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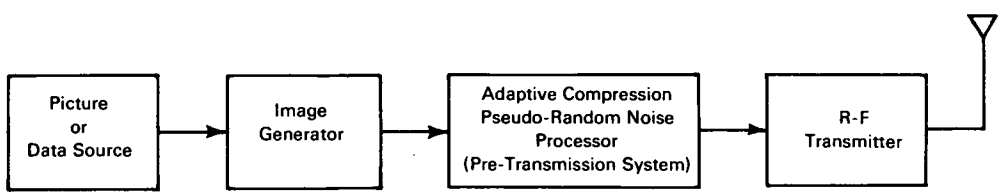
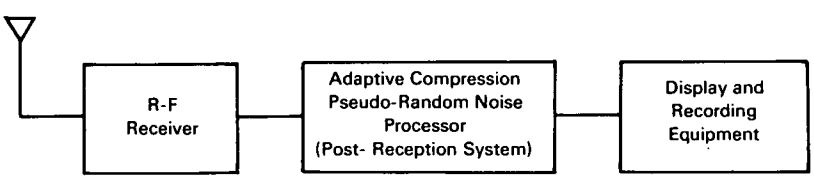
Brief 65-10345

NASA TECH BRIEF

Variable Word Length Encoder Reduces TV Bandwidth Requirements



TRANSMITTING SYSTEM



RECEIVER SYSTEM

The problem: To obtain more efficient transmission of pulse code modulated television signals by reducing the required bandwidth. An earlier method added pseudo-random noise to the television signal prior to encoding and transmission and removed the noise from the composite signal after it was received. Bandwidth compression was achieved but the bandwidth compression was limited to positive integers and to one fixed value of compression, set prior to use, and thereafter unalterable. It is also desirable to obtain positive mixed number compression ratios as well as postive integer compression ratios.

The solution: Utilize an adaptive variable resolution (variable word length) encoding technique to provide an adaptive compression pseudo-random noise signal processor. The processor is used to reduce the channel capacity required for signal transmission. Complementary processors are required in both the transmitting and receiving systems. The pretransmission processor is analog-to-digital in nature, while the postreception processor is digital-to-analog.

How it's done: The pretransmission processor (PTP) is placed between the image generator and the

(continued overleaf)

transmitter in the transmission system. The postreception processor (PRP) is placed between the receiver and the display and recording equipment.

The basic function of the PTP is to add an adapted pseudo-random noise to the picture data and encode this combined signal by means of a variable resolution encoder. This process generates a pulse-coded picture-plus-noise signal which modulates a transmitter that satisfies the communication system transmission requirements. The PTP obtains analog-to-digital conversion by means of a variable resolution analog-to-digital converter which is capable of converting input voltage into a 1 through n bit word. The number of bits per word is selected by a variable compression control generator.

After the signal has been received and decoded, the PRP puts the signal through a variable resolution digital-to-analog converter which decodes it into an analog signal. The adapted pseudo-random noise from the combined analog signal is then removed and processed by a compensator to give an output equivalent to the input signal the PTP was given.

Notes:

1. The following capabilities make this technique superior to prior art:
   a. Switching to a number of encoder resolutions, between encoder samples, provides positive mixed number compression ratios in pseudo-random noise picture compression systems.
   b. Adapting the decoded level of pseudo-random noise added to a picture signal in a compression system so that its full-scale value will follow, in real time, the equivalent weight of the least significant bit of the picture signal encoder.
   c. Output buffering of a number of inputs, differing in bit rate as a function of sampling and encoding conditions, in a manner rendering an output bit rate equal to the average bit rate of the inputs, over a conditional sampling cycle. (A sampling cycle is defined as a series of samples including a total number of samples as required to include one encoded sample of each different word length employed in the compression systems.)
   d. Altering the compression capability of a pseudo-random noise picture compression system, manually (preset or remotely controlled) or automatically (programmed or diagnostic processing) to satisfy real time operational conditions.
2. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Langley Research Center
   Langley Station
   Hampton, Virginia, 23365
   Reference: B65-10345

Patent status: NASA encourages the immediate commercial use of this invention. Inquiries about obtaining rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546.

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