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A CONTROL VOLUME MIXED FINITE ELEMENT FORMULATION FOR TRIANGULAR ELEMENTS

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Summary. In this study, an new vector test function is proposed for two-dimenional control volume mixed finite-element methods where discretization of the computational domain is based in triangular elements. The proposed test function has the advantage of allowing for a pressure-field approximation that is piecewise smooth rather than piecewise constant. Implementation of the test function, in association with the usual vector shape functions for triangular elements, is described. In the control-volume approach, the product of the test function and the flux approximation (obtained using associate shape functions) are integrated over a lesser volume than the full triangular element. With the proposed test function, a question arises as to the extent of the volume of integration; this question is explored by simulation, varying the volume coverage and examining error norms resulting from these simulations. Results, comparing standard and control volume mixed finite-element methods by means of the $\mathcal{L}^2$ norm of the simulated fluxes, are presented. Although the flux coefficient matrices for both standard and control volume mixed finite-element methods are rather different, simulation results indicate only minor error differences.