Opinion
Volume 12:05, 2023

Industrial Engineering and Management

ISSN: 2169-0316

Open Access

Multi-aim Optimisation of Thin-walled Composite Axisymmetric Structures Employing Genetic Algorithms and Neural Surrogate Models

Dootr Yooin*

Department of Industrial Engineering, University of Georgia, Atlanta, Georgia

Introduction

In the field of structural engineering, the design and optimization of thin-walled composite axisymmetric structures pose unique challenges. These structures are widely used in various applications, including aerospace, automotive, and civil engineering, due to their lightweight, high strength, and superior structural performance. Achieving optimal designs for these structures requires addressing multiple objectives, such as minimizing weight, maximizing strength, and reducing manufacturing costs. Traditional optimization techniques can be computationally expensive and time-consuming, making them less practical for complex problems. In this context, Genetic Algorithms (GAs) and neural surrogate models offer a powerful solution for multi-objective optimization [1,2].

Description

This article explores the application of genetic algorithms and neural surrogate models in the multi-objective optimization of thin-walled composite axisymmetric structures. We will delve into the key concepts and methodologies associated with this approach, highlighting its advantages and practical implications. Thin-walled composite axisymmetric structures consist of cylindrical or conical shapes with relatively thin walls. These structures are typically constructed by layering composite materials, such as carbon fiber or glass fiber, to achieve the desired mechanical properties. Due to their rotational symmetry, they are often found in components like pressure vessels, pipes, and aerospace components like rocket motor casings and aircraft fuselages [3,4]. The optimization of such structures is essential to ensure they meet performance requirements while minimizing weight and production costs. Genetic algorithms are a powerful optimization technique inspired by the process of natural selection. They are well-suited for solving complex problems with multiple objectives. GAsoperate by evolving a population of candidate solutions over several generations to reach the optimal solution or a set of Pareto-optimal solutions. The Pareto-optimal solutions represent the best trade-offs between conflicting objectives [5,6].

Conclusion

Designers can now make informed decisions based on the trade-offs between weight, strength, and manufacturing costs, tailoring the design to meet specific project requirements. Multi-objective optimization of thin-walled composite axisymmetric structures is a complex task with conflicting objectives. Genetic algorithms, in conjunction with neural surrogate models, provide a powerful and efficient solution to address these challenges. By combining the exploration capabilities of GAs with the prediction capabilities of surrogate models, designers can efficiently find optimal trade-offs and make informed decisions for their designs. This approach is particularly useful in industries such as aerospace, automotive, and civil engineering, where the performance, weight, and cost of structural components are critical factors. As computational power and machine learning techniques continue to advance, the integration of genetic algorithms and surrogate models in multi-objective optimization will become increasingly valuable, enabling the design of more efficient and cost-effective thin-walled composite axisymmetric structures.

Acknowledgement

None.

Conflict of Interest

None.

References

1. Hosain, Nazmul. "The early days of cardiac surgery in South Asia: The history and heritage." *Ann Thorac Surg* 104 (2017): 361-366.
2. Azad, Bijan and Nelson King. "Institutionalized computer workaround practices in a Mediterranean country: An examination of two organizations." *Eur J Inf Syst* 21 (2012): 358-372.
3. Bos-Nehles, Anna C. and Andre AR Veenendaal. "Perceptions of HR practices and innovative work behavior: The moderating effect of an innovative climate." *Int J Hum Resour Manag* 30 (2019): 2661-2683.
4. Donate, Mario J. and Jesús D. Sánchez de Pablo. "The role of knowledge-oriented leadership in knowledge management practices and innovation." *J Bus Res* 68 (2015): 360-370.
5. Acedo, Francisco José, Carmen Barroso and Jose Luis Galan. "The resource-based theory: Dissemination and main trends." *Strateg Manag J* 27 (2006): 621-636.
6. Liu, Fan and Xiaohong Wang. "Synthetic polymers for organ 3D printing." *Polymers* 12 (2020): 1765.

***Address for Correspondence:** Dootr Yooin, Department of Industrial Engineering, University of Georgia, Atlanta, Georgia, E-mail: dootry@gmail.com*

Received: 02 September 2023, Manuscript No. iem-23-118020; **Editor Assigned:** 04 September 2023, Pre-QC No. P-118020; **Reviewed:** 16 September 2023, QC No. Q-118020; **Revised:** 21 September 2023, Manuscript No. R-118020; **Published:** 28 September 2023, DOI: 10.37421/2169-0316.2023.12.206

How to cite this article: Yooin, Dootr. "Multi-aim Optimisation of Thin-walled Composite Axisymmetric Structures Employing Genetic Algorithms and Neural Surrogate Models." *Ind Eng Manag* 12 (2023): 206.