



Surrogate-assisted Meta-Heuristic for Aerodynamic Design of an Aircraft Wing

Cho Mar Aye¹, Nantiwat Pholdee², and Sujin Burreat¹

¹ Sustainable and infrastructure research and development center, department of mechanical engineering, faculty of engineering, Khon Kaen University, 40002, Thailand

² Sustainable and infrastructure research and development center, department of mechanical engineering, faculty of engineering, Khon Kaen University, 40002, Thailand

* Corresponding Author: nantiwat@kku.ac.th, 0845114841

Abstract

This paper presents aerodynamic design of an aircraft wing using a surrogate-assisted meta-heuristic. The optimization problem is posed to find wing shape in order to maximize its lift-to-drag ratio. Two surrogate-assisted MHs are presented which are the use of a surrogate model to predict the objective function directly and using a surrogate model to predict lift coefficient and drag coefficient separately before calculating the objective function. Computational fluid dynamic analysis is used for calculating the values of lift and drag coefficients while a Differential Evolution (DE) algorithm and a radial basis function are respectively used as MH and a surrogate model. From this study, the performance of the surrogate-assisted design approaches for aerodynamic optimization of an aircraft wing is obtained. The results obtained are said to be the baseline for future study of surrogate-assisted aerodynamic optimisation.

Keywords; Evolutionary algorithms, Meta model, Aerodynamic of aircraft wing, Computational Fluid Dynamics