

A Bibliography on Television Bandwidth Reduction Studies

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Abstract—This bibliography contains books, papers, and articles on the subject of television bandwidth reduction. Also included is related information on the processing and coding of video signals, and the subjective evaluation of television images.

INTRODUCTION

STUDIES into methods of reducing the bandwidth required for the transmission of television have been of considerable interest over the past several years. This bibliography brings together the results of these studies which have appeared in English-language books, journals, and periodicals. Company, university, governmental, and other less readily available reports have not been included.

The subjects covered in this bibliography include:

Description of Television Bandwidth Reduction Systems
Viewability Requirements and Physiological Viewing Properties of Television
Statistical Picture Properties and Information Theoretic Aspects of Television Images.

- Balder, J. C., and Kramer, C., "Video transmission by delta modulation using tunnel diodes," *Proc. IRE*, vol. 50, pp. 428-431, April 1962.
- Baumunk, J. F., and Roth, S. H., "Pictorial data transmission from space vehicle," *Elec. Engrg.*, vol. 79, pp. 134-138, February 1960.
- Beddoes, M. P., "A variable-velocity magnetic scanning process," *IEE Monograph*, No. 241R, pt. C, June 1957.
- , "Experiments with a slope feedback-coder for television compression," *IRE Trans. on Broadcasting*, vol. BC-7, pp. 12-28, March 1961.
- , "Two channel method for compressing bandwidth of television signals," *Proc. IEE*, vol. 110, pp. 369-374, February 1963.
- Bedfor, L. H., and Puckle, O. S., "A velocity modulation television system," *J. IEE*, vol. 75, p. 63, 1934.
- Bell, D. A., "Economy of bandwidth in television," *J. Brit. IRE*, vol. 13, pp. 447-470, September 1953.
- Bell, D. A., and Howson, E. A., "Reduction of television bandwidth by frequency interlace," *J. Brit. IRE*, vol. 20, pp. 127-136, February 1960.
- Bell, D. A., and Swann, G. E. D., "Spectrum of television signals," *Wireless Engineer*, vol. 33, pp. 253-256, November 1956.
- Billings, A. R., "A coder for halving the bandwidth of signals," *Proc. IEE*, vol. 105, pt. B, pp. 182-184, March 1958.
- Bisignani, W. T., Richards, G. P., and Whelan, J. W., "The improved gray scale and the coarse-fine PCM systems, two new digital TV bandwidth reduction techniques," *Proc. IEEE*, vol. 54, pp. 376-390, March, 1966.

- Blasbalg, H., and Van Blerkom, R., "Message compression," *IRE Trans. on Space Electronics and Telemetry*, vol. SET-8, pp. 228-238, September 1962.
- Budrikis, Z. L. and Seyler, A. J., "Detail perception after scene changes in television image presentations," *IEEE Trans. on Information Theory*, vol. IT-11, pp. 31-43, January 1965.
- Cabrey, R. L., "Video transmission over telephone cable pairs by pulse code modulation," *Proc. IRE*, vol. 48, pp. 1546-1561, September 1960.
- Cahn, L., et al., "Experiments in processing pictorial information with a digital computer," *1957 Proc. Eastern Joint Computer Conf.* 1957 pp. 221-229.
- Cherry, C., et al., "An experimental study of the possible bandwidth compression of visual image signals," *Proc. IEEE*, vol. 51, pp. 1507-1517, November 1963.
- Cherry, E. C., "The bandwidth compression of television and facsimile," *Television Soc. J.*, vol. 10, pp. 40-49, February 1962.
- Cherry, E. C., and Gouriet, G. G., "Some possibilities for the compression of television signals by recoding," *Proc. IEE*, vol. 100, pt. 3, pp. 9-18, January 1953.
- Clinger, A. H., and Ziemer, D. R., "Reducing channel capacity requirements in digital imagery transmission: a study report," *1961 7th Nat'l Communication Symp. Rec.*, pp. 75-85.
- Deryugin, N. G., "Theoretical possibilities of compressing bandwidth of TV channel," *Telecommunications*, no. 8, pp. 805-810, 1958.
- Deutsch, S., "Narrow-band TV uses pseudo-random scan," *Electronics*, vol. 35, pp. 49-51, April 1962.
- , "The possibilities of reduced television bandwidth," *IRE Trans. on Broadcast and Television Receivers*, vol. BTR-2, pp. 69-82, October 1956.
- , "Pseudo-random dot scan television systems," *IEEE Trans. on Broadcasting*, vol. BC-11, pp. 11-21, July 1965.
- Dome, R. B., "Frequency interlace color TV," *Electronics*, vol. 23, p. 70, September 1950.
- , "Spectrum utilization in color television," *Proc. IRE*, vol. 39, pp. 1323-1331, October 1951.
- Elias, P., "Predictive coding," *IRE Trans. on Information Theory*, vol. IT-1, pp. 16-33, March 1955.
- Farango, J. P., and Narasimhan, R., "Some further experiments in the parallel processing of pictures," *IEEE Trans. on Electronic Computers (Short Note)*, vol. EC-13, pp. 748-750, December 1964.
- Foy, W. H., Jr., "Entropy of simple line drawings," *IEEE Trans. on Information Theory (Correspondence)*, vol. IT-10, pp. 165-167, April 1964.
- Fredendall, G. L., Powers, K. H., and Staras, H., "Some relations between television picture redundancy and bandwidth requirements," *Proc. Conf. on the Physical Problems of Colour Television; Acta Electronica*, vol. 2, pp. 378-383, 1957-1958.
- Gabor, D., and Hill, P. C. J., "Television bandwidth compression by contour interpolation," *Proc. IEE*, vol. 108, pt. B, pp. 303-315, 634, May 1961.
- Geddes, W. K. E., and Newell, G. F., "Tests of three systems of bandwidth compression of TV signals," *Proc. IEE*, vol. 109, pt. 5, pp. 311-324, July 1962.
- Gicca, F. A., "Digital spacecraft TV can beat bit-rate and weight problems," *Space Aeronautics*, pp. 73-78, December 1962.
- Glovazhy, A., "Determination of redundancies in a set of patterns," *IRE Trans. on Information Theory*, vol. IT-2, pp. 151-153, December 1956.
- Goodall, W. M., "Television by pulse code modulation," *Bell Sys. Tech. J.*, vol. 30, pp. 33-49, January 1951.

