

TITLE: TEMPORAL PRE-FILTERING APPLIED TO THE
REFERENCE MODEL 3.
SOURCE: UK

Reference Model 3 (RM3) was simulated using a pre-filter loop illustrated in Figure 1. The generic form of the non-linearity of the loop is shown in Figure 2. The filter attempts to reduce the temporal noise content of the sequence being coded.

Operation of the Filter.

The difference between pel values in the previous filtered frame and the current unfiltered frame are calculated and read off on the input difference axis. The appropriate values to be added to pels in the previous filtered image to generate the current filtered image can then be read off the output difference axis. The mask allows large changes, presumed to be signal, to take place but allows smaller changes presumed to be noise to take place only very gradually.

Results.

The results appended indicate the relative performance of the RM3 with and without the pre-filter.

The modified model shows a reduction in average buffer status (100 = full), and thus a reduction in average quantiser step size. A reduction in the number of motion compensated blocks is found which is generally expected after applying a temporal pre-filter to a codec. An increase in the number of fixed blocks occurs for the chrominance information and a small reduction in the number of fixed blocks for the luminance occurs. The locations of the extra fixed blocks has not yet been determined, however it is likely that they will be located in predominantly background areas. Further it may be found that in the basic RM3 several background blocks are motion compensated and that the pre-filter reduces the number of block in this category. Further work is required to verify these suppositions. The number of intra blocks remains almost unchanged which indicates no general loss in the predictability of the pre-filtered image. A fall in the average number of coded blocks is accompanied by a rise in the number of transmitted coefficients indicating a superior coding of the pre-processed image.

When considering the signal to noise ratio and RMS errors the pre-processing filter must distort the truth of any results as the codec is presented with an inherently less noisy signal than the source. Therefore even if the codec were perfect an infinite signal to noise ratio or zero RMSE could not be attained. When measuring the signal to noise ratio and RMSE against the pre-processed image the results are significantly better than the ordinary reference model results.

Conclusion

Pre-processing of the source material has been shown to significantly improve overall coding results,

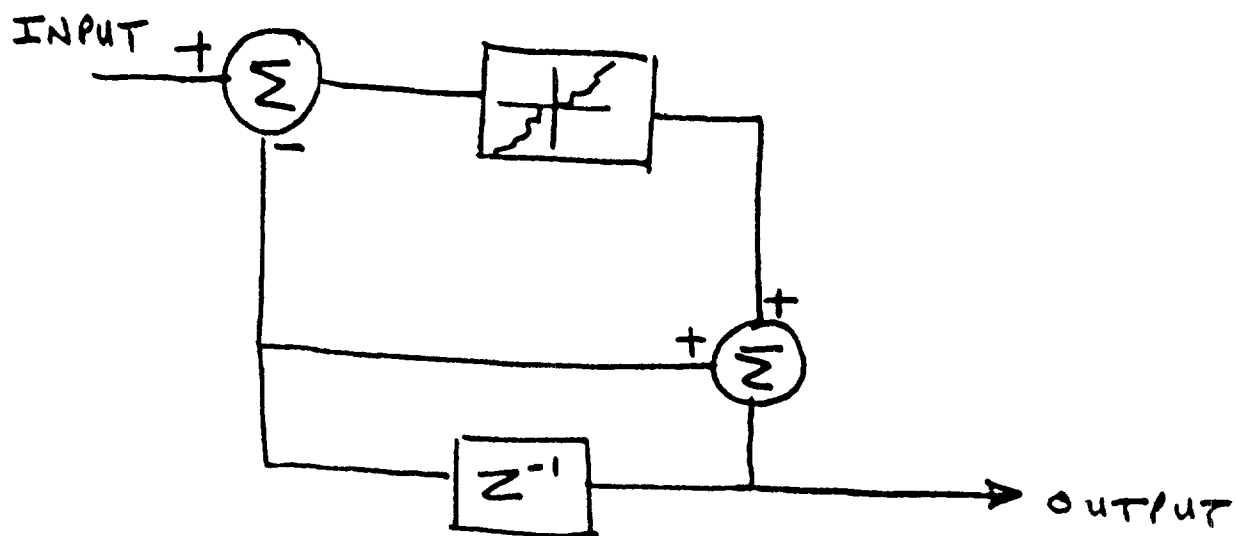
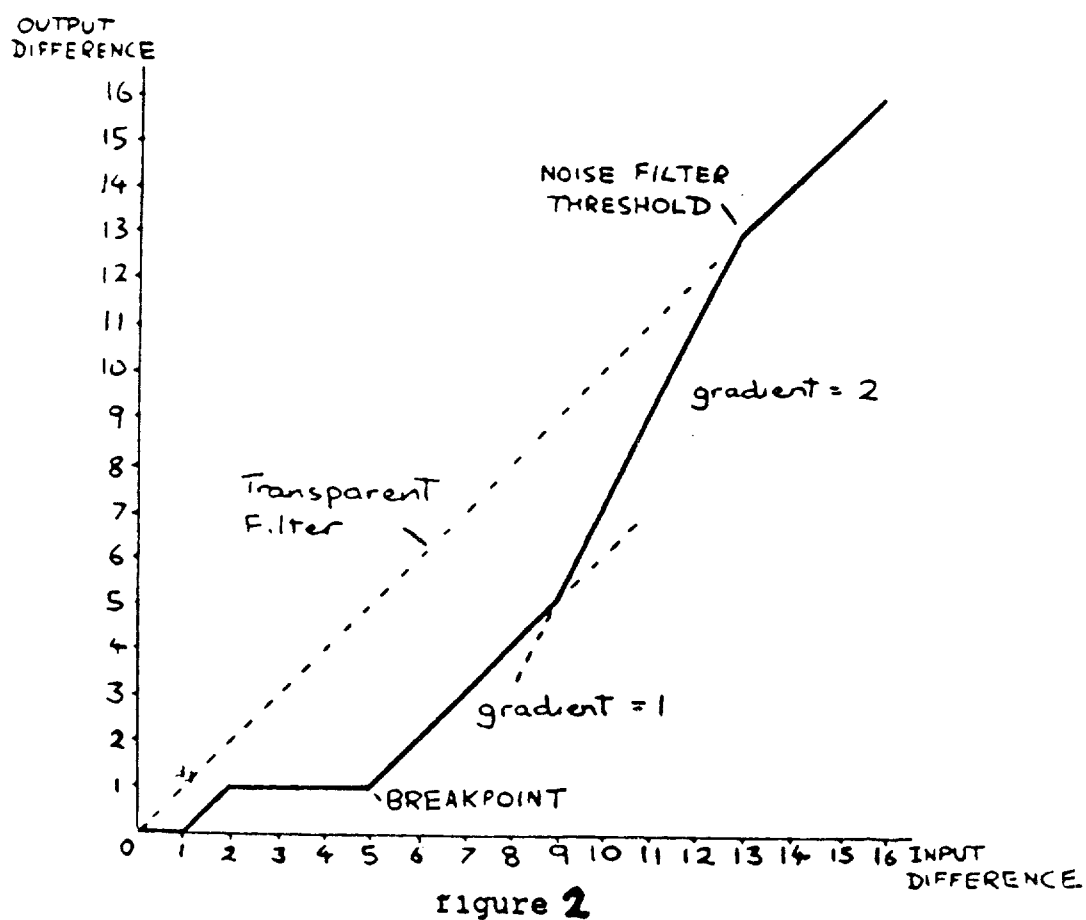


