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The Theory of Error-Correcting Codes - ScienceDirect

Introduction to the Theory of Error-Correcting Codes is a textbook on error-correcting codes, by Vera Pless. It was published in 1982 by John Wiley & Sons, with a second edition in 1989 and a third in 1998. The Basic Library List Committee of the Mathematical Association of America has rated the book as essential for inclusion in undergraduate mathematics libraries.

Introduction to the Theory of Error-Correcting Codes ...

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The theory of error-correcting codes Published in: Proceedings of the IEEE (Volume: 68 , Issue: 1 , Jan. 1980) Article #: Page(s): 185 - 186. Date of Publication: Jan. 1980 . ISSN Information: Print ISSN: 0018-9219 Electronic ISSN: 1558-2256 INSPEC Accession Number: Persistent Link: ...

The theory of error-correcting codes - IEEE Journals ...

Quantum Error Correction will be necessary for preserving coherent states against noise and other unwanted interactions in quantum com-putation and communication. We develop a general theory of quantum error correction based on encoding states into larger Hilbert spaces subject to known interactions. We obtain necessary and su cient con-

A Theory of Quantum Error-Correcting Codes

Error correction is the detection of errors and reconstruction of the original, error-free data. History. The modern development of error correction codes is credited to Richard Hamming in 1947. A description of Hamming's code appeared in Claude Shannon's A Mathematical Theory of Communication and was quickly generalized by Marcel J. E. Golay.

Error detection and correction - Wikipedia

Quantum error correction is used in quantum computing to protect quantum information from errors due to decoherence and other quantum noise. Quantum error correction is essential if one is to achieve fault-tolerant quantum computation that can deal not only with noise on stored quantum information, but also with faulty quantum gates, faulty quantum preparation, and faulty measurements. Classical error correction employs redundancy. The simplest way is to store the information multiple times, and

Quantum error correction - Wikipedia

Comments: 34 pages in LaTex, 1 figures, the paper is also available at this http URL: Subjects: Quantum Physics (quant-ph) Journal reference: Phys.Rev.Lett.84:2525-2528,2000

[quant-ph/9604034] A Theory of Quantum Error-Correcting Codes

In computing, telecommunication, information theory, and coding theory, an error correction code, sometimes error correcting code, (ECC) is used for controlling errors in data over unreliable or noisy communication channels. The central idea is the sender encodes the message with redundant information in the form of an ECC. The redundancy allows the receiver to detect a limited number of errors that may occur anywhere in the message, and often to correct these errors without retransmission.

Error correction code - Wikipedia

A binary code of symmetric distance d is capable of correcting d- 1 of fewer 1-errors (or O-errors) and zs therefore called a (d- 1) 1-error correcting code. Outline of the Pro@ For any vector X, let S x denote the set of vectors obtained from X by replacing l's with 0's in t places, t ~< d- 1. Then, for

On the Theory of Binary Asymmetric Error Correcting Codes*

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It will be shown that such questions are linked with the properties of the error correcting codes arising in classical information theory. The possibility of error correction in quantum systems has been considered recently because of its importance in the theory of quantum computation and quantum cryptography.

Error Correcting Codes in Quantum Theory

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A complete introduction to the many mathematical tools used tosolve practical problems in coding. Mathematicians have been fascinated with the theory oferror-correcting codes since the publication of Shannon's classicpapers fifty years ago. With the proliferation of communicationssystems, computers, and digital audio devices that employerror-correcting codes, the theory has taken on practicalimportance in the solution of coding problems. This solutionprocess requires the use of a wide variety of mathematical toolsand an understanding of how to find mathematical techniques tosolve applied problems. Introduction to the Theory of Error-Correcting Codes, Third Editiondemonstrates this process and prepares students to cope with codingproblems. Like its predecessor, which was awarded a three-starrating by the Mathematical Association of America, this updated andexpanded edition gives readers a firm grasp of the timelessfundamentals of coding as well as the latest theoretical advances.This new edition features: * A greater emphasis on nonlinear binary codes * An exciting new discussion on the relationship between codes andcombinatorial games * Updated and expanded sections on the Vashamov-Gilbert bound, vanLint-Wilson bound, BCH codes, and Reed-Muller codes * Expanded and updated problem sets. Introduction to the Theory of Error-Correcting Codes, Third Editionis the ideal textbook for senior-undergraduate and first-yeargraduate courses on error-correcting codes in mathematics, computerscience, and electrical engineering.

