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Enhancement of Slat Airfoil Configuration using Invasive Weed Optimization Framework coupled with Artificial Neural Networks.[1] SUSHRUT KUMAR, PRIYAM GUPTA, RAJ KUMAR SINGH, Delhi Technological University — This research attempts to develop an optimization scheme by integrating Genetic Algorithm and Artificial Neural Network (ANN) - surrogate model which was successfully implemented to optimize Leading Edge Slat shape and configuration. The optimization model used Invasive Weed Optimization. Bezier curves were used as an aerodynamic shape parameterization method to ensure the generation of smooth-contoured slat profiles. Geometry, Overhang, Depth and Deflection were taken as the defining parameters for each individual. These parameters were varied within a range which is 3.4% to 15% of slat chord for Overhang, -5% to 4% of slat chord for Depth, -5% to 5% of initial deflection for Deflection and the ordinate of shape control points had a variation of y+3 to y-3. The standard deviation decreases non linearly from 6 to 0.005 with a modulation index of 3. Multiple Computational Fluid Dynamics simulations were run for each individual under various operating conditions to evaluate their fitness (lift to drag ratio). The data generated from this process was used as training and test sets for the ANN. Shape control points, angle of attack, Reynolds number and operating conditions were taken as input parameters for the neural network to predict lift to drag ratio. The developed technique showed approximately 85% improvement in the time taken and allowed algorithm to better explore design space.

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