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

Document #485
March, 1989

Source : Japan
Title : Video data buffering

1 Introduction

A specification is required to secure stable decoder operation. It has been pointed out that some specification is necessary about the minimum coded frame interval and the maximum coded frame interval (#445R, 7.1.2). The following items have been already discussed for flexible hardware specification.

- to restrict the maximum picture rate of encoders by defining the minimum number of non-transmitted frames between transmitted ones (#445R, Annex 3, 1.1)
- the maximum number of bits per frame (#445R, Annex 3, 3.2)

The specification about the above items are insufficient because of the problem to be described as follows. Two applicable schemes are introduced in order to solve the problem.

2 Problem

Overflow of the receiving buffer or abandonment of some part of coded data may occur because of the limited decoder capability in the following case.

CASE some frames which have been coded with small number of bits are packed and transmitted at short intervals

This problem has much influence on how to design a low cost decoder.

3 Consideration

Following two schemes are considered as solution of the problem.

Ⓐ to define the permitted limit of deviation from the constant frame reference timing (See Annex 1.)

Ⓑ to define the permitted limit of delay time from the time that a frame is given to the source coder to the time that PSC of the coded frame is sent to the transmission line (See the figures in Annex 2.)

4 Conclusion

Some specification is required for the flexible hardware and the final recommendation. Discussion of this issue at the Oslo meeting is invited.

Annex 1 to Document # 485

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1 Introduction

The term of the maximum frame rate is required to be defined as limitable and measurable parameter on the transmission line. In this annex, a method is introduced for keeping the maximum frame rate within some allowable jitter from the reference timing.

2 Limitation of maximum frame rate

① Generate the reference frame pulse from video frame pulse. For example, when the maximum frame rate is required to be 15 frame/sec, the period is set to 1/15 sec.

② Observe the start pulse to begin to send each frame.

③ Observe the jitter d between the start pulse and the reference frame pulse and compare d with threshold TH. (Fig. 1)

④ *IF* (the start pulse is behind of the reference pulse and $d > TH$),
Regenerate the reference frame pulse. (Fig. 2)
ELSEIF (the start pulse is ahead of the reference pulse and $d > TH$),
Fill bits are to be inserted. (Fig. 3, 4) The Proposal on fill bits insertion has been described in Doc. #412.
ENDIF

3 Behavior of buffer control

In the case of Fig. 1, the jitter d is always within TH, which means that the coding parameters are well-controlled.

In the case of Fig. 2, the reference frame pulse is regenerated corresponding to frame dropping.

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The case of Fig. 3 is a rare case. This case means that the coded data have been stored in a buffer too long. Fill bits are inserted to smoothe the delay of each frame and to save a decoder with a little receiving buffer. Without the insertion of fill bits, a big receiving buffer is necessary, which causes a large delay.

The case of Fig. 4 is a very rare case. The coding parameters are bad-controlled. Successive overflow and underflow cause a large variation of delay and reproduce jerky motion.

4 Advantages of this scheme

This scheme is desirable for the following reasons.

① It clarifies the definition of the maximum frame rate. on the transmission.

② It reduces total delay by designing of small buffer.

③ It smoothes delay of each frame. (good for lip synchronization)

④ It expands the possibility of decoders. (various decoding speed)

5 Conclusion

The method of keeping the maximum frame rate was introduced. The significant factors to be defined are the period of the reference frame pulse and the threshold of jitter d.

