

TITLE: COMPARISON OF FULL CIF AND 4/9 CIF FORMAT CODED AT
64KBITS/S USING REFERENCE MODEL 5.

SOURCE: UK, FRG, NORWAY, FRANCE, NETHERLANDS.

A set of video sequences are used to compare the results of coding 4/9 CIF sized pictures against the full CIF size versions. The codec model used is RM5. The only modifications are:-

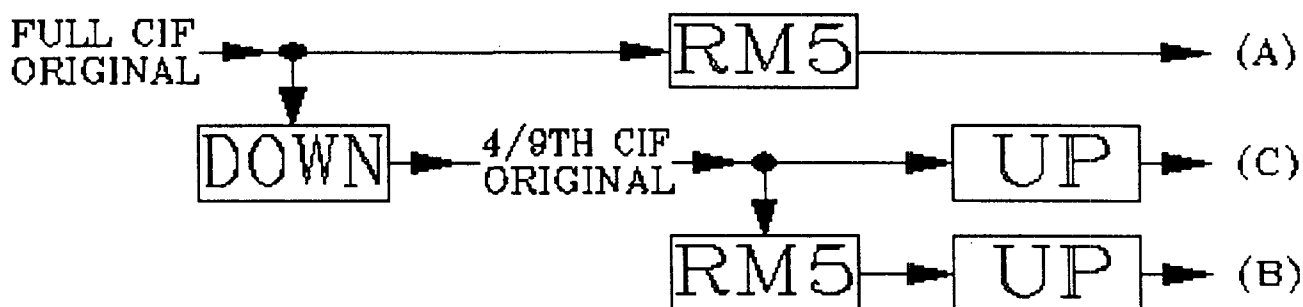
1. The number of bits spent per macro block was increased to 33.75 for the 4/9 sequence.
2. The source sequence size was 240 x 192 pels.
3. The output sequence was upfiltered to 360 x 288 pels.

A 4/9 CIF source sequence was created from the full CIF source sequence by down filtering. A broadcast quality two dimensional 441 tap filter was used to reduce the picture size from 360x288 to the required 240x192.

The RM5 coder was run at 15 bits per macro block for the full CIF sequences, and 33.75 bits per macro block for the 4/9 sequences. This maintained a bit rate of 59.4kbits/sec for both sequences.

The coded output for the 4/9 sequences was up filtered back to 360x288 for comparison with the full CIF coded results. A broadcast quality two dimensional 441 tap filter was again used on all three bands.

Three types of sequence were constructed for comparison, as outlined in the diagram below:-



Results.

The signal to noise measurements using the full CIF as the original for all three sequence types are given in the table below.

SEQUENCE	(A) RM5 FULL CIF		(B) RM5 4/9 CIF		(C) 4/9 CIF	
	frm. 15	seq.	frm. 15	seq.	frm. 15	seq.
Miss USA	38.098	37.646	37.540	37.298	41.865	41.773
Claire	37.599	37.468	36.487	36.696	41.750	42.327
Salesman	29.088	30.157	29.150	30.135	34.279	34.145
Swing	28.514	31.063	25.535	26.420	27.006	27.029

The significant subjective points from viewing the sequences are:

- 1] The main impairment in the 4/9 sequence is a blurring which is greater than that due to the down-filtering and up-filtering. This is most noticeable as a loss of clarity in the eyes of Miss America and Claire, and the readability of the letters in the Swing sequence.
- 2] The 4/9 coded sequences benefit from a faster recovery time from buffer overload.
- 3] Block edge artifacts are not significantly reduced by spending 100% more bits per macro block.

N.B. The striking difference in sharpness of the Full CIF pictures is somewhat lost due to the transfer to video tape.

Simplified 2D Filter

A simplified 2D filter as shown below was also tried :-

Conversion Full CIF to 4/9 CIF

Full CIF : $360 \times 288 = 120 \times 96$ squares blocks of 3×3 .

each 3×3 block filtered to give a 2×2 block.

4/9 CIF : 120×96 square blocks of $2 \times 2 = 240 \times 192$.

A	B	C	
*	*	*	
D	E	F	
*	*	*	----->>
G	H	I	
*	*	*	

	A	(B+C)/2
	*	*
(D+G)/2		(E+I)/2
*		*

Conversion Full CIF to 4/9 CIF

A	B	C		A	$(A+2B)/3$	$(2B+C)/3$	C
*	*	*	---->>	*	*	*	*

Applied in both directions.

A tape showing the performance of this filter will be presented.

Conclusion

Both the quantitative measurements of SNR and the subjective assessment of the sequences support full CIF as being the better format. The main point in favour of the 4/9 CIF format is the marginally improved performance in the start-up phase of the sequences. However as this occurs infrequently, it is a minor consideration that does not justify sacrificing the benefits of the full CIF format.

The simplified filter produced a slightly lower performance than the 441 tap 2d filter.