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- Gouriet, G. G., "A method of measuring television picture detail," *Electronic Engrg.*, vol. 24, pp. 308-311, July 1952.
- , "Bandwidth reduction in relation to television," *Brit. Commun. and Electronics*, vol. 3, pp. 424-429, 1956.
- , "Bandwidth compression of a television signal," *Proc. IEE*, vol. 104, pt. B, pp. 265-272, May 1957.
- , "Dot interlaced television," *Electronic Engrg.*, vol. 24, pp. 166-171, April 1952.
- Graham, R. E., "Communication theory applied to TV coding," *Acta Electronica*, vol. 2, pp. 334-343, 1957-1958.
- Graham, R. E., "Predictive quantizing of television signals," 1958 *IRE Wescon Conv. Rec.* pt. 4 pp. 147-157.
- Graham, R. E., and Kelly, J. L., Jr., "A computer simulation chain for research on picture coding," 1958 *IRE Wescon Conv. Rec.*, pt. 4 pp. 41-46.
- Haantjes, J., and Teer, K., "Multiplex television transmission: sub-carrier and dot interlace systems," *Wireless Engineer*, pt. I, vol. 31, pp. 225-233, September 1954, pt. II, vol. 31, pp. 266-273, October 1954.
- Harrison, C. W., "Experiments with linear prediction in television," *Bell Sys. Tech. J.*, vol. 31, pp. 764-783, July 1952.
- Haynes, H. E., and Rogers, D. T., "Stop-go scanning saves spectrum space," *Electronics* September 1958.
- Honnel, M. A., and Prince, M. D., "Television image reproduction by use of velocity-modulation principles," *Proc. IRE*, vol. 39, pp. 265-268, March 1951.
- Huang, T. S., "PCM picture transmission," *IEEE Spectrum*, vol. 2, pp. 57-63, December 1965.
- Huang, T. S., and Scoville, F. W., "The subjective effect of spatial and brightness quantization in PCM picture transmission," *Proc. NEREM Conv. Rec.* November 1965.
- Huang, T. S., and Tretiak, O. J., "Research in picture processing," in *Optical and ElectioOptical Information Processing Technology*. Cambridge, Mass.: M.I.T. Press, 1965, ch. 3.
- Jesty, L. C., "Television as a communication problem," *Proc. IEE*, vol. 99, pt. 3A, pp. 761-770, 1952.
- Joseph, H. M., and Kovásznyai, L. S. G., "Image processing," *Proc. IRE*, vol. 43, pp. 560-570, May 1955.
- Julesz, B., "A method of coding TV signals based on edge detection," *Bell Sys. Tech. J.*, vol. 38, pp. 1001-1020, July 1959.
- Kay, N. D., Knapp, C. F., and Schreiber, W. F., "Synthetic highs—an experimental TV bandwidth reduction system," 84th *SMPTE Conv.* pp. 1-18, October 1958.
- Kelly, D. H., "Information capacity of a single retinal channel," *IRE Trans. on Information Theory*, vol. IT-8, pp. 221-226, April 1962.
- Kitsopoulos, S. C., and Kretzmer, E. R., "Computer simulation of a television coding scheme," *Proc. IRE (Correspondence)*, vol. 49, pp. 1076-1077, June 1961.
- Knapp, C. F., and Schreiber, W. F., "TV bandwidth reduction by digital coding," 1958 *IRE Nat'l Conv. Rec.*, pt. 4 pp. 88-99.
- Knight, J. M., Jr., "Maximum acceptable bit error rates for PCM analog and digital TV systems," *National Telemetering Conf. Proc.*, Paper 10-3 pp. 1-9, 1962.
- Kretzmer, E. R., "Reduced-alphabet representation of television signals," 1956 *IRE Conv. Rec.*, pt. 4 pp. 140-147.
- , "Statistics of television signals," *Bell Sys. Tech. J.*, vol. 31, pp. 751-763, July 1952.
- Kubba, M. H., "Automatic picture detail detection in the presence of random noise," *Proc. IEEE*, vol. 51, pp. 1518-1523, November 1963.
- Lewis, N. W., "Television Bandwidth and Kell Factor," *Electronic Tech.*, vol. 39, pp. 44-47, February 1962.
- Michel, W. S., et al., "A coded facsimile system," 1957 *IRE Wescon Conv. Rec.*, pt. 2 pp. 84-93.
- Nishikawa, S., Massa, R. J., and Mott-Smith, J. C., "Area properties of television pictures," *IEEE Trans. on Information Theory*, vol. IT-11, pp. 348-353, July 1965.