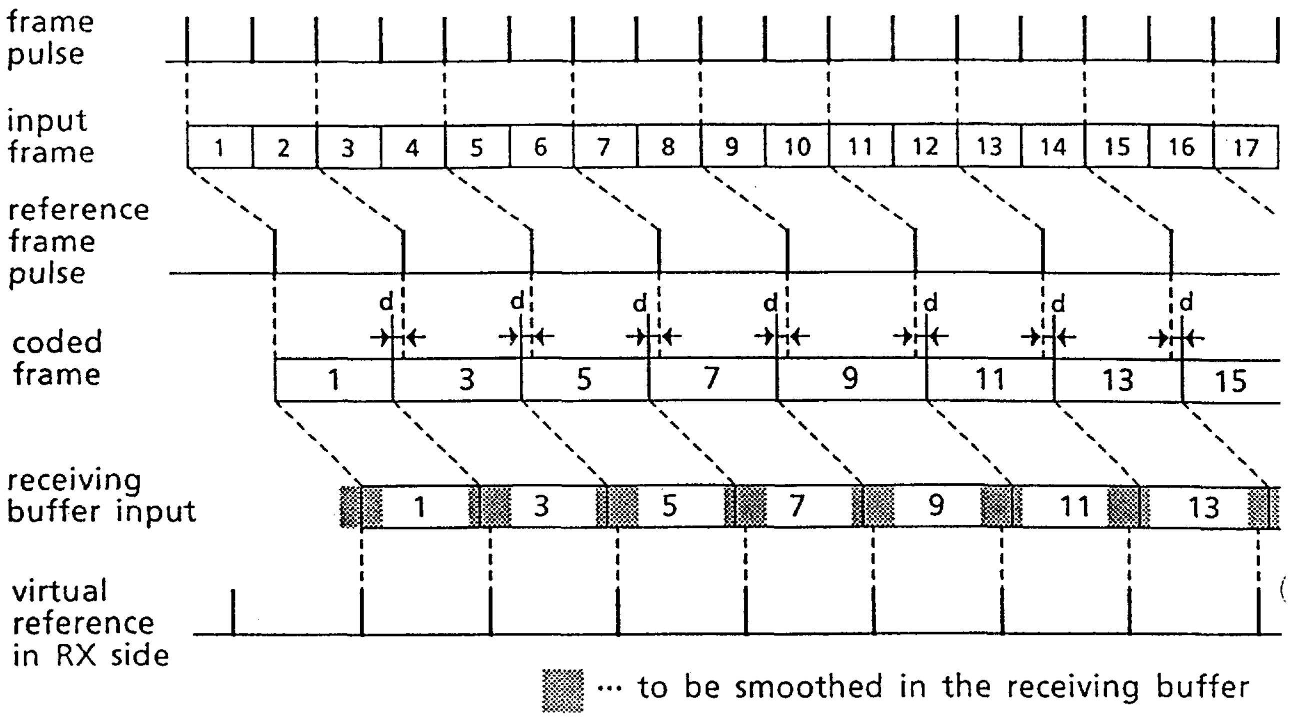

Fig. 1 ordinary case (all d are less than TH)

