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*Editorial*

# Editorial for Special Issue "Advances in Computer-Aided Technology II"

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The selection of the topic for this Special Issue, Advances in Computer-Aided Technology II, under the section "Mechatronic and Intelligent Machines", has garnered positive feedback from the scientific community. Computer-aided technologies (CAx) refers to the integration of computer technology in the design, analysis, and production of products, and noteworthy advancements have occurred in this field due to the swift evolution of science and technology. Advanced CAx tools incorporate various elements of product lifecycle management (PLM), such as design, finite element analysis (FEA), manufacturing processes, and production planning. With the shift toward the Industry 4.0 paradigm, the concept of a digital twin has become increasingly important, necessitating the adaptation of current CAx systems. This Special Issue features eight chosen papers that address industrial applications across significant topics within the scientific community, including emerging trends in CAx systems, additive manufacturing, neural networks and IoT in manufacturing, production system simulations, robotics, advanced FEA systems, material engineering, digitization, and virtual and augmented reality.

A study by Ling et al. presents an enhanced extreme learning machine (ELM) neural network to connect robotic spraying processes with quality outcomes, addressing the complexities of manual spraying that relies on human expertise. An optimization using a K-means improved predator optimization algorithm (KHPO) significantly improves the model's prediction accuracy, achieving up to a 61.95% reduction in errors for average film thickness compared to traditional ELM models. This KHPO-ELM neural network effectively predicts multi-spraying parameters, thereby facilitating improved automated spraying quality [1]. ISO 9283 serves as an important standard for evaluating robot performance. The paper of authors Pollák et al. focuses on verifying the repeatability of the Panasonic TM-2000 welding robot in a manufacturing setting. The study utilizes simulation software RoboDK to create a complete welding station, involving the design of a measuring device and the determination of measurement protocols. The results, based on the measurements taken from multiple points along the X and Y axes, were compared to manufacturer specifications, illustrating the robot's positional repeatability with graphical representations of its deviations [2].

Additive manufacturing is increasingly used across various fields, but its components exhibit orthotropic behavior, making mechanical properties difficult to predict due to various influencing factors. The study by Grozav et al. developed a predictive model using an artificial neural network trained on empirical tensile strength data from FDM-printed PLA test parts, achieving an accuracy of approximately 93%. The model successfully correlates predicted mechanical characteristics with real-world testing, allowing for an accurate FEA of complex geometries by defining custom orthotropic material profiles [3].

Furthermore, the article by Novikov et al. introduces a new methodology for evaluating modern visualization tools in the pre-production phase of manufacturing processes, validated through the successful implementation of ten real projects. The methodology uses a modified Z-score to categorize processes and facilitates decision-making for manufacturing companies in deploying computer-aided instruction tools such as tutorials utilizing video, augmented reality, and virtual reality. The methodology confirms a dependency between the chosen visualization tools and the nature of production processes, enhancing the rationalization of pre-production activities [4].

Currently, there is a growing emphasis on reducing the carbon footprint of production processes, and natural fiber-reinforced plastics (NFRP) have potential applications due to their unique properties. Conventional machining of NFRP faces challenges because of their non-homogenous structures, but abrasive water jet (AWJ) machining offers a solution. The article by Mitalova et al. evaluates the surface topography of an NFRP composite after AWJ cutting, demonstrating promising results for the application of this technology in processing NFRP materials [5]. The paper by Popan et al. addresses the challenge of enhancing the accuracy of abrasive waterjet cutting (AWJC) for carbon-fiber-reinforced polymers (CFRP), focusing on minimizing shape errors, particularly at the cut-in and cut-out points. The study investigates the formation mechanisms of these errors related to lead-in/lead-out strategies and process parameters, proposing a correction method with recommendations for the selection of an optimal strategy. A mathematical model to determine the depth of shape errors was developed and validated through industrial applications [6]. The paper by authors Vandzura et al. examines the direct metal laser sintering (DMLS) process, which is widely utilized in additive manufacturing across various industries, particularly for the production of prototypes and small series using metal powders like aluminum alloys and maraging steels. The study focuses on optimizing heat treatment processes for maraging steel samples printed via DMLS, experimenting with reduced maintenance times at elevated temperatures to achieve desired hardness levels. The results indicate that maintaining a temperature of 590 °C for just 1 h, followed by air cooling, achieves a hardness of around 50 HRC while also yielding a fine and uniform microstructure [7].

The paper of Rojas-Sola et al. analyses the design of the single-cylinder steam engine of the Grasshopper beam created by Henry Muncaster in 1912 and later published in the Model Engineer journal in 1957. A computer-aided engineering (CAE) study was conducted using Autodesk Inventor Nastran to perform a linear static analysis of the 3D CAD model under real operating conditions, focusing on material resistance criteria. The analysis identified the maximum admissible steam pressure during operation as 0.15 MPa, while evaluating von Mises stresses, displacements, and safety coefficients under unfavorable situations [8].

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**Conflicts of Interest:** The authors declare no conflicts of interest.

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