

**SOURCE:** France Télécom (CNET)

**TITLE:** Very low bitrate "H.261 like" coding - simulation.

**PURPOSE:** Information/ accompanying tape demo

## **1. Introduction**

Considering the introduction of videotelephony over PSTN as a first step towards ISDN videotelephony, it is obviously desirable to have a "high level of compatibility" between H.261 and the video coding algorithm used for this application.

The purpose of this simulation work was to see the picture quality we can obtain when an algorithm very close from H.261 is applied at very low bitrates.

## **2. "H.261 like" coding**

### **2.1 Picture format**

A reduced format, which has third the number of pels and third the number of lines of CIF, has been used.

luminance signal:	120 pels per line/ 96 lines per frame
each color difference signal:	60 pels per line/48 lines per frame

This format can be called "Ninth-CIF" (NCIF).

The significant pel area is only 112 pels per lines for Y (4 pels left in each side) and 56 pels for U and V are encoded.

### **2.2 Coding loop**

"H.261" is kept as coding method for prediction, transform, and quantization.

### **2.3 Entropy coding and video multiplexing adaptations**

The modifications of H.261 are on picture format, entropy coding and video-multiplexing.

In NCIF format, one picture contains 42 MacroBlocks. The GOB structure is removed- the videomultiplex has only three layers: Picture layer/Macroblock layer/ Block layer.

The main modification deals with the VLC-2D which is replaced by a VLC-3D table. The 3 dimensions are: RUN/LEVEL/last coefficient of the block or not/ (see NTR document).

All the other VLCs have been optimized by using the statistics given by the coding of 3 sequences (CLAIRE/MISS A/SUSIE) at very low bitrate (8/16 kbit/s).

### **3. Simulation**

Simulations have been made on the sequences MISS A, CLAIRE and SUSIE at two bitrates (8.4 and 16.8 kbit/s).

The simulation conditions are as follows:

#### *-Down-conversion filtering:*

CIF to NCIF:	luminance:	7-tap horizontal filter/5-tap vertical filter
	chrominance:	5-tap horizontal filter/3-tap vertical filter

#### *-Up-conversion*

NCIF to CIF	luminance:	4-tap horizontal filter/4-tap vertical filter
	chrominance:	4-tap horizontal filter/4-tap vertical filter

(pel repetition for CCIR 601 display).

- *input frame rate* : 7.5 Hz or 10 Hz.

- *First picture*: INTRA (as in RM8)

-*Motion compensation*: 4\_step search/ +/- 15 pixels

-*MTYPE decision*: as in RM8

-*Buffer content* : 2400 bits for 8.4 kbit/s  
4800 bits for 16.8 kbit/s

#### *-Regulation:*

- quantizer stepsize
- frame skipping (if at the end of the processing of frame, the buffer is full).

#### **4. Conclusion**

1- Only few bits are saved by the optimization of the videomultiplex and the entropy coding (about 5%).

2- The picture quality is not acceptable if the size of the display is greater than  $3 \approx 4$  inches.

#### 4. Statistics for the simulations (8/16 kbit/s).

SEQUENCE:	MISS A	MISS A
BITRATE:	8.4 kbit/s	16.8 kbit/s
EFFECTIVE FREQ:	5.21 Hz	7.5 Hz
SNR luminance:	32.66	38.53
SNR chrominance:	36.80	38.55
Mean stepsize:	14.37	11.26
MB TYPE		
Intra coded MBs:	1	1
MC coded MBs:	7	7
MC no coded MBs:	0	0
no MC coded MBs:	15	17
no MC no coded MBs:	19	17
BITS:		
MTYPE:	62	72
CBP:	60	194
MQUANT:	0	2
Vectors:	35	45
Coef. Y:	896	1776
Coef C:	146	321
Total:	1199	2410

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SEQUENCE:	CLAIRE	CLAIRE
BITRATE:	8.4 kbit/s	16.8 kbit/s
EFFECTIVE FREQ:	7.5 Hz	7.5 Hz
SNR luminance:	35.19	38.47
SNR chrominance:	37.51	40.04
Mean stepsize:	18.40	10.81
MB TYPE		
Intra coded MBs:	1	1
MC coded MBs:	2	2
MC no coded MBs:	0	0
no MC coded MBs:	13	18
no MC no coded MBs:	26	21
BITS:		
MTYPE:	74	75
CBP:	64	161
MQUANT:	3	3
Vectors:	14	15
Coef. Y:	967	1992
Coef C:	51	139
Total:	1173	2385

SEQUENCE:	SUSIE	SUSIE
BITRATE:	8.4 kbit/s	16.8 kbit/s
EFFECTIVE FREQ:	5.83 Hz	6.64 Hz
SNR luminance:	26.92	25.87
SNR chrominance:	36.84	38.46
Mean stepsize:	41.10	22.45
MB TYPE		
Intra coded MBs:	1	1
MC coded MBs:	16	16
MC no coded MBs:	5	4
no MC coded MBs:	10	12
no MC no coded MBs:	10	9
BITS:		
MTYPE:	81	70
CBP:	203	199
MQUANT:	2	2
Vectors:	130	104
Coef. Y:	938	1683
Coef C:	23	42
Total:	1377	2080