineering, manufacturing systems, bioengineering, materials technology, power energy and neurorehabilitation require optimization about multiple conflicting criteria, such as the speed of the system and its energy efficiency, or precision and stability, or require solving the multi objectives contradictory problems by using the Extenics theory.

Another important consideration when optimizing the performance of a robotic systems, or aerospace devices, or the power energy systems is that the optimization work can be *expensive* such as time of assisted research, financial cost, or use of computational resources. In the expensive MOO case, the goal is to reduce the number of experiments needed to find the *Pareto* solutions. Methods such as descent gradient method or genetic algorithms are not designed to limit the number of objective functions. In any cases of optimization work the required steps are the following: establishing all desirable and needed optimizing ways; define the optimization functions conformity with the needed results; establishing the objective function's values and constraints violation; establishing the optimization of the mathematical algorithm; define detailed system parameters model; make the simulation procedure and obtain the results characteristics; comparing the results with the required performances and adjust iteratively the algorithm to touch the imposed target with respect strictly the objective functions and the constraints.

This special issue on Cyber Systems in the fields of Aerospace, Robotics, Mechanical Engineering, Manufacturing Systems, Bioengineering, Power Energy, Materials Technology and Neurorehabilitation is brought from the short listed papers of the International Conference on Cyber Systems- (*ICMERA'2017*) during 2 November- 4 November 2017 in Yesterday Hotel, Bucharest, Romania. It contents papers on: cyber systems applied to the rockets, airplane, unconventional energy systems, assembly technology, landing autopilot systems, manufacturing process, multicriteria optimization of the mechatronics systems, space technology, dynamic identification methods, neural network, Extenics theory in optimization of the robots, aditive manufacturing concept, satellite magnetic stabilization, adaptive balancing, swarm optimization algorithm.

We hope that this special issue contributes to the researchers and academicians in the field of aerospace, robotics, mechanical systems, manufacturing systems, power energy, materials technology and neurorehabilitation systems.

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