- Pawula, R. F., "Comments on 'statistical properties of the contours of random surfaces,'" *IRE Trans. on Information Theory*, vol. IT-9, pp. 208-209, July 1963.
- Prasada, B., "Some possibilities of picture signal bandwidth compression," *IEEE Trans. on Communications Systems*, vol. CS-11, pp. 315-328, September 1963.
- Pratt, W. K., "Stop-scan edge detection system for interplanetary television transmission," *Nat'l Symp. on Space Electronics and Telemetry*, Section 4.3, October 1962.
- Raga, G. L., "Digital television compression—fact or myth," 1965 *Nat'l Telemetering Conf. Proc.*
- Reiss, R. A., "Pseudo-random scan applications to data processors," *Proc. NEREM Conv. Rec.* November 1965.
- Renn, R. L., and Schaphorst, R. A., "An image coding system which reduces redundancy in two dimensions," *Proc. NEC, Dayton, Ohio*, 1962.
- Roberts, L. G., "Picture coding using pseudo-random noise," *IRE Trans. on Information Theory*, vol. IT-8, pp. 145-154, February 1962.
- Ross, I., and Zuckerman, L. G., "Some coding concepts to conserve bandwidth," *IRE Telemetering Conf.* May, 1959.
- Salaman, R. G., "Digital television encoding," 1961 7th *Nat'l Communication Symp. Rec.* pp. 274-279.
- Schreiber, W. F., "The measurement of third order probability distributions of television signals," *IRE Trans. on Information Theory*, vol. IT-2, pp. 94-105, September 1956.
- Sekey, A., "Detail detection in television signals," *Proc. IEEE (Correspondence)*, vol. 53, pp. 75-76, January 1965.
- Seyler, A. J., "An experimental frame difference signal generator for the analysis of television signals," 1963 *IRE Radio and Electronic Engineering Conv.*, Australia.
- , "Bandwidth reduction in television relaying," *Proc. IRE Australia*, pt. 1 pp. 218-225, July 1955; pt. 2, pp. 261-276, August 1955.
- , "Coding of visual signals to reduce channel capacity requirements," *Proc. IEE*, vol. 109, pt. C, pp. 676-684, September 1962.
- , "Real-time recording of television frame difference areas," *Proc. IEEE (Correspondence)*, vol. 51, pp. 478-480, March 1963.
- , "Visual communication and psycho-physics of vision," *Proc. IRE Australia*, vol. 23, pp. 291-304, May 1962.
- , "Probability distribution of television frame differences," *Proc. IEEE (Australia)*, November 1965.
- , and Wallace, P. R., "Acquisition of statistical television signals," *Proc. IRE (Australia)*, pp. 343-354, November 1965.
- Swerling, P., "Statistical properties of the contours of random surfaces," *IRE Trans. on Information Theory*, vol. IT-8, pp. 315-321, July 1962.
- Teacher, C. F., "Digital television techniques," *Nat'l Communications Symp.*, October 1964.
- Tsukkerman, I. I., "The transmission of the coordinates of a televised image," *Radio Engrg.*, vol. 13, pp. 93-105, July 1958.
- Whelan, J. W., "Digital TV bandwidth reduction techniques as Applied to spacecraft television," *AIAA Unmanned Spacecraft Meeting Proceedings*, pp. 5-22, March 1965.
- Wholey, J. S., "The Coding of Pictorial Data," *IRE Trans. on Information Theory*, vol. IT-7, pp. 99-104, April 1961.
- Wichman, T., "Optimum coding of pictorial data," 1963 9th *Nat'l Communications Symp. Rec.*, pp. 18-27.
- Winkler, M. R., "Pictorial transmission with HIDM," 1965 *IEEE Internat'l Conv. Rec.*, pt. 1, pp. 285-291.
- "Digital television: shrinking bulky bandwidths," *Electronics*, December 14, 1964.
- "Discussion on the impact of information theory on television," *J. Brit. IRE*, vol. 13, pp. 590-591, December 1953.
- "Saving television bandwidth," *Wireless World*, vol. 59, pp. 158-162, April 1953.
- "TV bandwidth reduction," *Wireless World*, vol. 65, p. 402, September 1959.