Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Aerodynamic shape optimization of Airfoils in 2-D incompressible flow SRINIVETHAN RANGASAMY, University of Southern California, HARSHAL UPADHYAY, Indian Institute of Technology, Kanpur, SANDEEP SOMASEKARAN, SREEKANTH RAGHUNATH, Zeus Numerix — An optimization framework was developed for maximizing the region of 2-D airfoil immersed in laminar flow with enhanced aerodynamic performance. It uses genetic algorithm over a population of 125, across 1000 generations, to optimize the airfoil. On a stand-alone computer, a run takes about an hour to obtain a converged solution. The airfoil geometry was generated using two Bezier curves; one to represent the thickness and the other the camber of the airfoil. The airfoil profile was generated by adding and subtracting the thickness curve from the camber curve. The coefficient of lift and drag was computed using potential velocity distribution obtained from panel code, and boundary layer transition prediction code was used to predict the location of onset of transition. The objective function of a particular design is evaluated as the weighted-average of aerodynamic characteristics at various angles of attacks. Optimization was carried out for several objective functions and the airfoil designs obtained were analyzed.

Srinivethan Rangasamy
University of Southern California

Date submitted: 06 Aug 2010 Electronic form version 1.4