ISO/IEC JTC1/SC29/WG11
MPEG93/
January 1993

CCITT SGXV
Working Party XV/1
Experts Group for ATM Video Coding
(Rapporteur's Group on Part of Q.3/XV)

Document AVC-418
January 11, 1993

SOURCE : JAPAN
TITLE : CORE PROFILE BASED ON COMMUNICATION APPLICATIONS CONSIDERATIONS
PURPOSE : Proposal

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1. Introduction

The definition of the core profile has been discussed. Therefore, it is necessary to clarify the required functionalities, picture quality level, etc. for communication applications in which CCITT has much interest, and to reflect those requirements to the core profile development.

In this document, necessary profile elements for typical B-ISDN applications are examined. As a result, the syntax elements to be included in the core profile are proposed. This document also points out the items which need further study.

2. Working method

(1) We picked up five applications as shown in Table 1, which were expected to be realized at comparatively early stage, from various B-ISDN application services (COM XV-D482) of each service category (conversational, messaging, retrieval, distribution).

(2) Functional switches of the syntax elements were listed up from the current TM3 specification.

(3) We made the matrix of (1) and (2), and selected the necessary syntax elements to realize each application.

(4) Considering the selection results for each application and the fact that the core profile should cover a wide range of applications including non-communicational ones, we have decided the elements to be included in the core profile.

(5) During the above work, the syntax elements which could not reach clear conclusion at this time were noted as further study items.

3. Examination results

The examination results for each application are shown in Table 2. In this table, necessary syntax elements are marked with circle or indicated by numerical figures when the elements should have definite value. The elements for the "core" are shown in Table 3 as the result of synthesis.

Consideration points for this examination are as follows.

- In the core profile development, the importance (or demand size) of each application should be taken into considerations for synthesis work. However, the weighting for the application is not so much clear.
- Whether a particular syntax element is adopted may be decided according to the trade off relation between required functionality, quality, performance, etc. and implementation complexity.
- The core profile should be defined as simple as possible. However, if we restrict too many elements in the core profile, flexibility of the encoder design will decrease and the terminal will become more complex (ex. coupling of frame/field prediction and frame/field DCT). There is some other opinion that the core should cover wide range of elements unless implementation complexity will not increase.

4. Conclusions

This document has discussed necessary profile elements for the selected typical B-ISDN early stage applications. We have proposed the syntax elements to be included in the core profile by synthesizing those elements from the communication application point of view.

The following items need continuous further study.

- Compatibility (spatial scalability) is thought to be a very important functionality. However, that can be realized by means of simulcast or switchable other than embedded. Further study based on practical situation is required (see AVC-419).
- It needs further study whether the Chroma_format should be 4:2:0 or 4:2:2 in the core profile.
- The management of special prediction also needs further study.
- The above two issues will be decided according to whether the application E (CATV) requires those, if the application E spreads the most widely in B-ISDN environment.
- There is some opinion that flexibility of the encoder design may decrease and the terminal may become more complex by adopting the Simplification of TM (L.8). The conclusion is now pending.
- Non 8X8 DCT/Non DCT Coding will be examined again after the verification of effectiveness by core experiments, taking the competition with field/frame DCT and special prediction into consideration. These three techniques may be reducing the same redundancy.

END

Table 1 Applications for B-ISDN.

Applications		Category of I.211	Target Period	Video Direction	Hardware Complexity	Cod/Dec Delay	Remarks
A	Videophone/ Video conference (CNV)	Conversational services	I	User A <-> User B	User A,B : normal	less than 150ms	-Terminals might be implemented on workstations (WS) or personal computers(PC)
B	Electronic News Gathering (ENG)	Messaging services	I	Remote -> Center	Remote : simple Center : complex	low delay is preferable	-Including SNG(satellite news gathering) -High quality picture would be required. -Some of the received images might be used for real time broadcasting.
C	Video mail (VML)	Messaging services	II	User A <- or -> User B	User A,B : simple - normal	less than several sec	-Most of the terminals would be implemented on WS or PC. -Transmitted mail would be temporarily or permanently stored in local or remote storage.
D	Electronic library/ museum/ gallery (RET)	Retrieval services	I	Center -> Satellite Center	Center : complex Satellite Center : simple - complex	less than several sec	-Moving pictures are transmitted. -Some users would require high quality images. -The compression efficiency of video data is one of the most important items to reduce storage capacity.
E	Cable TV (CATV)	Distribution services	II	Center -> User	Center : complex User : simple	less than several sec	-Low cost receivers would be desired.

