CCITT SGXV
Working Party XV/I
Experts Group for ATM Video Coding

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SOURCE : Japan
TITLE : PICTURE HEADER MODIFICATION FOR VIDEO SOURCE CLOCK RECOVERY
PURPOSE : Proposal

1. Introduction

This document proposes to add a new field in a picture header for the purpose of video source clock recovery.

In realtime communication systems, video source clock recovery at a decoder is an indispensable function, because without the exact recovery of the video source clock, received pictures will, in the long run, encounter either a frame skip or a frame repeat when they are displayed from a decoder.

The proposed new field is intended to be used for a frequency counting method, in which the video source clock supplied to an encoder is counted for the interval defined by the network clock and its lower N bits (N tentatively being 8 bits) are transmitted to a decoder using a newly defined field in a picture header.

The decoder recovers the video source clock frequency by using both the transmitted value and the network clock which is assumed to be commonly available both at the encoder and the decoder.

The basic idea of the method is essentialy the same as the one described in Part 3 of H. 120, a CCITT recomendation for a video codec using 1.5Mbps trasmission lines, and has been proved to work successfully in various existing systems.

2. Frequency counting method vs. stuffing method

The document AVC-273[1] and its Annex describes a frequncy counting method for video source clock recovery, and compares the method with another possible method, namely, a stuffing method.

As is aleardy mentioned in [1], a frequncy counting method has the advanteages of cell loss resilience and greater flexibility for VBR operations.

3. Video source clock recovery as a user level function

A frequency counting method belongs to a category in which video source clock recovery is supported at a user level and AAL type 1 functions are not involved.

The method has the advantage of system flexibility, because an audio source clock frequency, which may not be in synchronization with the video source clock, can be recovered using the same method seperately without affecting the AAL functions.

4. Parameters to be defined

The following parameters must be defined:

f the nominal frequency of the video source clock to be counted, tentatively 13.5 MHz.

Δf allowable error in video source clock frequency, tentatively $\pm$ 50 ppm.

N the length of the field to transmit counted values, tentatively 8 bits.

I_0 the interval for transmitting the counted values, a frame interval, if the field is a part of a picture header as is proposed by this document.

I_1 the interval for counting the source clock. In H. 120, a value of 32 mS (i.e., two supermultiframe periods = 8 kHz(-1) x 16 x 8 x 2) is adopted. Note that this interval is obtained by divinding the network clock, and is not with synchronization with I_0. Also note that, although it is not necessary, if one wishes to send all the couted values to achieve most exact recovery of the clock, I_1 must be larger than I_0, i.e., 40 mS/33.3 mS for 525/625 systems, and that an N bit null code (eg. all 1's) must be defined in such cases to indicate that there is currently no count values available for transmission. A tentative value is 64 mS.

5. Discussions

Frame skip

If a frame skip is allowed and the picture header pertaining to a skipped frame is not transmitted, the counted values will not have a chance to be transmitted and therefore will be lost.

This situation could be either (1) simply neglected or (2) compensated by adding the not transmitted value to the value to be transmitted at the next occasion.

In the latter case, the length of the field to transmit counted values, N, may need to be extended.

Cell loss

If a counted value is lost due to a cell loss or bit errors, the lost information could be either (1) neglected or (2) estimated by using the last successfully received value.

The necessity for error detection is for further study.

VBR operation

Since the method works independently of the bitrate for video bit streams as long as there is a reasonble amount of available picture headers, no modification of the method is necessary for VBR operations.

Availability of network clock

It is assumed that the network clock is commonly available both at an encoder and a decoder. Considerations for the case where LAN or PBX are involved are for further study.

6. Conclusion

A new field in a picture header is proposed for the purpose of video source clock recovery using a frequency counting method.

References

[1] AVC–273, "Clock Recovery For Video", Japan, July 1992

END