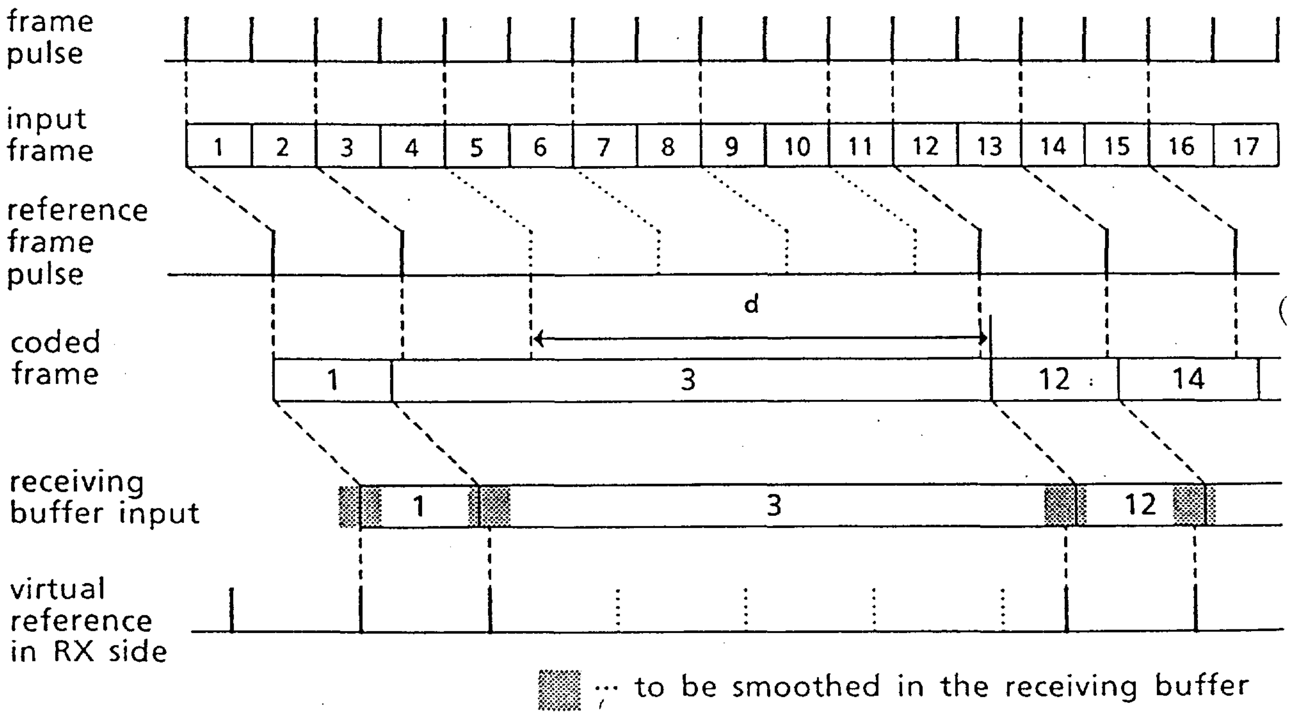

Fig. 2 case of overflow (d is more than TH in frame 3)