target period : I = time when B-ISDN is available in several percents of offices (similar to video conferences)
II = time when B-ISDN is available in scores percents of offices (similar to E-mail)

Table 2 TM3 Function Switch Table. (* indicates important study items)

Seq. Layer

Name	bit	Category	A	B	C	D	E
* horizontal_size_value	12	General	QCIF, CIF, R.601(525 and 625), HDTV	R.601(720x486 or 576) or HDTV	up to R.601	R.601, HDTV, more than HDTV	R.601 or HDTV
* vertical_size_value	12	General					
* pel_aspect_ratio	4	General			including 1.0		
* picture_rate	4	General			~30frame/s		
* bit_rate	18	General	~10Mbit/s (601)	15Mbit/s (601), several 10Mbit/s(HDTV)	~10Mbit/s	10~100Mbit/s	10Mbit/s (601) 40Mbit/s (HDTV)
sscalable	1	Compatibility	△ (under study, see AVC-419)				△ (under study, see AVC-419)
sscale_code	8	Compatibility					
compatible_mtype	2	Compatibility					
load_prediction_weighting_matrix	1	Compatibility					
fscalable	1	Scalability			○	○	
interlaced	1	Scalability					
subband	1	Scalability					
linked_prediction	1	Scalability					
scalable_side_information	1	Scalability					
motion_refinement	1	Scalability					
MUVLC_coding	1	Scalability					
motion_compensation_loop	1	Scalability					
low_resolution_prediction _horizontal_dimension	17	Compatibility & Scalability				○	△ (vary together with sscalable)
low_resolution_prediction _veritcal_dimension	17	Compatibility & Scalability				○	
* choroma_format	2	General	4:2:0	4:2:2	4:2:0	~4:4:4	4:2:0/4:2:2
* extended_horizontal_size	1	General					
* (horizonatal_size_extension)	4	General					
* extended_vertical_size	1	General					
* (vertical_size_extension)	4	General					
* video_format	3	General	○ (for PAL)	○		Component	○ (for PAL)
* intra_vlc_format	1	General, Quantize		○		○	
* tcoef_escape_format	1	General, Quantize		○		○	
* display_horizonatal_dimension	16	General				○	○
* display_vertical_dimension	16	General				○	○

Table 2 (contd.) Pic. Layer

	Name	bit	Category	A	B	C	D	E
*	picture_structure	2	General, Prediction	Frame	Frame	Frame	Frame	Frame
	v_axis	1	General, Composite	○ (for PAL)	○			○ (for PAL)
	field_sequence	3	General, Composite					
	sub_carrier	1	General, Composite					
	burst_amplitude	7	General, Composite					
	sub_carrier_phase	8	General, Composite					
*	pan_horizontal _left_upper_offset	16	General				○	○
*	pan_vertical _left_upper_offset	16	General				○	○
	lower_picture_reference	10	Compatibility	△				△
	overlap_horizontal _left_upper_offset	17	Compatibility & Scalability				○	△ (vary together with sscalable)
	overlap_vertical _left_upper_offset	17	Compatibility & Scalability				○	
*	intra_dc_precision	2	General, Quantize		○		○	
*	qscale_type	1	General, Quantize		○		○	

Table 2 (contd.) MB. Layer

	Name	bit	Category	A	B	C	D	E
*	frame_motion_type	2	Prediction	Fr/Fi (special)	Fr/Fi	Fr	Fr	Fr/Fi (special)
*	field_motion_type	2	Prediction					
*	dct_type	1	General, Prediction	Fr/Fi	Fr/Fi	Fr	Fr	Fr/Fi

Table 2 (contd.) Elements not explicitly described as switch, or under study

Category	Name	Effect to Syntax	A	B	C	D	E
ATM & Cell Loss							
*	Leaky Prediction	yes	△				△
Low Delay			frame M=1	frame M=1 (SNG)			frame M=1 fixed delay
*	Picture Structure (frame M = 1, field M = 2, field M = 1)	no					
*	Intra Slice, Intra Column	no					
Prediction							
*	Reverse Order Prediction	no					
*	Simplification of TM (Exp. L.8)	yes	? Note	? Note	? Note	? Note	? Note
Quantize				Either is necessary		Either is necessary	Either is necessary
*	Non DCT Coding (NTC)	yes					
*	Non 8x8 DCT	yes					
	Maximum Value of M	no		M=3	M=3	M=3	

Note: Further study is required, because flexibility of encoder design may decrease if adopted.

