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# Discrete adjoint techniques for flow optimization

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We describe a systematic way to generate adjoint code by applying an efficient sparsity exploiting forward mode of Automatic Differentiation to the original code. The result is a linear system for the adjoint that can be solved by taking advantage of the original code. The structure of a parallel solver can be used for the AD. This gives rise to a parallel distribution of the adjoint linear system. Reusage of a multigrid structure is also possible.

This procedure has been applied to the finite volume, parallel, block-structured, multigrid flow solver FASTEST, which can also run Large Eddy Simulations and is written in Fortran. Numerical results of engineering applications will be presented.