

STABILISING THE $\mathbb{Q}_{K+1} \times \mathbb{P}_{K-1}$ ELEMENT IN ANISOTROPIC QUADRILATERAL MESHES

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Key words: *Stokes problem; quadrilateral mesh; high aspect ratio.*

When approximating the Stokes problem by means of the finite element method, it is a classic result that the finite element spaces for velocity and pressure are subject to the satisfaction of the inf-sup condition. The inf-sup constant must not depend on the discretisation parameter, but usually depends on the regularity of the mesh. Now, in the case meshes with high aspect ratio are used, the inf-sup constant usually degenerates with the aspect ratio. In some cases, such as the $\mathbb{Q}_{k+1} \times \mathbb{P}_{k-1}$ element, it is possible to identify the unstable modes of the pressure space, this is, to decompose the pressure space into the sum of a stable part and an unstable part. In this work we start by identifying the unstable part of this space, to later propose a stabilising term that penalises this part. We prove that the modified method enjoys stability independent of the aspect ratio of the mesh, and that its convergence is not affected by the added term.