SOURCE: Canada

TITLE: Picture Format for Conversational Video Applications

PURPOSE: Discussion

ABSTRACT

This document presents the impact on picture quality degradation and coding efficiency of using SCIF for intra-regional communications in areas where 525-line TV systems are deployed.

1.   Introduction/Background

In document AVC-59, Canada proposed the use of two picture formats for intra-regional communications (adapted to 525-line and 625-line TV systems). Inter-regional communications could be established using the CIF format (mandatory) or an optional SCIF format as proposed in AVC-29.

This document presents the impact on picture quality degradation and coding efficiency of using SCIF for intra-regional communications in areas where 525-line TV systems are deployed.

2.   Discussion

2.1 Picture Quality Degradation

In this section, picture quality degradation due to the 480 lines --> 576 lines --> 480 lines conversion process is discussed.

To assess the picture quality degradation, two test patterns of still images were generated. The first consists of a staircase and the second, horizontal bars of increasing vertical thickness. These progressive images of 480 vertical lines are then converted to 576 lines and back to 480 lines, using filters proposed in document AVC-80. These images are then compared to original images. Tape demonstration showed that the picture quality degradation is not perceivable if fairly complex vertical filters such as those described in AVC-80 are used.

2.2 Loss of Coding Efficiency

In this section, loss of coding efficiency due to the increased number of pixels to be transmitted in the 576-line format is discussed. The 576-line format represents 20% more pixels to code than the 480-line format. However, the resolution is limited to the input signal (480 lines).

To assess the coding efficiency, five test sequences were coded with modified versions of H.261 to handle 704 pels x 480 lines x 30 Hz and 704 pels x 576 lines x 30 Hz picture formats, as shown in Figure 1. The set of sequences were coded in the following way:

    1) 480 lines, Q=10
    2) 480 lines, Q=8
    3) 576 lines, Q=10.

To estimate the loss of coding efficiency, the number of bits required for the 480-line format to obtain the same SNR as the 576-line format for Q=10 was computed by linear interpolation between the two measurements for the 480-line format (Q=10 and Q=8). This is illustrated in Figure 2, and the results are shown in Table 1. The average loss of coding efficiency, is 2.7%.

3. Conclusions

This document presented the impact on picture quality degradation and coding efficiency of using SCIF for intra-regional communications in areas where 525-line TV systems are deployed.

Conclusions are:

- Using a high-order vertical filter results in no visible picture quality degradation due to the 480-line --> 576-line --> 480-line conversion process.

- Coding efficiency of 576-line format is reduced by a factor of less than 3%.
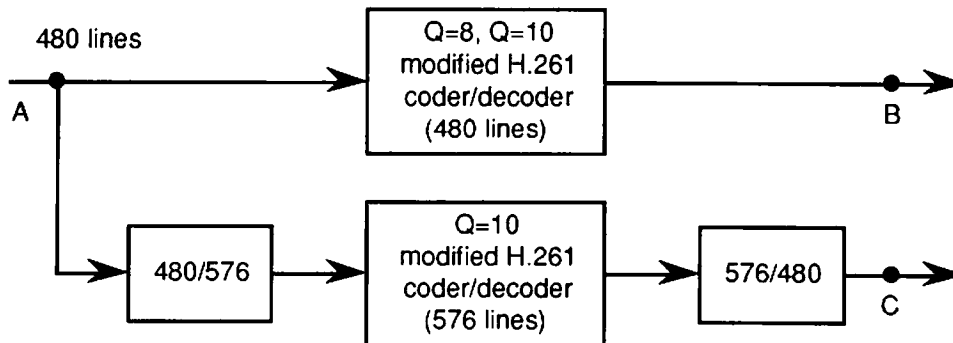

Figure 1:   Simulation set-up. The SNR is measured between B and A, as well as C and A.

