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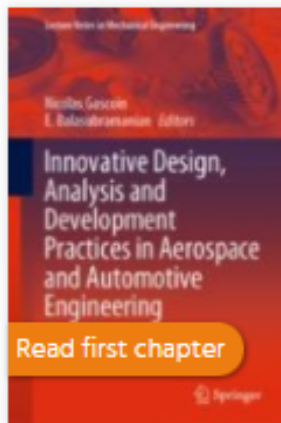
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Innovative Design, Analysis and Development Practices in Aerospace and Automotive Engineering

Proceedings of I-DAD 2020



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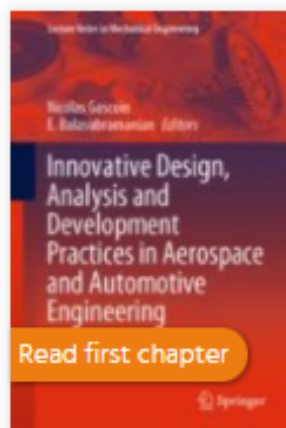
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This book gathers the best articles presented by researchers and industrial experts at the International Conference on "Innovative Design, Analysis and Development Practices in Aerospace and Automotive Engineering (I-DAD 2020)". The papers discuss new design concepts, and analysis and manufacturing technologies, with a focus on achieving improved performance by downsizing; improving the strength-to-weight ratio, fuel efficiency and operational capability at room and elevated temperatures; reducing wear and tear; addressing NVH aspects, while balancing the challenges of Euro VI/Bharat Stage VI emission norms, greenhouse effects and recyclable materials. Presenting innovative methods, this book is a valuable reference resource for professionals at educational and research organizations, as well as in industry, encouraging them to pursue challenging projects of mutual interest.

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Numerical Investigation on Optimized Convergent Divergent Nozzle in 3S Separator Device



Authors: L. Prabhu, N. Kiran Jadediya, P. Gangadhar Venkata Ramana, J. Srinivas

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Abstract

In this work, the optimal parameters required to develop the shock at a specified location of a convergent-divergent nozzle in the 3S supersonic separator are obtained using a meta-heuristic algorithm in conjunction with the surrogate model. Here, the study is carried over the air. Initially, a non-conventional optimization scheme firefly algorithm is employed to obtain the optimal parameters of convergent-divergent nozzle such as area ratio and operating pressure ratio to develop the normal shock at a specific location of a nozzle in 3S device. The operating pressure ratio limit is imposed as a constraint in the problem. The mathematical modelling of a nozzle is based on the one-dimensional flow governing equations. To reduce the computational cost, mathematical modelling is replaced by a neural network-based surrogate model. Then, using the optimal parameters obtained from an optimization scheme, the nozzle is modelled and simulated in ANSYS Fluent to validate it by identifying the shock location in the divergent portion of nozzle.



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Experimental investigation on mechanical behavior of synthetic based bidirectional reinforced hybrid epoxy laminates

AIP Conference Proceedings 2283, 020047 (2020); <https://doi.org/10.1063/5.0025072>

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The design engineers are vigilant about weight reduction without compromising on the structural strength. The composite is a lightweight material that has good structural properties, and it is widely used as it can be tailored based on the requirements. Fabric-reinforced polymer composites have a wide application in engineering because of its high specific strength. The fabric serves as reinforcement, and it may be synthetic or natural. Synthetic fibers are not only strong but also lightweight. In the present work, fabrication and experimental investigation on synthetic fiber-based polymer composites are carried out. Initially, bidirectional carbon, Kevlar, and glass laminates are fabricated using hand lay-up and vacuum bagging methods. Then, hybrid laminate made up of carbon-Kevlar and carbon-glass laminates are fabricated, and experimental investigation is conducted to study their mechanical behavior. The comparative studies on the laminates are carried out and the obtained results are quite interesting.

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Design of an optimal ramjet inlet using meta-heuristic optimization scheme

AIP Conference Proceedings 2283, 020045 (2020); <https://doi.org/10.1063/5.0025071>

L. Prabhu^{1,a)}, B. Eswara Kumar¹, and S. Teja Swaroop Reddy¹

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- Combustion engine
- MATLAB
- Subsonic flows
- Algorithms and data structure
- Evolutionary computation

ABSTRACT

A supersonic inlet plays a predominant role in obtaining the optimal thrust in a ramjet engine. Since there are no moving parts in a ramjet, the air gets compressed by the formation of a series of oblique and normal shock along the inlet to ensure that combustion occurs at subsonic flow. Generation thrust is depends on the inlet aerodynamic design, so there is a need for an optimal design for the maximum efficiency. In this work, design of optimal inlet design is carried out using the meta-heuristic optimization scheme. Initially, the Bezier curve parameterization method and QuickerSim flow analysis tool are coupled with genetic algorithms to parametrize the inlet design and to identify the total pressure recovery over an inlet respectively. The objective function of optimization scheme is to design the optimal inlet design by maximizing the total pressure recovery under a constraint. The complete cycle is coded in Matlab platform to reduce the computational cost.

