Numerical study of the airflow over a high-altitude pseudo-satellite wing

Update

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Sections

Airfoil sd7003s Reynolds 60000, AoA 4

1 Hardcore validation

Comparing the velocity along vertical planes: LES hardcore validation.

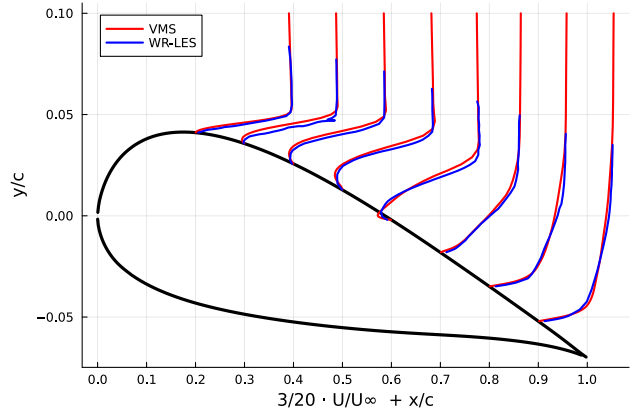

Figure: sd7003s and velocity profiles (re-scaled)

Airfoil DU89 Reynolds 500000, AoA 1

1 Hardcore validation

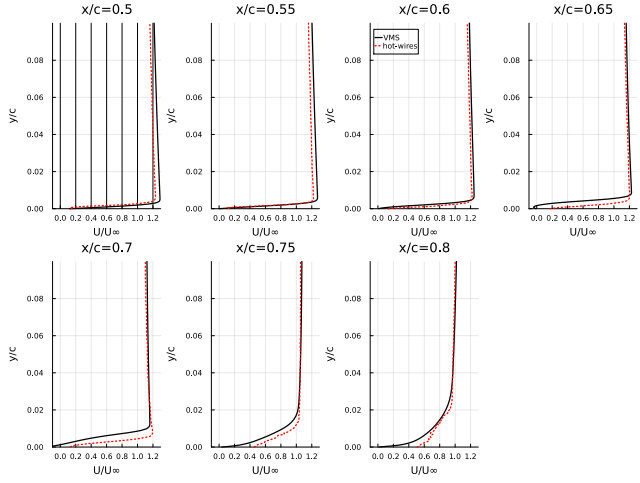

Figure: hot-wires and VMS velocity profiles

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Sections

2 Adjoint method

Adjoint Method

2 Adjoint method

- Airfoil optimization
- Require primal and adjoint simulation
- Complexity is independent of the number of parameters (eg control points on the airfoil)

NACA0012 $AoA = 2.5°$, $Re = 1000$ - drag minimization

2 Adjoint method

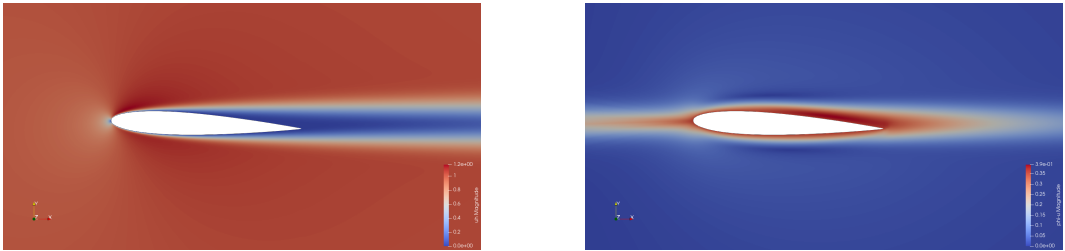


Figure: Primal and Adjoint Velocity

NACA0012 $AoA = 2.5°$, $Re = 1000$ - drag minimization

2 Adjoint method

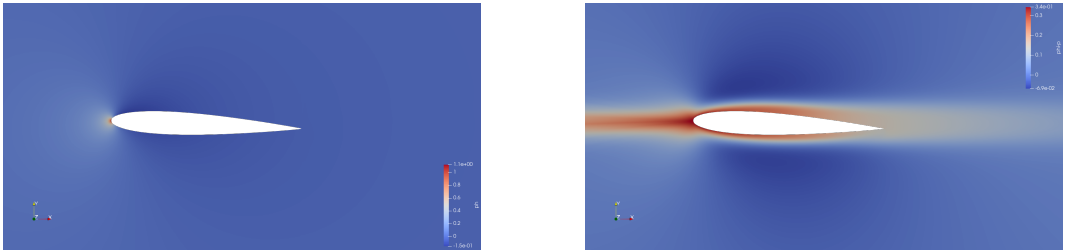
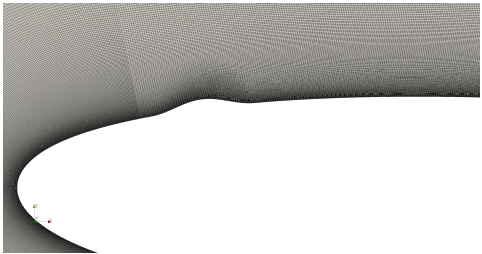


Figure: Primal and Adjoint pressure

NACA0012 $AoA = 0.0°$, $Re = 100$ - drag minimization

2 Adjoint method



(a) Local Mesh Deformation

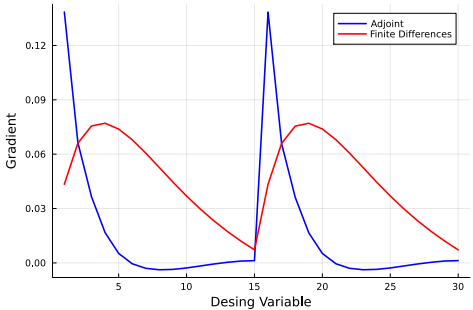


Figure: Finite Difference and Adjoint gradient