Average no. of bits (Mbit/s)

21
18
15
12
9
6
3

efficiency
loss = (a/b) -1

a
b

Q=8
Q=10
Q=8
Q=8
Q=10
Q=8
Q=10
Q=8
Q=10
Q=10
Q=8
Q=10

34   35   36   37   38

SNR (dB)

● Calendar & mobile
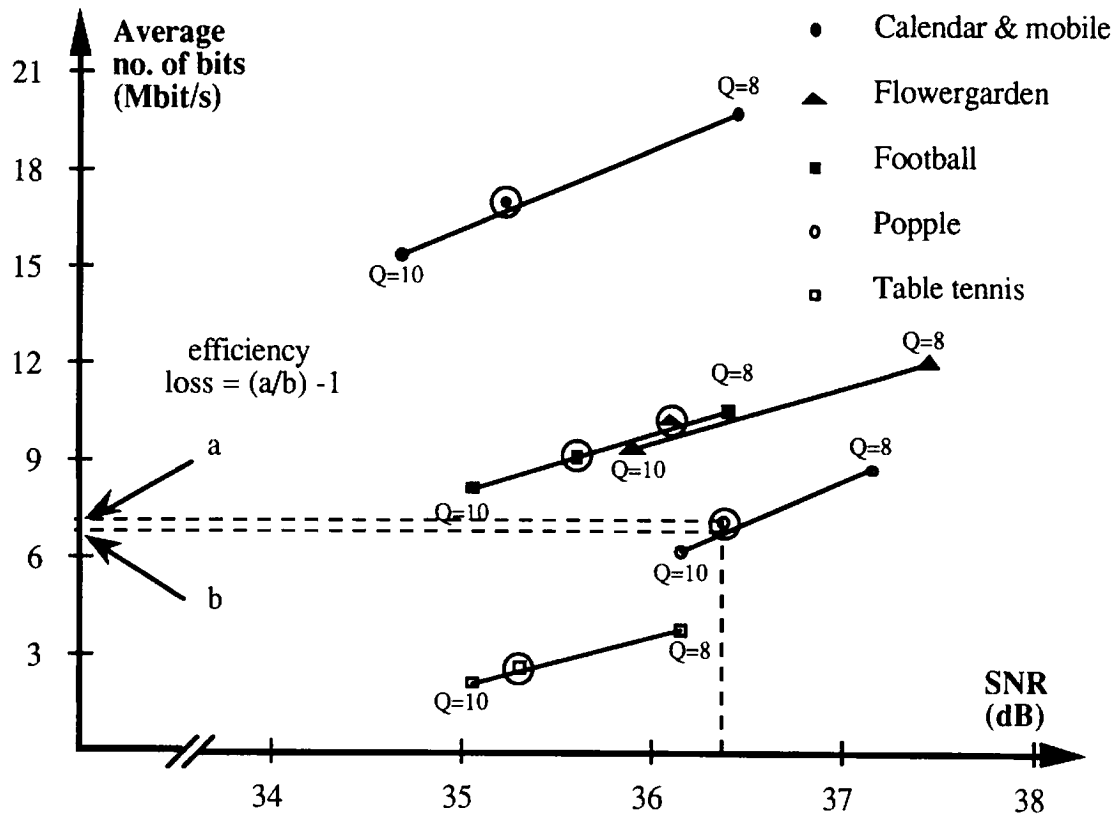▲ Flowergarden
■ Football
○ Popple
□ Table tennis

Figure 2: Simulation results using modified versions of H.261. Circled points indicate results of 576-line format for Q=10; other points are for 480-line format.

Sequence	Measurements						Computed results		
	480 lines, Q=10		480 lines, Q=8		576 lines, Q=10		480 lines, Q=? (interpolated)		% loss of coding
	SNR (dB)	Bit rate (Mbit/s)	SNR (dB)	Bit rate (Mbit/s)	SNR (dB)	Bit rate (Mbit/s)	SNR (dB)	Bit rate (Mbit/s)	efficiency
Calendar & Mobile	34.67	15.31	36.48	19.68	35.22	16.91	35.22	16.64	1.61
Flower-garden	35.86	9.19	37.49	12.01	36.22	10.11	36.22	9.81	3.09
Football	35.05	8.10	36.41	10.80	35.62	9.28	35.62	9.23	0.59
Popple	36.14	6.18	37.14	8.68	36.37	7.09	36.37	6.74	5.27
Table tennis	35.06	2.16	36.14	3.71	35.30	2.57	35.30	2.50	2.80
Average									2.67

Table 1: Simulation results using modified versions of H.261.