Some Error Estimates for the Discretization of Parabolic Equations on General Multidimensional Nonconforming Spatial Meshes

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This work is devoted to the error estimates of the discretization of parabolic equations on general nonconforming spatial meshes in several space dimensions. These meshes are recently used to approximate anisotropic heterogeneous diffusions and nonlinear equations. We present an implicit scheme based on an orthogonal projection of the exact initial function. We provide error estimates in discrete norms $L^\infty(0,T;H_0^1(\Omega))$ and $W^{1,\infty}(0,T;L^2(\Omega))$. In the particular case when the discrete flux is performed using a stabilized discrete gradient, we prove that the convergence order is $h_{\mathcal{D}}+k$, where $h_{\mathcal{D}}$ (resp. k) is the mesh size of the spatial (resp. time) discretization, in discrete norms $L^\infty(0,T;H_0^1(\Omega))$ and $W^{1,\infty}(0,T;L^2(\Omega))$ under the regularity assumption $u \in \mathcal{C}^2([0,T];\mathcal{C}^2(\overline{\Omega}))$, with u is the exact solution. These error estimates are useful because they allow us to obtain approximations for the! exact solution and its first derivatives of order $h_{\mathcal{D}}+k$.