

Abstracts of Papers From Other Journals

The Future of Digital Magnetic Recording on Flexible Media, Geoffrey Bate, *The Radio and Electronic Eng.*, 50: 283-290, June 1980.

Digital magnetic recording on flexible media has grown from 1/2-in tape in 1959 to include mass storage systems, digital cassettes, data cartridges and flexible disks in 1980. The properties of greatest interest are the capacity of the removable unit, the access time to the data and the rate at which data can be communicated to another device. To the customer the price he must pay per bit of data stored is very important, but he must also consider the price of the drive unit and not just the price of the removable unit. The characteristic by which different storage devices are most commonly compared is their storage capacity. To increase this continuously in response to the ever increasing amount of information that must be stored in machine-accessible form requires a steady improvement in the amount of data that can be packed into each unit of area. The problems encountered in increasing this area storage density are discussed in detail. Three kinds of limits to bit and track density are considered: the fundamental limit, the techno-

logical limit, and the economic limit, which is strongly machine-dependent, but the fundamental limit to bit and track density is given as 20,000 bits or tracks per mm (500,000/in). The technological limit for bit density is given as 4,000-8,000 bits/mm (100,000-200,000 bits/in) and for track density 600 tracks/mm (15,000 tracks/in).

GaAs MESFET Comparators for Gigabit-Rate Analog-to-Digital Converters, L. C. Upadhyayula, *RCA Rev.*, 41: 198-212, June 1980.

A novel MESFET comparator circuit has been proposed. A three-comparator circuit has been fabricated with discrete GaAs FETs and evaluated up to 250 MHz clock rates. The comparators and coding logic for a 2-bit A/D converter have also been designed. The performance of the converter has been studied using a computer simulation program. The simulations indicate that the circuit can function satisfactorily up to 1.0 GHz sampling rates. The development of a monolithic IC chip consisting of comparators and coding logic is also reported.

Compact Low-Power Coder for Extreme Bit Rate Reduction of Television Pictures, J. G. McWhirter, J. B. G. Roberts, R. F. Simons and D. J. Watson, *IEE Proceedings, F*, 127: 368-383, No. 5, Oct. 1980

A subsystem is described which enables real time television pictures to be transmitted with very low bit rates while preserving spatial and temporal resolutions adequate for scene monitoring. The chief design constraints were to minimize the size and power consumption in an inexpensive robust construction. This was achieved by optimizing the frame rate and picture resolution and by removing image redundancy using a variable Walsh transform differential PCM coding scheme. A CCD imager, custom large-scale integration and standard digital components now enable a compact low-data-rate sensor and data link to be effectively realized.

Multiplexed CCDs for Bandwidth Compression Applications, J. C. White, J. G. Harp, J. R. Hill, D. V. McCaughan, J. M. Keen, and J. D. E. Beynon, *Radio and Electronic Eng.*, 50: 237-242, May 1980.

A 321-cell CCD bandwidth compressor capable of analog sampling at 100 MHz is described. This system is designed to accept data with a bandwidth of 50 MHz and subsequently to clock the data out at rates up to 2MHz for recording on magnetic tape via a low cost, low speed A/D converter. Since power requirements are at a premium, low overall power consumption and high speed performance were essential design goals. Details of the chip architecture are given and associated driver circuitry and preliminary experimental results described.

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Bandwidth Compression of Image Signals, M. N. Faruqi, *J. Institution Electronics and Telecommunication Engineers*, 26: 29-40, Jan. 1980.

The techniques of bandwidth compression of picture signals, in order to represent it by as few a binary number of bits as possible, have been extensively studied and reported. This paper describes some of these techniques, particularly in the context of encoding monochromatic images at bit rates less than 2 bits/pel. The techniques have been broadly classified into transform coding, predictive coding and hybrid coding techniques. Transform coding basically converts blocks of a raster scanned, sampled, two-dimensional set of picture elements into another set of transformed coefficients. Non-adaptive and adaptive KL, discrete Fourier, discrete cosine, Hadamard, slant, Haar transforms etc., or combinations thereof have been used for the purpose. Essentially the adaptive quantization and sample selection in the transform domain has resulted in coding picture areas of high activity with a greater number of bits and low activity areas with a lesser number of bits. Fairly good picture coding systems using less than 1 bit/pel on an average have been developed in both software and hardware. The discrete cosine transform system seems to be the most economical in this regard. Predictive and adaptive predictive coding systems employing differential pulse code modulation (DPCM) and adaptive delta modulation (ADM) techniques are much simpler in hardware realization but their bit rate is higher than the transform coders. Both adaptive prediction and adaptive quantization have been used in

DPCM systems. Using adaptive quantization and reassignment techniques, bit rates of the order of 2-3 bits/pel have been achieved. Good results in ADM using a two-dimensional look-ahead circuitry have been obtained at similar bit rates. A hybrid of transform and differential PCM seems to be attractive from the hardware implementation viewpoint. The effect of channel errors is also discussed.

Design and Performance of a CCD Comb Filter IC, D. J. Sauer, *RCA Review*, 41: 29-56, Mar. 1980.

A low-cost CCD comb filter for video signal processing in color television receivers is described. The chip combines a buried-channel CCD 1-H (63.5 μ s) analog delay line with all necessary linear and digital support circuitry using an advanced double-polysilicon N-channel self-aligned gate technology. The design of new circuits is discussed, including a linear variable gain BCCD input structure, automatic CCD input and output biasing, and 10.7 MHz on-chip clock drivers. Specifications and data for the CCD comb filter IC are presented.