Teaching the theory of error correcting codes on an introductory level is a difficulttask. The theory, which has immediate hardware applications, also concerns highly abstractmathematical concepts. This text explains the basic circuits in a refreshingly practical way thatwill appeal to undergraduate electrical engineering students as well as to engineers and techniciansworking in industry.Arazi's truly commonsense approach provides a solid grounding in the subject,explaining principles intuitively from a hardware perspective. He fully covers error correctiontechniques, from basic parity check and single error correction cyclic codes to burst errorcorrecting codes and convolutional codes. All this he presents before introducing Galois fieldtheory - the basic algebraic treatment and theoretical basis of the subject, which usually appearsin the opening chapters of standard textbooks. One entire chapter is devoted to specific practicalissues, such as Reed-Solomon codes (used in compact disc equipment), and maximum length sequences(used in various fields of communications). The basic circuits explained throughout the book areredrawn and analyzed from a theoretical point of view for readers who are interested in tackling themathematics at a more advanced level.Benjamin Arazi is an Associate Professor in the Department ofElectrical and Computer Engineering at the Ben-Gurion University of the Negev. His book is includedin the Computer Systems Series, edited by Herb Schwetman.

Assuming little previous mathematical knowledge, Error Correcting Codes provides a sound introduction to key areas of the subject. Topics have been chosen for their importance and practical significance, which Baylis demonstrates in a rigorous but gentle mathematical style.Coverage includes optimal codes; linear and non-linear codes; general techniques of decoding errors and erasures; error detection; syndrome decoding, and much more. Error Correcting Codes contains not only straight maths, but also exercises on more investigational problem solving. Chapters on number theory and polynomial algebra are included to support linear codes and cyclic codes, and an extensive reminder of relevant topics in linear algebra is given. Exercises are placed within the main body of the text to encourage active participation by the reader, with comprehensive solutions provided.Error Correcting Codes will appeal to undergraduate students in pure and applied mathematical fields, software engineering, communications engineering, computer science and information technology, and to organizations with substantial research and development in those areas.

The book offers an original view on channel coding, based on a unitary approach to block and convolutional codes for error correction. It presents both new concepts and new families of codes. For example, lengthened and modified lengthened cyclic codes are introduced as a bridge towards time-invariant convolutional codes and their extension to time-varying versions. The novel families of codes include turbo codes and low-density parity check (LDPC) codes, the features of which are justified from the structural properties of the component codes. Design procedures for regular LDPC codes are proposed, supported by the presented theory. Quasi-cyclic LDPC codes, in block or convolutional form, represent one of the most original contributions of the book. The use of more than 100 examples allows the reader gradually to gain an understanding of the theory, and the provision of a list of more than 150 definitions, indexed at the end of the book, permits rapid location of sought information.

This text offers an introduction to error-correcting linear codes for researchers and graduate students in mathematics, computer science and engineering. The book differs from other standard texts in its emphasis on the classification of codes by means of isometry classes. The relevant algebraic are developed rigorously. Cyclic codes are discussed in great detail. In the last four chapters these isometry classes are enumerated, and representatives are constructed algorithmically.

Fundamentals of Error Correcting Codes is an in-depth introduction to coding theory from both an engineering and mathematical viewpoint. As well as covering classical topics, there is much coverage of techniques which could only be found in specialist journals and book publications. Numerous exercises and examples and an accessible writing style make this a lucid and effective introduction to coding theory for advanced undergraduate and graduate students, researchers and engineers, whether approaching the subject from a mathematical, engineering or computer science background.