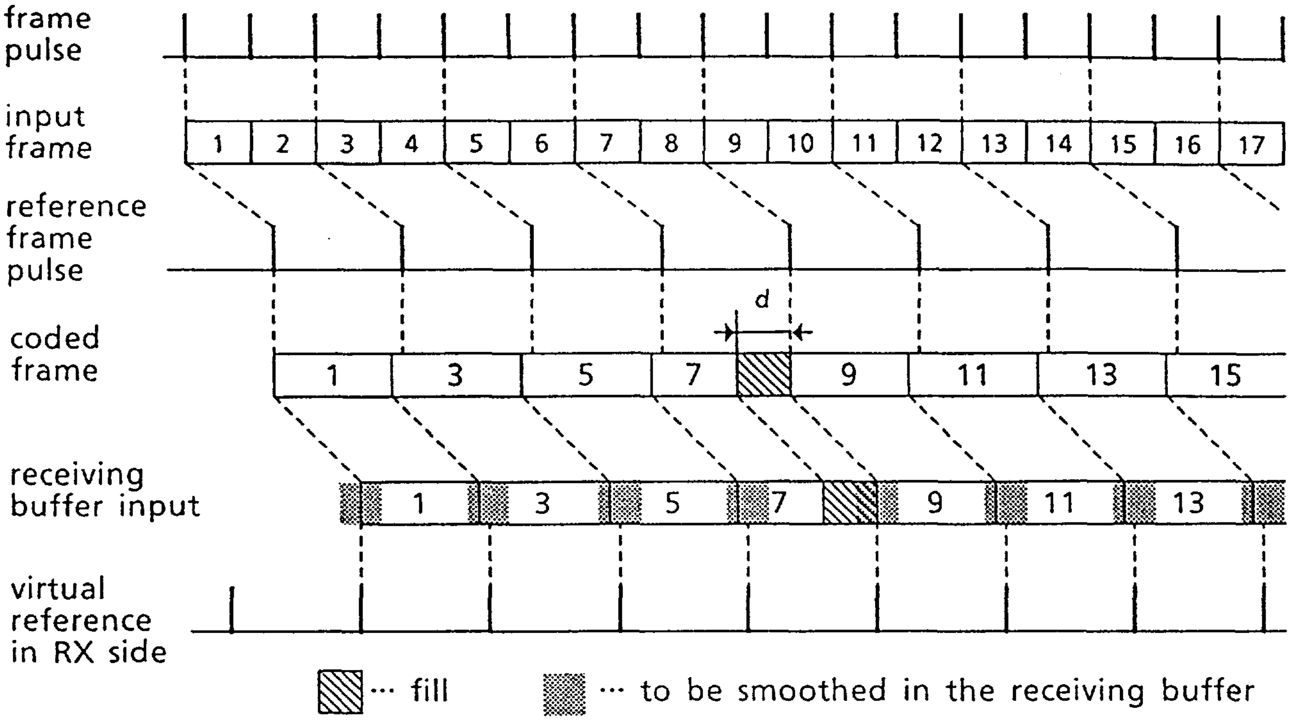

Fig. 3 case of underflow (d is more than TH between frame 7 and 9)

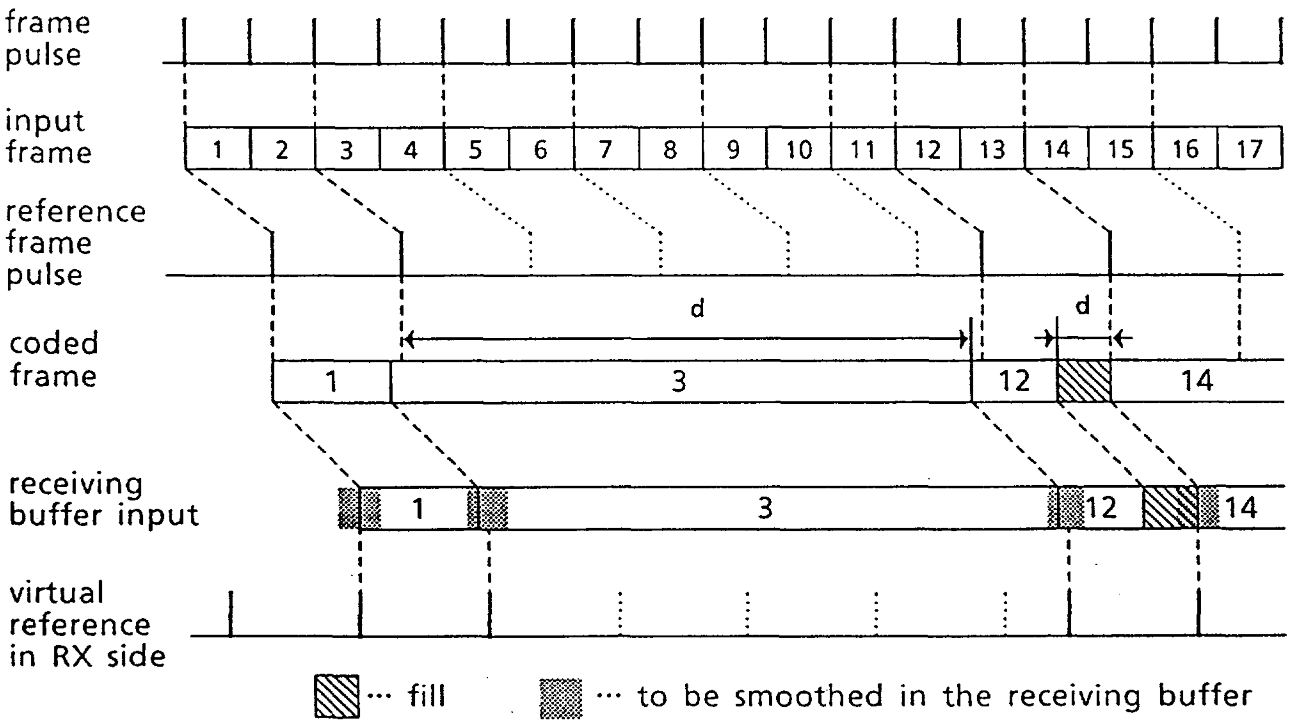

Fig. 4 case of bad control (underflow follows overflow)

