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LOW RATE TRANSMISSION OF VIDEO SIGNALS USING ADAPTIVE DELTA MODULATION

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Donald L. Schilling
(212) 862-3737
Principal Investigator

COMMUNICATIONS SYSTEM LABORATORY
DEPARTMENT OF ELECTRICAL ENGINEERING

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report describes the mode of operation of the slow scan digital video encoder.

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Summary

The objective of this project is to design and construct a slow scan digital video system, using adaptive delta modulation. This system should be capable of transmitting a single frame of video from the encoder, and receiving the video frame at the receiver.

The technique employed is to digitize a frame of "real-time" video using an adaptive delta modulator operating at 16 Mb/s. Thus, for each line in the video frame we generated 928 bits, which are then stored in a digital memory. Since there are approximately 500 lines/frame, the digital memory stores approximately 464 K bits. The 464 K bits are then modulated by a modem and transmitted. In the receiver a modem decoder recovers the data which is then stored in a second digital memory. The bits are read out of memory at the regular video rate, decoded by an ADM decoder, and then displayed on a monitor.

The significance of this system when completed will be that:

1) the quality of the received video picture is quite good, being that of a 16 Mb/s ADM;

2) the cost, complexity, and size of the system is quite small and much of the system can be integrated using standard LSI chips;

3) the picture quality does not degrade as a function of the storage time of a frame since a digital memory is used;

4) portions of the frame can be retransmitted without retransmitting the entire frame;

5) the picture quality is relatively immune to channel errors; error rates of up to 10^{-3} being permissable without significant video degradation;

6) the time to transmit a frame of 16 Mb/s ADM encoded video is approximately one-fourth the time needed to transmit PCM encoded video.

Int roduction

In Technical Report TR-1, the design of the digital memory was discussed. Two such memories have now been constructed, tested, and are working properly. In this technical report we describe the various modes of operation.

Modes of Operation

1) Single-memory R/W: In this mode a frame of video is encoded and stored in the digital memory. The memory is then read at the 16 Mb/s rate by the ADM decoder and displayed on the video monitor. Note that the memory is constantly being read, since the monitor requires a continual real-time input signal.

2) Computer-mode: In this mode a frame of video is encoded and stored in the digital memory. The memory is then outputted and read into disk storage in a PDP 11/34. The computer provides a 15 bit address through its 16 bit output port. Data is read into the computer through the computer's 16 bit input port. Data is read out of the computer over the 16th address line in serial form. The system operation in this mode is currently being improved. With the data stored in the computer it can be processed to remove redundancy. This mode can also be used to packetize the data for transmission over the ARPANET.

3) In this mode the digital memory is read into a modem for transmission over the telephone lines. Initial tests have indicated that 4800b/s transmission is possible over the local network in New York City. At this rate a complete frame of video is transmitted every 100s (approximately). Transmission over long distance lines without equalization has resulted in excessively high error rates.

Conclusions

A slow-scan video system has been built and is now operational. The modes of operation has been presented. The removal of redundancy from the video signal will be attempted so as to decrease the time required to transmit a frame of signal.