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Identification of nozzle parameters in 3S device using artificial intelligence and meta-heuristic optimization scheme

AIP Conference Proceedings 2204, 030004 (2020); <https://doi.org/10.1063/1.5141567>

P. Gangadhar Venkata Ramana^{1,a)} and L. Prabhu^{2,b)}

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ABSTRACT

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TOPICS

- Shock waves
- Mathematical modeling
- Artificial neural networks
- MATLAB
- Artificial Intelligence
- Algorithms and data structure
- Public policy and governance
- Evolutionary computation
- Fuels

ABSTRACT

The supersonic separator is a device used to separate the unwanted components in a natural gas. The separated components are drained through the condensate drain which is placed before the normal shockwave in the convergent divergent nozzle. In this work, optimal area ratio and operating pressure ratio of the nozzle are obtained to develop the shock at a specific location with an acceptable pressure recovery coefficient. Here, the non-conventional optimization scheme genetic algorithm is employed to identify the optimal parameters. Further, the mathematical modelling is replaced by a neural network in the optimization scheme to reduce the computational cost. The complete work is carried out in the Matlab platform. The optimal parameters obtained using neural network are well in agreement with the mathematical model and the computational cost is drastically reduced.

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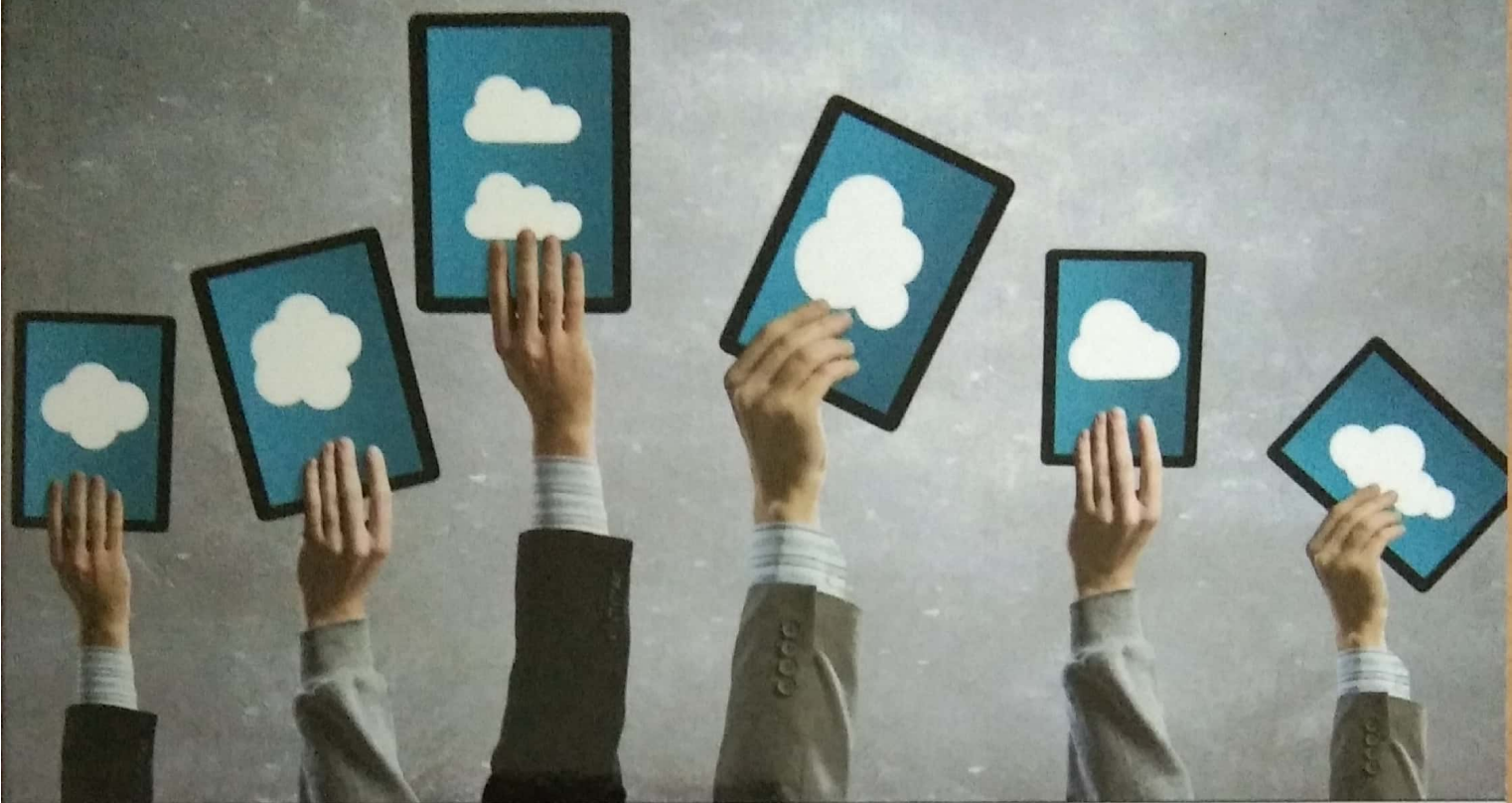
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Architectural Concepts


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Introduction to Multi-cloud Computing: Architectural Concepts

First Edition

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