Evolutionary Computation Theory and Application Assignment III - Shape Matching

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1 Hyper parameters

Population size (λ)	15
Number of genes (N)	32
Number of generations	1200
Step size (σ)	0.3
μ ($\lambda/2$)	7
weights ($w_i \propto (\mu - i + 1)$)	$[0.2381 \quad 0.2063 \quad 0.1746 \quad 0.1429 \quad 0.1111 \quad 0.0794 \quad 0.0476]$
μ_{eff} ($1/\sum w_i^2$)	5.845
c_μ (μ_{eff}/N^2)	0.0057

2 Solution

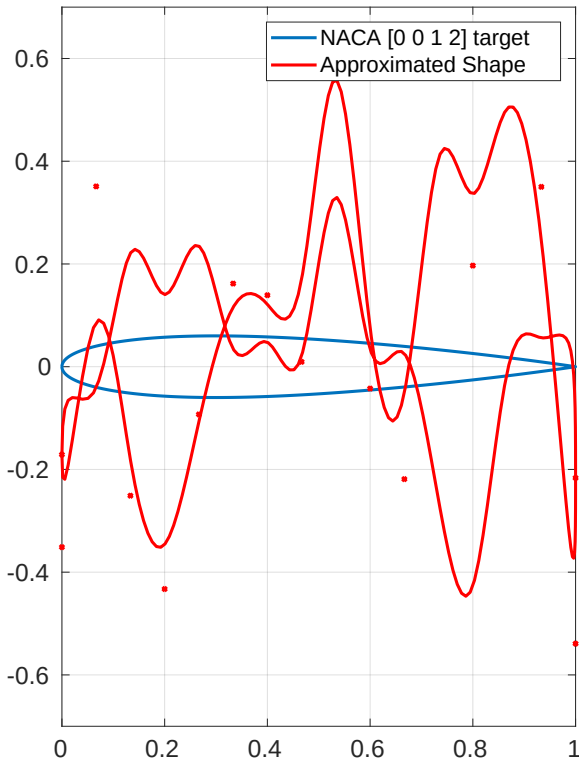

Figure 1: *Initialized solution for the 0012 shape*

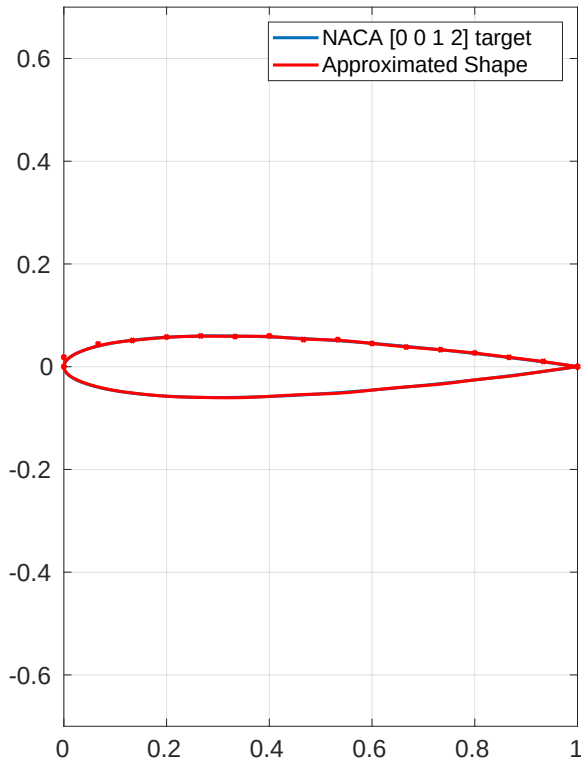

Figure 2: *A final solution for the 0012 shape*

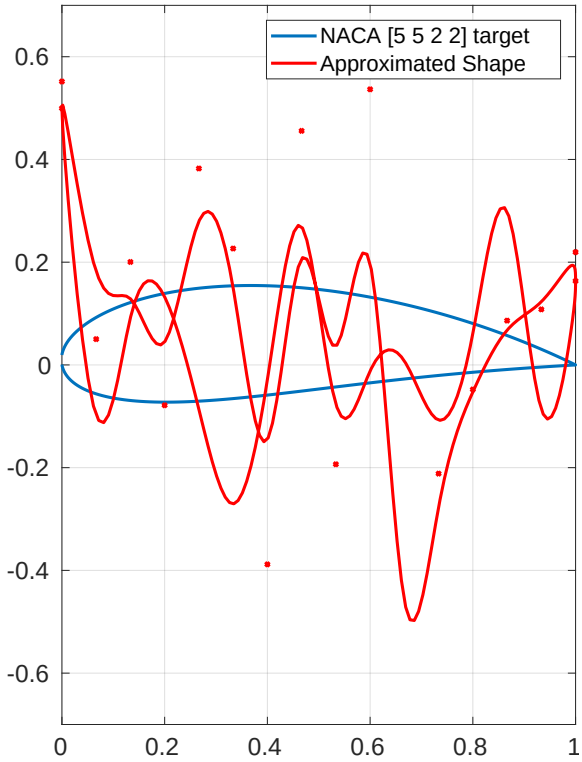

Figure 3: *Initialized solution for the 5522 shape*

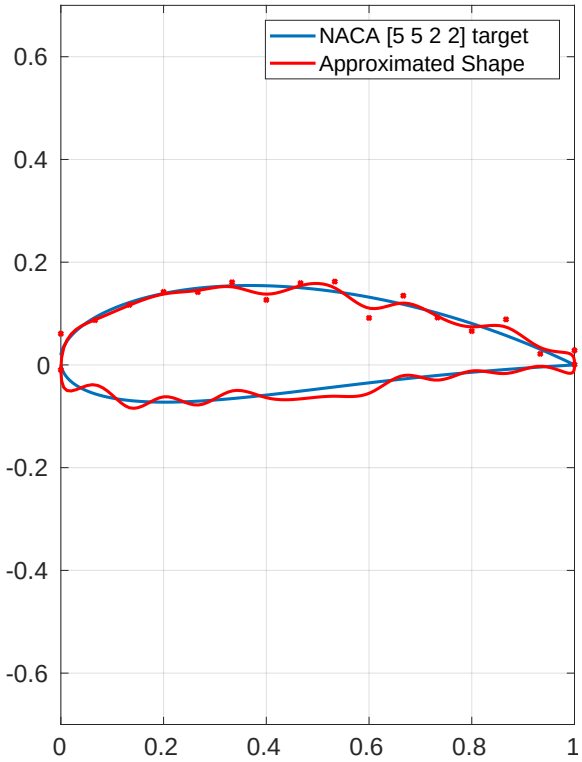

Figure 4: *A final solution for the 5522 shape*

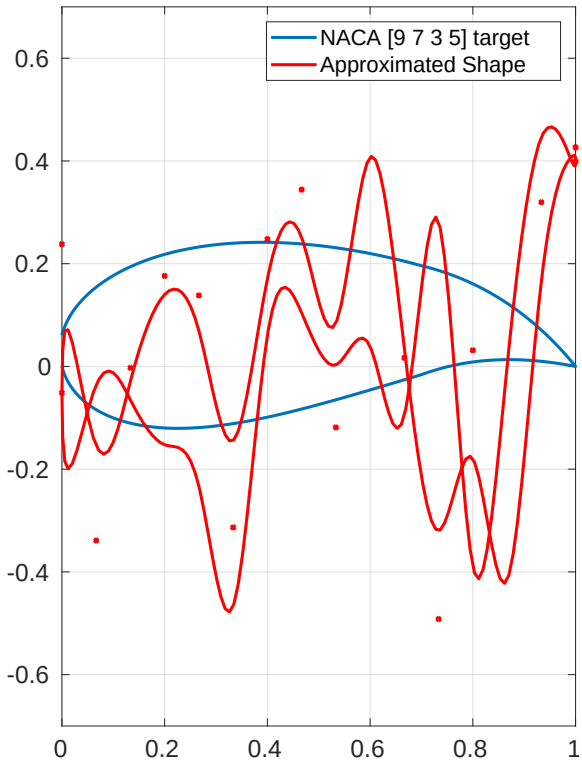

Figure 5: *Initialized solution for the 9735 shape*

