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SOURCE : Japan
TITLE : Study items for embedded coding
PURPOSE : Discussion

1. Introduction

It has been shown that for realization of compatible coding, an embedded coding scheme which employs a conventional standard codec (H.261/MPEG1) as a base layer codec, is advantageous in coding efficiency compared to the simulcast method (cf. AVC-234). However, there are certain items, such as hardware complexity, that should be studied and clarified before embedded coding is adopted as a standard coding algorithm.

2. Adoption of embedded coding

There are two ways to adopt embedded coding as the new standard. One way is to require embedded coding or decoding capability as a mandatory function, and the second way is to define it as an option (or tool kit).

One possible application of the new standard codec may be a retrieval service of images from a database. In such a service, the encoding mode is predefined and no selection is possible at the decoder. However, if an embedded scheme is standardized only as an option, a decoder which does not have the tool kit will be unable to access a database which uses embedded coding. Therefore, we feel that embedded capability should be made mandatory in the decoder at the very least, in case the scheme is adopted. Based on the concept described above, some aspects of the embedded coding scheme will be evaluated in the following section.

3. Study items

In communication services, multipoint communication that includes both current standard codecs (H.261) and new standard codecs is a very good example of when embedded coding works effectively. To realized multipoint communication, there are four alternatives, as follows:

1. Embedded coding
2. Simulcast
3. Decode and re-code at Multipoint Control Unit (MCU)
4. Mode down to current standard communication

Some aspects of these methods are compared as follows. (see Table 1)

(1)Complexity of the hardware

Ideally, the new standard codec would cover all the video services. Therefore, it would be preferable if the new codec could decode both H.261 and MPEG1 bitstreams. Based on the previously described concept, this means that the new standard decoder should have the capability to decode the embedded bitstream with either H.261 bitstream as the core or MPEG1 bitstream as the core. This may increase the decoder hardware complexity compared to the simulcast method. Figure 1 shows the hardware configuration for each method. In the figure, '/' means switchable, in either hardware or software. Increase in the hardware complexity of embedded coding compared to that of other methods should be clarified.

(2)End to end delay

If the MCU re-coding method is selected, end to end delay among the conventional codecs will increase compared to that of the new standard codec. If the 'Mode down to current standard communication' is used, delay among the new codecs will be as much as that among conventional codecs. For embedded coding, delay of the conventional codec may be a problem when the embedded stream is separated into different channels at the transmitter output (see Figure 2). However, if these streams are separated at the MCU, conventional bitstreams can be burstly packed into the total stream (for example, frame by frame), thus avoiding an increase in delay time. The specifics of delay should be clarified for each method.

(3)Coding performance

Additional items that must be considered are the amount of picture degradation caused by re-coding at the MCU, and actually demand for higher resolution pictures from the new codec for a paticular communication service.

As for embedded coding, it has been reported by several organizations that the scheme gives better performance if the base layer is coded at around 1.5Mbps of a total 4Mbps. When the base layer bitrate is lower or the total bitrate is higher than that, the gain may decrease. Further investigation is necessary, taking a realistic combination of the bitrate of the base layer and the total bitrate into account.

(4)Service aspect

When embedded coding is adopted, five kinds of bitstreams will exist: H.261, MPEG1, embedded stream with H.261, embedded bitstream with MPEG1 and single layer bitstream of the new standard. This may interfere with service integration in the future.

4. Conclusion

An embedded coding scheme with a conventional standard core has been

discussed, and its coding efficiency compared to the simulcast method. However, there are certain items that must be studied further in order to ascertain the full impact of its adoption. In this document, some of these items were discussed. These items should be clarified before embedded coding is adopted as a new standard coding algorithm.

Table 1 : Multipoint communication method

		Embedded	Simulcast	MCU	Mode down
Hardware complexity	Encoder	Same*	Increase*	Same*	
	Decoder	Increase*	Same*		
End to end delay		?	Same*	Increase in conventional codec*	Increase in new codec*
Coding performance		Better than simulcast(?)	Worse than embedded(?)	?	?
Service aspect etc.		?			

* Compared with point to point communication between codecs of the same type.
In embedded coding, only the decoder is assumed to have embedded capability.

