

FOREWORD

SPECIAL ISSUE “INTERNATIONAL CONFERENCE ON ADVANCED RESEARCH IN ENGINEERING, CARE 2022”

The second edition of the *International Conference on Advanced Research in Engineering, CARE 2022*, organized by the University of Craiova, Romania, on October 28, 2022, had, as main objective, to promote excellence in research, to establish partnerships and collaborative relationships through the exchange of knowledge and expertise and to respond to new trends and challenges in doctoral research in engineering.

The conference aims to provide a platform for researchers, engineers, doctoral and postdoctoral students involved in the interesting and complex fields of Mechanical engineering and Industrial engineering, such as: robotics, mechatronics, biomechanics, advanced materials, advanced processes and technologies, automotive and transport engineering.

This special issue gathers 6 papers by researchers with a continued interest in exploring the field of robotics analysis and design (3 papers), as well as the field of advanced materials and technologies (3 papers). The range of appropriate contributions in this number of the Romanian Journal of Technical Sciences – Applied Mechanics is very wide.

A team made by researchers from Auburn University and University of Craiova used in the first paper Lagrange's equations of motion in order to find the displacement of the robotics system. The generalized active forces are calculated symbolically in terms of the control torques. To reach the final positions, the PD control torques are improved with a term calculated from the generalized active forces. Robots with one and two arms are analyzed.

The scope of the research performed in the second paper by an interdisciplinary team made by engineers and medical doctors from Romania and US, was to develop a novel robotic catheter system to help doctors navigate with increased precision and accuracy to treat arrhythmia, especially for patients with complicated pathologies, increasing success rate and decreasing patient radiation exposure. The working prototype in two versions, developed by the authors was successfully tested for feasibility in a 3D vasculature model.

The third paper presents aspects of how an exoskeleton assists disabled people to walk on an inclined plane. This study is carried out with the help of the

dynamic modelling software for mobile mechanical systems, ADAMS. Variation laws of kinematic parameters of interest, such as rotation angles in knee and hip kinematic couplings, and connecting forces in kinematic couplings are obtained. In the last part a structural optimization using ANSYS software for a kinematic element of the exoskeleton structure is performed.

The fourth study falls in the direction on advanced materials such as reinforced composite materials, which were made from ground sunflower seed husks (waste from the production process of oil factories) and have as a matrix a hybrid resin with different volumetric proportion of Dammar natural resin. The vibration behavior was studied according to the proportion of natural Dammar resin in the matrix used. The eigen frequency and damping factor for the first natural vibration mode were determined experimentally.

The fifth paper presents the results of authors' research that aims to highlight the possible changes of the material deposited by 3D printing, when a hybrid heating source is used. The introduction of the second source to create a hybrid heating system produces a local increase in temperature, but, also, changes of the mechanical characteristics and of the structure of the deposit in material. The authors show that a hybrid heating during the 3D printing process is possible; important is the appropriate dosage of the additional amount of heat.

The last paper aims to prove that, by creating specific conditions, the metal powders can be heated in microwave and to simulate the temperature distribution in Fe samples by considering three different cases of simulation in terms of ceramic susceptor as primary heating source. The results of simulation revealed that, by using a combination of plate support and a second plate with a central hole, the temperature distribution outside the Fe sample affects the ceramic.

The authors of this special issue of the Romanian Journal of Technical Sciences-Applied Mechanics wish to express their gratitude for being invited to share some of the latest results of their research. Also, special thanks are addressed to Professor Dorel Banabic, Member of the Romanian Academy, who suggested, encouraged and made possible the publication of this issue.

Guest editor,

Prof. dr. eng. Daniela Tarnita

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