#3 (D1)

International Telegraph and Telephone
Consultative Committee
(CCITT)

COM XV-No D.1

Period 1981-1984

English only

Question : 4/XV

Date : November 1984

STUDY GROUP XV - CONTRIBUTION No. D. 1

SOURCE : JAPAN

TITLE : A DRAFT FOR PARTS 3 OF RECOMMENDATIONS H.120 AND H.130

---

1. Introduction

During the 1981-1984 study period, Recommendations H.120 and H.130 on the codec and its frame structure for videoconferencing have been established. In these Recommendations, however, Parts 3 for 525-lines, 60 field/s and 1544 kbit/s transmission for intra-regional use are still under study.

This Contribution is aimed at completing the Parts 3 of H.120 and H.130 which is urgently needed.

2. Proposal

The proposed details for the Parts 3 of H.120 and H.130 are described in the Annex 1 and Annex 2, respectively.

The draft is based on the Annex 5 to the new Question D/XV and includes recent advancements in the interframe predictive coding technology in Japan. Considering possible future progress in various aspects of video coding, the specifications are limited to those items which ensure the decodability between different design codecs. Other items are left to each hardware implementation.

It should be noted that this proposal does not exclude future possible improvements which might be made by the time of the first Working Party meeting scheduled in next June.

3. Features of the proposed Part 3 Codec

3.1 TDM Video Signal

The input analog NTSC signal is sampled at 4 fsc (subcarrier frequency) and the luminance signal Y and the two color components C_1 and C_2 are digitally separated. These three signals are time division multiplexed into a digital video format after Y and C_1/C_2 having been resampled with 2 fsc and 1/3 fsc, respectively.

3.2 Coding Modes

In addition to Normal Mode to transmit all of the pels, Subsampling Mode to omit half of the pels and Field Repetition Mode to omit one or more fields are also provided. When the information generation exceeds the channel capacity, Stop Mode is applied. To remove the trace of any transmission error, Refresh Mode is used.

3.3 Adaptive Predictive Coding

The coding algorithm is predictive coding in which the following three predictions are adaptively selected on a pel by pel basis:

- motion-compensated interframe prediction for a still or slowly moving area
- background prediction for an uncovered background area
- intraframe prediction for a rapidly moving area

The selection is determined by prediction errors for the preceding pels located on the present line and the previous line.

3.4 Block Basis Processing

A block-line consists of 8 consecutive lines. Consequently, a video frame consists of 32 + 32 block-lines with 13 lines remaining which are not transmitted. A block consists of 8 lines x 16 pels. Coding modes are controlled in a unit of frame, block-line or block.

3.5 Quantization

Four kinds of quantizing characteristics (57-37 levels) are provided. These are selected according to the buffer memory occupancy.

3.6 Demand Refresh

In order to remove the picture defects due to uncorrected transmission errors, parities are checked between the coder and decoder frame memories. If any difference is found, the decoder requests a demand refresh of the frame memory in the coder. Considering such applications as unidirectional broadcasting communication in which no backward channel is available, cyclic refresh is also provided.

3.7 Motion Vector Detection

The tracking range is defined as ±7 lines x ±15 pels for each block. Detection methods are not defined.

3.8 Entropy Coding

Prediction errors for both of the video signals and motion vectors are data compressed by using the following entropy coding:

- variable length coding for non-zero errors
- run length coding for zero errors

3.9 Coding Commands and Control

In order to control the coding parameters, a number of commands are defined and transmitted at the head of a frame or a block-line. With these commands, quantizing characteristics and coding modes are switched

according to the buffer memory occupancy. Control sequences are not defined.

3.10 Buffer Memory

The irregularly spaced compressed data are smoothed out by the transmission buffer memory with 180 kbits memory size. The receiving buffer memory needs a size of more than 220 kbits, considering the variation of the read-out speed of the transmission buffer due to insertion/removal of an optional data channel and stuffing pulses.

3.11 Audio Coding

An audio signal with 7 kHz bandwidth is coded into a 64 kbit/s digital signal.

3.12 Transmission Coding

Optional encryption is applicable to the video and/or audio signals independently. By introducing the (255,239) BCH error correction code and 16 phase interleaving, isolated errors up to 2 in 255 bits or a single burst of up to 32 bit errors in 255 x 16 bits are corrected.

4. Features of the Proposed Frame Structure for Part 3 Codec

4.1 Interface

The interface conforms to the Recommendation G.703. As regards interface codes, CMI is also applicable in addition to AMI/B8ZS.

4.2 Frame Structure

The following channels are defined and bit allocated in a 1544 kbit/s transmission frame (193 bits per 125 μs):

- one 8 kbit/s channel for frame alignment, alarm signals and other signals as required
- one 64 kbit/s channel for the audio signal
- one 32 kbit/s channel for codec-to-codec information
- one optional 64 kbit/s channel for auxiliary data service
- the remaining capacity (between 1376 and 1440 kbit/s) is used for the encoded video signal

4.3 Codec-to-codec Control Information

Various control information is defined and transmitted in the 16 multiframe, 8 supermultiframe arrangement.

4.4 Auxiliary Data Channel

If this channel is not used for data transmission, it is used for video transmission. Its insertion and removal is controlled by the codec-to-codec information.

4.5 Stuffing

In some networks, there are restrictions to the transmission format. If any violation of these restrictions is checked in consecutive 4 transmission frames, a stuffing pulse of '1' is inserted in every 8 bits throughout these 4 frames. The flag for stuffing is transmitted in the codec-to-codec control channel.

5. Conclusion

A draft for the Parts 3 of the Recommendations H.120 and H.130 has been proposed. It is expected that this draft will contribute to completing the existing Recommendations on codec for videoconferencing.