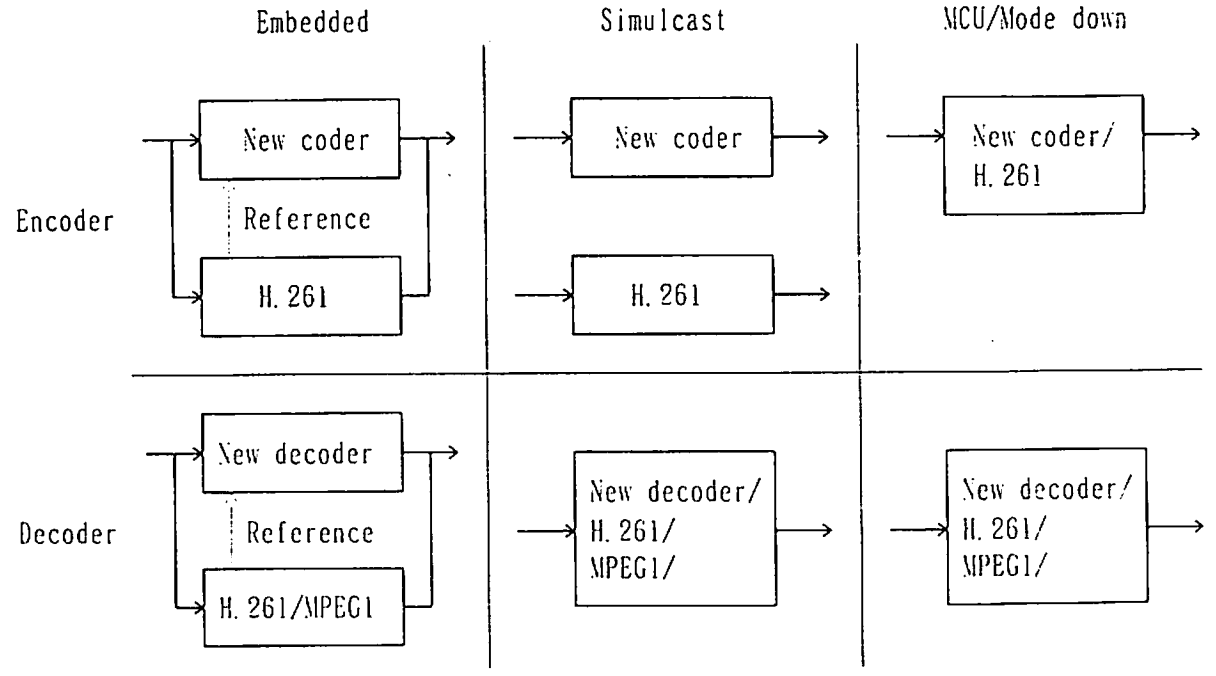

Figure 1 : Hardware configuration for each method

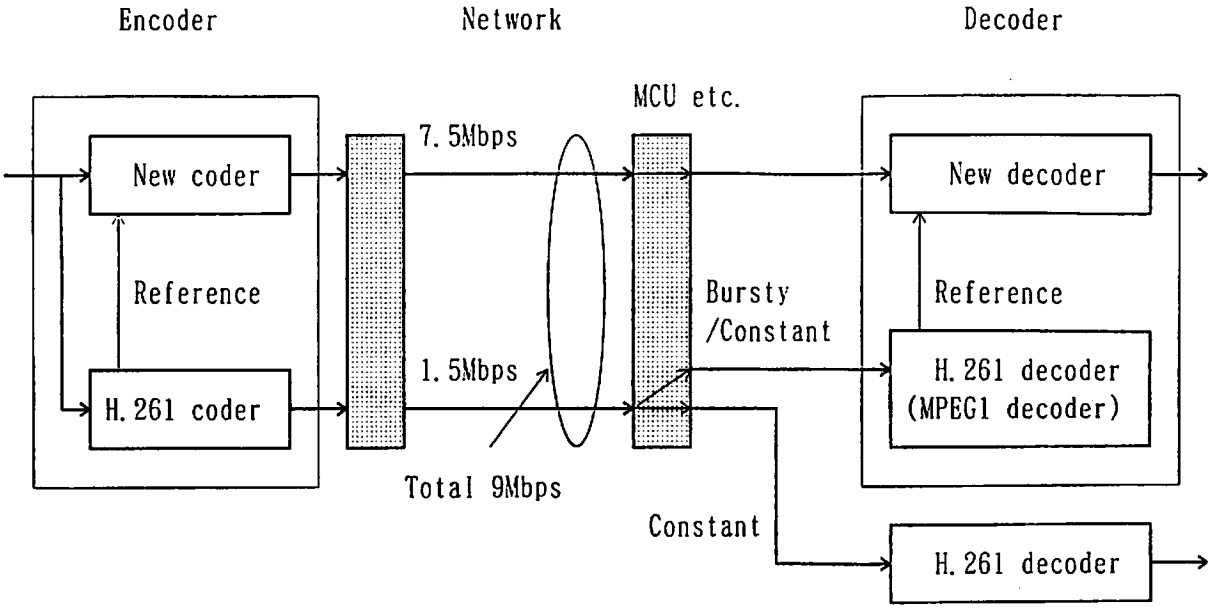

Figure 2 : Multipoint communication system

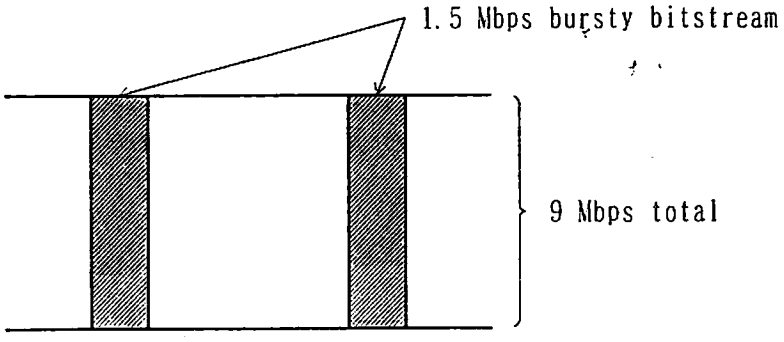

Figure 3 : Bursty transmission in embedded coding using MCU

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