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TITLE : Time stamp for a large picture
PURPOSE : Proposal
Relevant Sub-group : System, Video

1.Introduction

In order to avoid excessive buffering delay due to the large picture just after a scene change, we adopted a technique of picture skipping in the Main Profile. Then, through studying from the point of system specifications, a new problem has arisen,that is, how to handle the time stamps for the large picture.

The purpose of this contribution is to propose how to handle the time stamp taking account of picture skipping.

2.Description of the problem

An example of the time sequence of each stage is shown in Figure 1. When a scene change takes place between P3 and P4, P4 becomes the large picture and P5 and P6 become the skipped pictures, for instance. Each picture excluding P5 and P6 is encoded, multiplexed and transmitted to the decoder. In the multiplexing process, if the access unit corresponding to the large picture becomes the first access unit of the packet, what kind of time stamps and what kind of values should be coded? Though the time stamp does not have to be encoded in every packet which includes the beginning of an access unit in it, it is likely to take place that the time stamp for the large picture should be encoded, for the maximum difference between coded PTSs (presentation_time_stamps) is 0.7second[1].

Some decoders may desire to get the PTS corresponding to the time Tb shown in Figure 1, because the large picture, P4, is presenting at the time Tb. But it seems impossible for any encoder to do such a magic, because the encoder can hardly identify the existence of the large picture before encoding it.

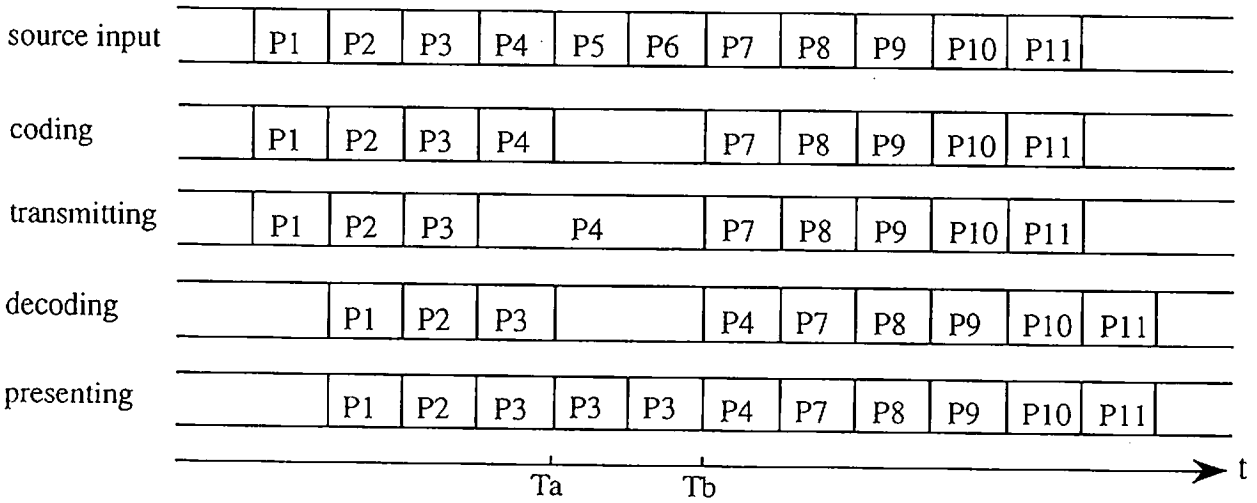

Figure 1 Time sequence of each stage

3.Proposal

TIME STAMP TO BE CODED

According to the current description[1], a DTS (decoding_time_stamp) shall appear in a packet header if and only if the following two conditions are met:

1) A PTS is present in the packet header.
2) The decoding time differs from the presentation time.

Picture skipping is allowed only when the value of M (picture distance between P-pictures) is equal to 1. Then, the decoding time is always the same as the presentation time as shown in Figure 1. Thus, only PTS corresponding to the temporal reference (source input) should be encoded also in the low delay mode, regardless of whether the large picture comes or not. In the case of P4 in Figure 1, Ta is coded as its PTS.

OPERATION OF STD

We have considered the hypothetical decoder, VBV, instead of the real decoder in the video layer. Also in the system layer, the hypothetical decoder, known as the STD (system target decoder), composed of the input buffer of the system target decoder for each elementary stream, the decoder for each elementary stream and so on has been considered. And this STD is inherently able to detect the beginning of the access unit. The operation of STD taking account of the large picture is proposed as follows.

Define that to "check the Bv" means to check whether the Bv (input buffer in the system target decoder for video elementary stream) contains complete data for one access unit or not. Define the picture period to be same as the period of time, t, of inspecting the VBV in the video layer[2][3]. In case that M is greater than 1 and DTSs exist, "PTS" is replaced with "DTS" in the following description.

1) Check the Bv at the time indicated by a certain PTS.

2) If the Bv contains complete data for one access unit, all of the data for the access unit which has been in the buffer longest is instantaneously removed from the buffer and decoded.

3) If the Bv does not contain complete data for one access unit, proceed without further action to clause 4).

4) After one picture period or at the time indicated by the subsequent PTS, check the Bv and go back to clause 2).

4.Conclusion

A new problem relating to the picture skipping has been presented from the point of system specifications. And we propose a solution similar to the VBV consideration in the video layer.

Reference

[1] ISO/IEC 11172-1:1993(E) MPEG1 System Part
[2] G.Bjontegaad: ' Proposed text for WD Annex C ', WD Edit adhoc group e-mail, Wed,26 May 93
[3] AVC-519 I MPEG93/XXX VBV operation in 3:2 pulldown

END