Digital-to-Analog Converter, Yasuhiro Mitsuhashi, *J. Audio Eng. Soc.*, 28: 515-520, July/Aug. 1980.

A new type of digital-to-analog converter has been developed whose output samples are quantized in both amplitude and time. This method provides flexible and effective means of controlling both conversion precision and sampling rate.

Solution Management Systems for Ferricyanide Bleach and Fix, G. W. Stanwix, *The BKSTS Journal*, 61: 42-46, Feb. 1979.

The author explains the method of control and replenishment of chemicals that the laboratory technologist has available to him for ferricyanide bleach and fixing solutions in film processing machines. He goes on to explain how the various methods relate to present day high speed processing operating for 24 hours per day for six days a week. The author describes the Rotex system which provides an effective means of minimizing pollution by greatly reducing the volume of chemical overflow and consumption and also continuously and automatically corrects the chemical balance of the solutions in the processing bath with a resultant great savings in chemical costs.

Insertion of a Commentary in the Field-Blanking Interval of the Television Signal, M. Ardito, M. Barbero and G. F. Barbieri, *EBU Technical Part*, 180: 54-61, Apr. 1980.

This article describes a system for the coding of a speech signal and for its insertion in the unused television lines of the field-blanking interval. The system occupies a maximum of two lines per field, although the average number of lines can be reduced to one by exploiting the pauses in speech. The message structure is compatible with existing teletext systems with which the sound may be associated; the receiver could easily be incorporated as part of the teletext decoder.

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The Search for a Common Standard for the Encoding of High Quality Sound Signals for International Transmission, A. Brown, *EBU Rev. Technical Part*, 177: 228-232, Oct. 1979

This article explains the studies made since 1973 by EBU Working Party C (now Sub-Group V1) on the standardization of digital codes for audio signals for international program exchanges using the distribution network. After recalling the arguments justifying such standardization, the article examines the factors which must be taken into account when choosing a suitable system and the quality criteria to be adopted. The results are then used to consider the necessary bit rate and methods of reducing this bit rate.

Digitext: A Digital Caption System Specially Designed for Convenient Recording, Editing, and Transmission of Television Subtitles, Richard Anderson and Roland Eisentrager, *The BKSTS Journal*, 62: 322-326, Aug. 1979.

This report gives an outline of the operational features and technical implementation of an electronic subtitle generator and editor. The main design goals were versatility in use and ease of operation, including provisions for updating of operational characteristics and custom designed systems. To achieve these goals a bus-based system was chosen with an 8080 microprocessor as the controlling element. Mass storage is realized by means of floppy disks while an all electronic matrix type character generator

provides the text output. Operation may be either manual or automatic (time code). The operational characteristics are mainly determined by the software and the function modules included, the software being implemented in a high level language, PLM80 (trademark of Intel Corp.). PLM80 allows for structural programming thus making modifications relatively easy. An internal phase-locked video sync generator allows operation in conjunction with inexpensive VTRs.

The Effect of Rain on Satellite Communications Above 10 GHz, R. S. Engelbrecht, *RCA Review*, 40: 191-299, June 1979.

Rain-induced attenuation, scattering, and depolarization can significantly affect the performance of future satellite communications systems in the 12/14- or 18/30-GHz frequency bands. In this paper, the pertinent rainfall statistics are reviewed and then applied to the prediction of earth-space attenuation distributions as a function of operating frequency, geographical location, and path length (i.e. antenna elevation angle). For ground-site locations in the United States, the fraction of total time during which rain attenuation exceeds 3 dB can range from about 10^{-3} (short 11-GHz paths in low rain-rate regions) to almost 10^{-1} (long 30-GHz paths in high rainrate regions). To maintain communications service during periods of increased attenuation, the system must operate in some temporary diversity mode. Various diversity methods are evaluated and shown to provide substantial improvements in service availability.

Improving TV Audio and the Broadcast Transmitter — Receiver Interface, Daniel B. Talbot, *Journal of the Audio Engineering Society*, 27: 482-491, June 1979.

Theoretically the TV sound channel has the potential for extremely high quality, but many of the practical sources of impairment need to be understood. These impairments occur both at the transmitter (including the studio and/or network) and at the receiver (including any intervening signal processing such as antenna or cable TV chain, converter boxes, TV tuner, and intermediate-frequency strip). Most improvements must be treated as tradeoffs, that is, something must be sacrificed in order for something else to be gained. This is particularly true in the area of video-to-audio crosstalk in the transmitter and receiver and in the area of impulse-noise immunity. The sources of impairment and potential improvement are identified with additional supporting theory covered in the references.

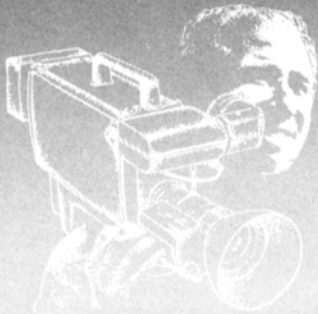
A Superposition-Based Analysis of Pulse-Slimming Techniques for Digital Recording, N. D. Mackintosh, *Radio and Electronic Eng.*, 50: 307-314, June 1980.

The application of pulse-slimming to digital magnetic recording is investigated and analyzed using superposition. Representative criteria are used to determine the maximum achievable packing density both before and after slimming. The results indicate that pulse-slimming is of little value for an already optimized recording system, but could be used to trade-off timing margin against amplitude margin in a new design.

TV TECHNOLOGY IN THE 80's
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