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Crouzeix-Velte spectrum for some finite elements

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Abstract

The Crouzeix-Velte decomposition is a decomposition into three orthogonal subspaces of the customary Sobolev space $(H_0^1(\Omega))^d$ of vector functions defined over a Lipshitz-continuous domain $\Omega \subset \mathbb{R}^d$. This decomposition can be used to get more information about the inf-sup constant of the Stokes problem.

The decomposition and the knowledge of the inf-sup constant are of interest for error estimation and numerical solution of the boundary value problems. For the same aim an algebraic and a discrete equivalent of the decomposition can be defined and is of advantage.

For some discretization of the unit square with the help of computers we calculated the discrete inf-sup constant and the Crouzeix-Velte spectrum of the pressure space. Using these results we investigate the effect of adding a bubble function to the local velocity space in case of Scott-Vogelius elements.