

## Research Announcement

### THE MIDPOINT UPWIND SCHEME

Martin Stynes and Hans-Görg Roos

A modified upwind scheme is considered for a singularly perturbed two-point boundary value problem whose solution has a single boundary layer. The scheme is analysed on an arbitrary mesh. It is then analysed on a Shishkin mesh and precise convergence bounds are obtained, which show that the scheme is superior to the standard upwind scheme. A variant of the scheme on the same Shishkin mesh is proved to achieve even better convergence behaviour. Full details appear in [1].

#### Reference

- [1] M. Stynes and H.-G. Roos, *The midpoint upwind scheme* (1996), Appl. Numer. Math. (to appear).

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## Book Review

### Introduction to Coding Theory (second edition)

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Reviewed by Pat Fitzpatrick

Coding Theory will soon be 50 years old: it dates precisely back to Claude Shannon's fundamental 1948 paper, [14]. For such a young subject it has achieved a great deal, particularly in establishing connections with fundamental mathematics in a wide variety of areas encompassing group theory, finite geometries, combinatorics, number theory, algebraic geometry, algebraic function fields, computational algebra, and complexity theory. These relationships are mainly in the sense that mathematics from other areas is applied to inform the coding theory, for instance in the development of the theory of geometric Goppa codes from curves over  $\mathbb{F}_q$ , but there have also been some notable applications in the opposite direction, such as in the proof of the non-existence of a projective plane of order 10, [8], and in classical sphere-packing problems, [2]. Coding theory is, in essence, an area of applied mathematics, although it makes use of mathematics which has, until recently, appeared only on the "pure" syllabus. Many researchers in coding theory are engineers and many of the fundamental concerns are with specifically engineering questions such as the implementation of finite field arithmetic in logic or the complexity of decoding algorithms.

Not so the present volume! This is a book about mathematics, written for mathematicians. The presentation is condensed almost to the point of terseness, but the writing is superb, reminiscent in style of what one finds in the poet's quintessential "slim volume." The book began life as a set of lecture notes, with the