Modification of Finite Volume Scheme for Laplace's Equation.

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Abstract. For Laplace's equation, we discuss whether it is possible to construct a linear positive finite volume scheme on arbitrary unstructured grids. Dealing with the arbitrary grids, we state a control volume which guarantees a positive finite volume scheme with linear reconstruction of the solution. The control volume is defined by a property of the analytical solution to the equation and does not depend on the grid geometry. For those problems where the choice of the control volume is prescribed a priori, we demonstrate how to improve positivity of the linear finite volume scheme by using corrected reconstruction stencils. The difficulties arising when grids with no geometric restrictions are used for the discretization are discussed. Numerical examples illustrating the developed approach to the stencil correction are given.

Key words. Laplace's equation, finite volume scheme, positivity, stencil correction

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