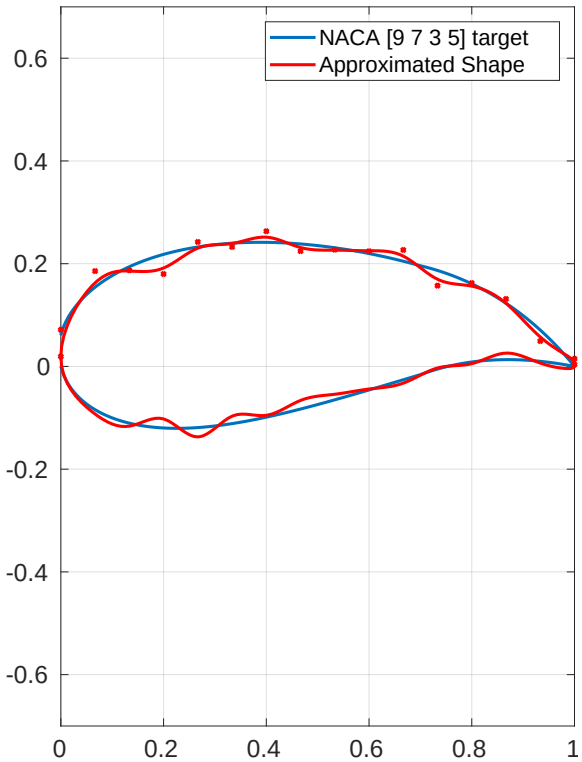

Figure 6: *A final solution for the 9735 shape*

The above solutions are the best after 3 runs of 1200 generations each.

3 Statistical Evaluation

The following box plot shows the fitness distribution of the best children after 30 runs of 1200 generations each for matching the 0012 NACA shape.

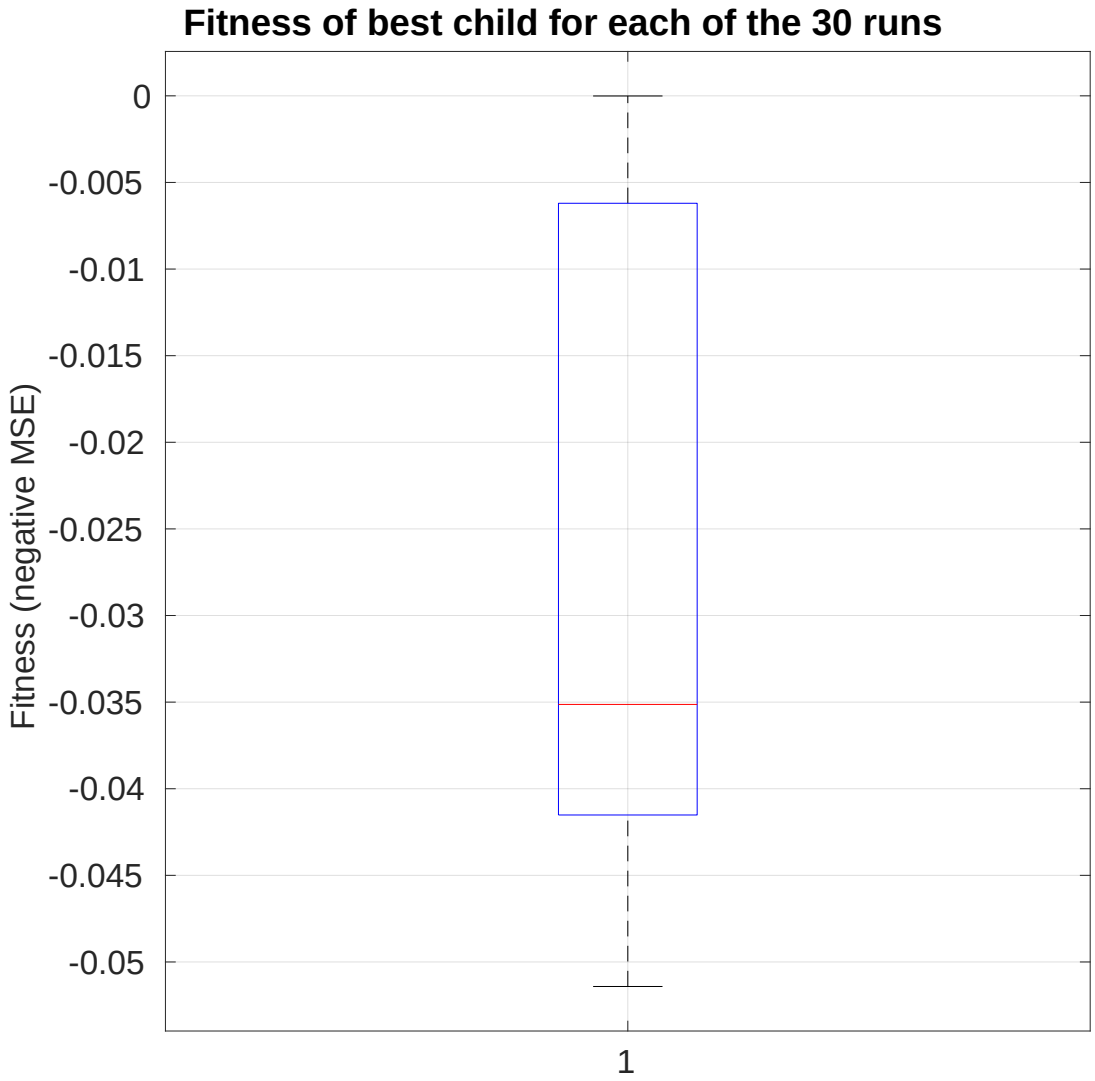

Figure 7: *Box plot for the distribution of fitness of the best children over 30 runs*