Annex 2 to Document # 485

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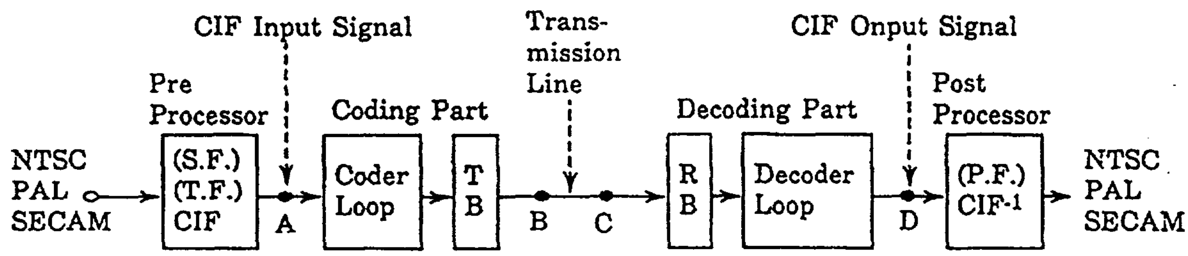

Fig. 1 Outline Block Diagram of the Codec

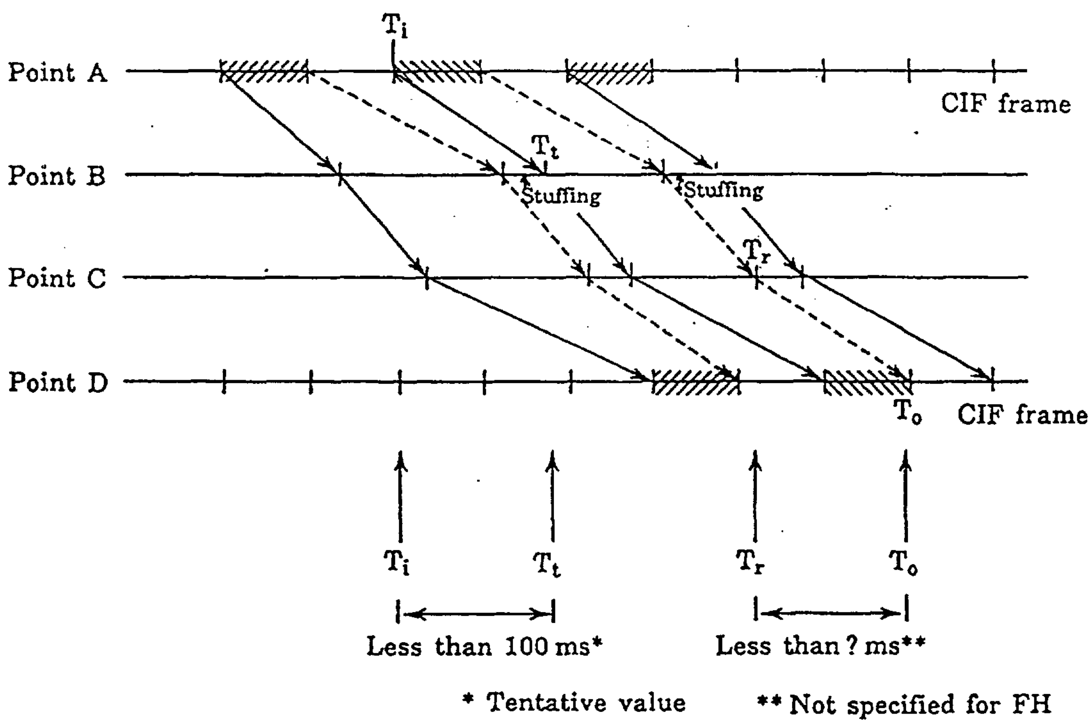

Fig. 2 Time Relations