Table 3 Proposed syntax elements for the core profile.

Seq. Layer

	Name	bit	Category	Core
*	horizontal_size_value	12	General	R.601 (525 and 625)
*	vertical_size_value	12	General	
*	pel_aspect_ratio	4	General	
*	picture_rate	4	General	
*	bit_rate	18	General	~15Mbit/s
	sscalable	1	Compatibility	(This functionarity is thought to be improtant by CCITT)
	sscale_code	8	Compatibility	
	compatible_mtype	2	Compatibility	
	load_prediction _weighting_matrix	1	Compatibility	
	fscalable	1	Scalability	
	interlaced	1	Scalability	
	subband	1	Scalability	
	linked_prediction	1	Scalability	
	scalable_side_information	1	Scalability	
	motion_refinement	1	Scalability	
	MUVLC_coding	1	Scalability	
	motion_compensation_loop	1	Scalability	
	low_resolution_prediction _horizontal_dimension	17	Compatibility & Scalability	
	low_resolution_prediction _veritcal_dimension	17	Compatibility & Scalability	
*	choroma_format	2	General	4:2:0 (4:2:2, if application E needs)
*	extended_horizontal_size	1	General	
*	(horizonatal_size_extension)	4	General	
*	extended_vertical_size	1	General	
*	(vertical_size_extension)	4	General	○ (for PAL)
*	video_format	3	General	
*	intra_vlc_format	1	General, Quantize	
*	tcoef_escape_format	1	General, Quantize	
*	display_horizonatal_dimension	16	General	
*	display_vertical_dimension	16	General	

Table3 (contd.) Pic. Layer

	Name	bit	Category	Core
*	picture_structure	2	General, Prediction	Frame
	v_axis	1	General, Composite	
	field_sequence	3	General, Composite	○ (for PAL)
	sub_carrier	1	General, Composite	
	burst_amplitude	7	General, Composite	
	sub_carrier_phase	8	General, Composite	
*	pan_horizontal_left_upper_offset	16	General	
*	pan_vertical_left_upper_offset	16	General	
	lower_picture_reference	10	Compatibility	
	overlap_horizontal_left_upper_offset	17	Compatibility & Scalability	
	overlap_vertical_left_upper_offset	17	Compatibility & Scalability	
*	intra_dc_precision	2	General, Quantize	
*	qscale_type	1	General, Quantize	

Table3 (contd.) MB. Layer

	Name	bit	Category	Core
*	frame_motion_type	2	Prediction	Fr/Fi Note1
*	field_motion_type	2	Prediction	
*	dct_type	1	General, Prediction	Fr/Fi

Table3 (contd.) Elements not explicitly described as switch, or under study

	Category	Name	Effect to Syntax	Core
	ATM & Cell Loss			
*		Leaky Prediction	yes	
	Low Delay			
*		Picture Structure (frame M = 1, field M = 2, field M = 1)	no	frame M=1
*		Intra Slice, Intra Column	no	
	Prediction			
*		Reverse Order Prediction	no	
*		Simplification of TM (Exp. L.8)	yes	? Note2
	Quantize			
*		Non DCT Coding (NTC)	yes	? Note3
*		Non 8x8 DCT	yes	
		Maximum Value of M	no	M=3 Note4

Note1: plus special, if application E needs.

Note2: Further study is required, because flexibility of encoder design may decrease if adopted.

Note3: will be decided, after the effectiveness and the competition with dct_type and special prediction are clarified.

Note4: A larger value of M will not increase decoder implementation complexity, but value of M should be restricted to a reasonable value because the core profile will also provide the guide line of encoder implementation.