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**Snorre H Christiansen\*** (snorrec@math.uio.no), CMA c/o Dept. Math., University of Oslo, PO Box 1053 Blindern, NO-0316 Oslo, Norway. *Finite element systems of differential forms and applications to upwinding.*

The notion of a finite element system is designed to provide an alternative to Ciarlet's definition of a finite element, adapted to the needs of exterior calculus. It allows for cellular decompositions of space (rather than just simplexes or products thereof) and general functions (rather than just polynomials) yet guarantees compatibility with the exterior derivative and existence of commuting interpolation operators. We review basic definitions and properties. As an application we show how a form of upwinding, compatible with the exterior derivative, can be carried out within this framework.

references:

S. H. Christiansen, H. Z. Munthe-Kaas, B. Owren. Topics in structure-preserving discretization. *Acta Numer.* 20 (2011), 1-119.

S. H. Christiansen. Upwinding in finite element systems of differential forms. Smale lecture, Proceedings of FoCM 2011, to appear. (Received September 24, 2012)