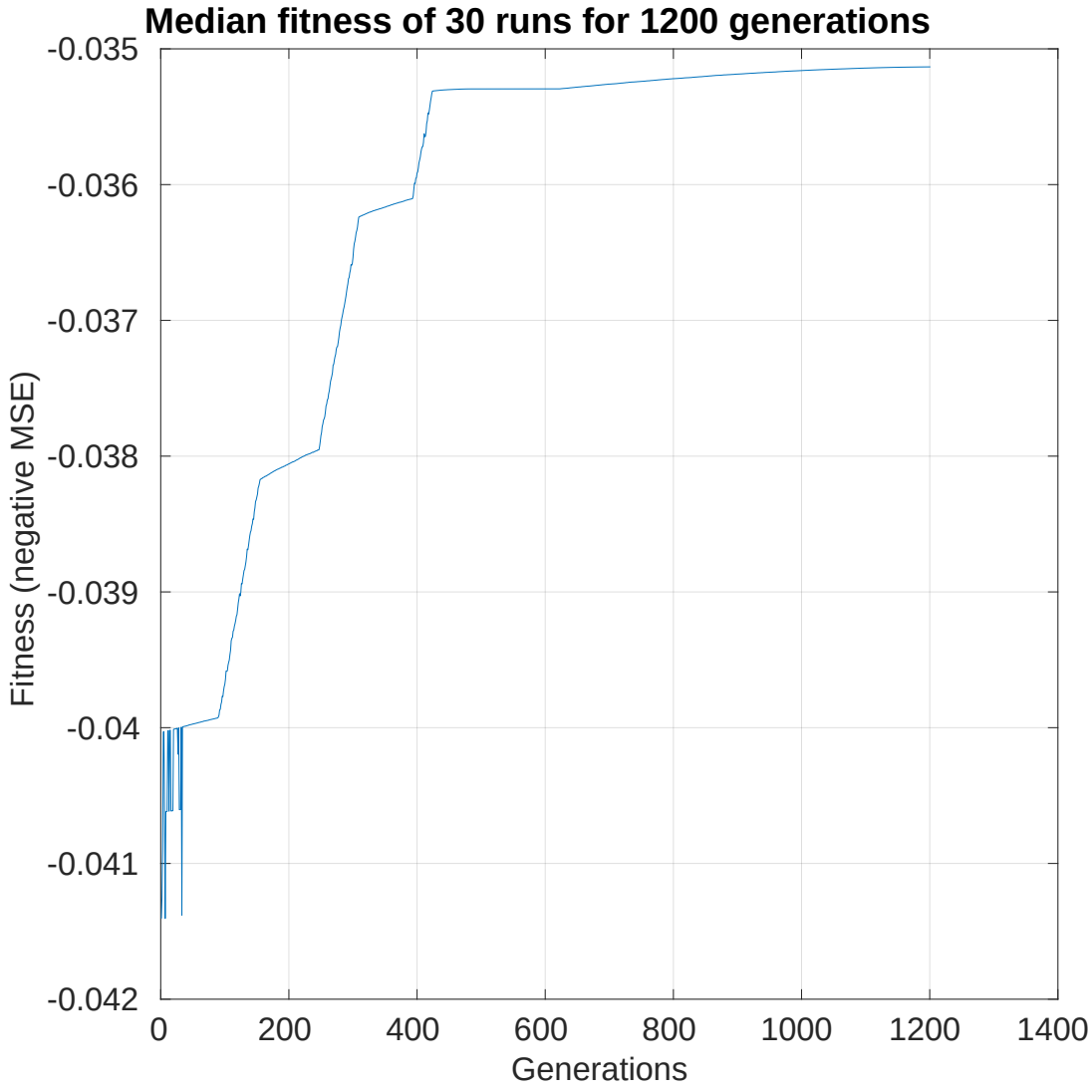

Figure 8: *Median fitness progression over 30 runs of 1500 generations*