CCITT SGXV
Working Party XV/1
Specialists Group on Coding for Visual Telephony

Document #324
March 15, 1988

SOURCE: NTT, KDD, NEC and FUJITSU
TITLE : TRANSMISSION BUFFER CONTROL

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1. Introduction

At the previous meeting in Tokyo, compatibility problem inherent in different transmission buffer structure, pre-coding buffer and post-coding buffer, was recognized. Further considerations were requested to ensure compatibility.

A receiving buffer control scheme described in Doc. #287 provides a solution in the environment where no video clock justification is provided and pre-coding buffer may be employed in the coder. This document discusses possibility of improving the delay performance of this scheme, "mod 16" counting of "Temporal Reference" and implication of buffer size.

2. Buffer control scheme in Doc. #287

The scheme is summarized as follows;

- Source decoder clock frequency is higher than that of source coder by a small amount, eg 1000 ppm.
- Source decoder works only after data for more than a complete coded picture are stored in the receiving buffer. If there is no complete picture in the buffer, the decoder halts its operation.
- In case of picture dropping where no data exists between two picture headers, decoder does not take time to decode this dropped picture.
- "Buffer State" is not used in decoding.

Due to the variable delay nature of the control, relative temporal relation among reproduced pictures may change according to the picture dropping rate.

3. Motion rendition in the constant delay scheme and the variable delay scheme

If we consider a case that picture dropping rate changes from 2:1 to 3:1 and back to 2:1, motion rendition for both schemes are illustrated as in Figure 1. Decoded pictures obtained by the Flexible Hardware are demonstrated at the meeting, one at the local decoder output and the other at the remote decoder output. The former picture corresponds to the one of the constant delay scheme, while the latter to the variable delay scheme. From Figure 1 and observation of decoded pictures, we can say the constant delay scheme gives more natural pictures by adding extra delay for pictures with lower picture dropping rate.

4. Possibility of improving the variable delay scheme performance

Essential difference between the two schemes mentioned above is in whether time is taken for decoding dropped pictures. Hence even in the variable delay scheme, it may be possible to take time for decoding dropped pictures if picture dropping rate is up to some value, eg 3:1 and/or if the buffer occupancy is not so high. The decision is out of compatibility and left to each decoder design.

5. Temporal Reference

Even in the variable delay scheme, time reference information is required if time should be taken for decoding dropped pictures. For this purpose, one solution is to transmit all the picture headers, the other solution is to transmit "Temporal Reference" as in the Flexible Hardware specification.

The latter approach is supported to save some bits. The current specification defines mod 8 counting for Time Reference. If we consider to consume up to around 120 kbit/picture at 320 kbit/s, however, mod 16 counting is necessary.

6. Buffer Size

Based on the Flexible Hardware experiments, a buffer size of 128 Kbits was proposed in Doc. #287 with an additional specification for buffering delay of less than 132 ms when no picture dropping is invoked. However, buffer size of the coder is meaningless for the pre-coding buffer scheme as pointed out in Doc. #292. In this case the buffer size should be interpreted as the maximum coded data per picture.

By extending the meaning of "buffer size" like this, we can ensure compatibility among different buffering schemes.

7. Conclusion

It has been shown that the receiving buffer control scheme presented in Doc. #287 ensures secure operation for the mixture of pre-coding and post-coding buffers and has possibility of maintaining constant delay when picture dropping rate is up to a certain value. For the dropped pictures, it is proposed not to send picture headers. Each coded picture should contain Time Reference of mod 16 instead. Interpretation of "buffer size" is extended to include the maximum coded data per picture.

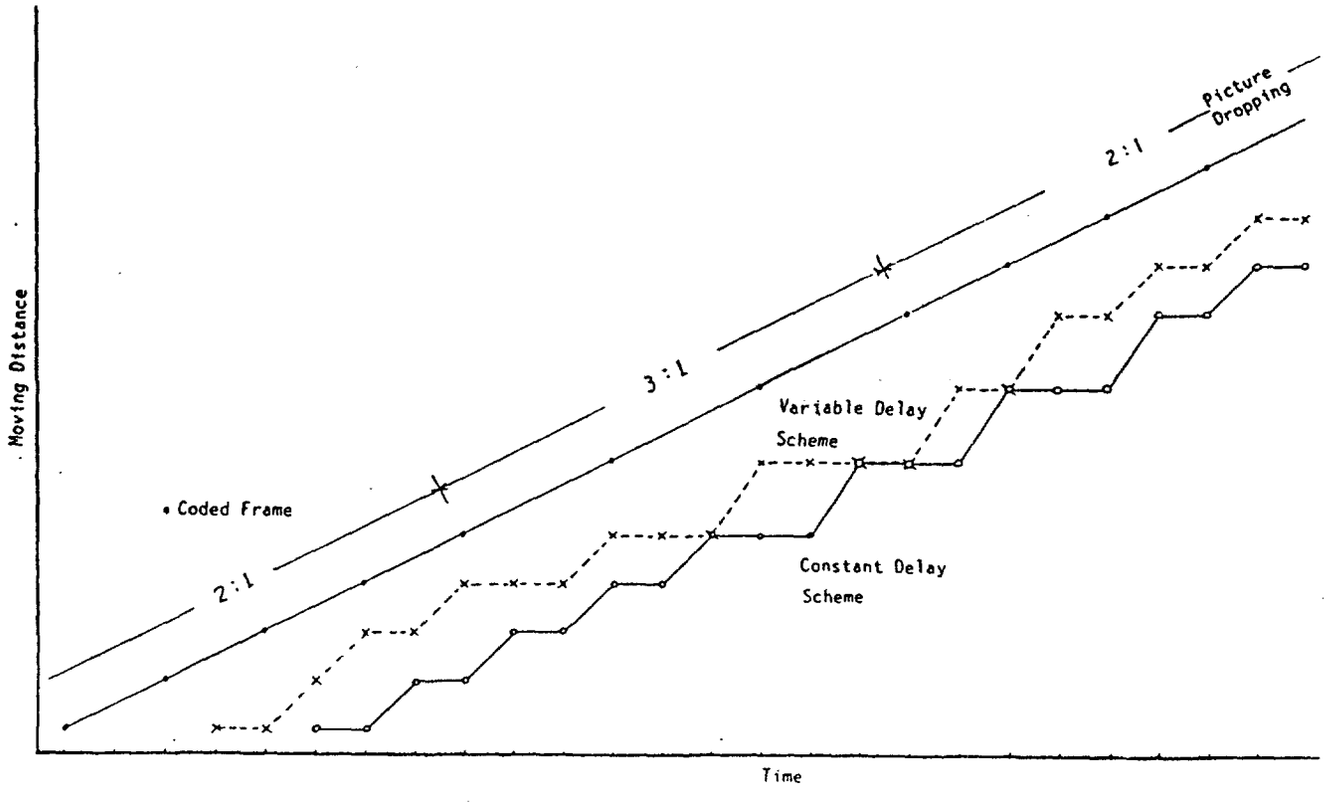

Figure 1 Motion rendition in case of picture dropping