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## $P_1$ Nonconforming Finite Element Method on Quadrilaterals and its Domain Decomposition Procedure

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**Abstract:** Recently a new  $P_1$  nonconforming finite element space on quadrilaterals has been proposed in [1] for second-order elliptic problems. This new nonconforming finite element space has only 3 degrees of freedom on quadrilaterals, and thus the global degrees of freedom for this space will be about half the usual nonconforming finite element space on quadrilaterals. This notion is easily generalized to three dimension so that only 4 degrees of freedom will be needed for hexahedrons.

After introducing this element and discussing several computational issues briefly, we will discuss some on-going research results on domain decomposition procedures using this new element.

[1] C. Park and D. Sheen, *P1-nonconforming quadrilateral finite element methods for second-order elliptic problems* SIAM J. Numer. Anal., 41, pp. 624–640, 2003.

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