FIGURE 1 NON-LINEAR TEMPORAL PRE-FILTER



	FRAME 1	AVERAGE
Rits per frame.....	55235	9814
Buffer status.....	50.807247	17.435791
No of MC blocks.....	0	242
No of FIXED luminance blocks.....	0	1089
No of INTRA luminance blocks.....	1584	1
No of INTER luminance blocks.....	0	412
No of FIXED chrominance blocks.....	0	600
No of INTRA chrominance blocks.....	792	0
No of INTER chrominance blocks.....	0	191
No of transmitted coeffs.....	8635	5695
No of non-zero transmitted coeffs.....	4710	1941
No of zero transmitted coeffs.....	3925	11261
mean quantiser step size.....	13	5.946429
Signal to noise ratio.....	38.17	42.4
RMSE value of coded data.....	3.14	1.93
RMS value of prediction.....	0.000000	0.000000
RMS value of prediction error.....	0.000000	0.000000

Ref model 3 processing a temporally noise reduced version of MISSA

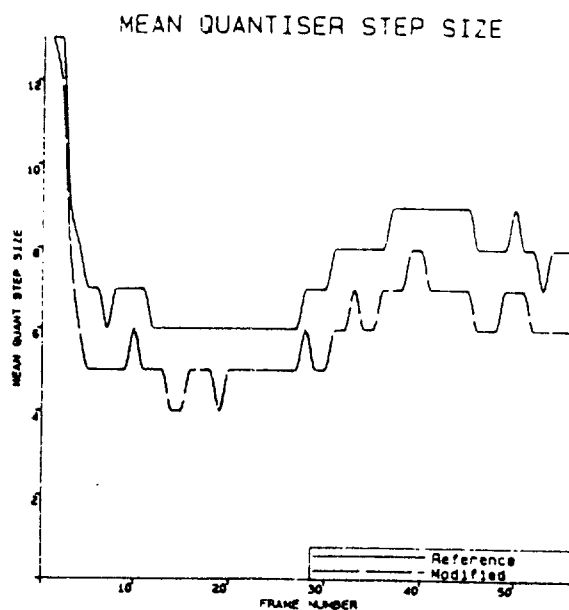
DATE: 4/2/87
SOURCE: BTRL UK
AUTHOR: G SEXTON

CODER SOFTWARE: CODEC6 V1.3 (OKUBO
REFERENCE MODEL3

MODIFICATIONS: TEMPORAL PREFILTER

SOURCE SEQUENCE: NOISE REDUCED MISSA
FRAME SIZE: 352 * 288
BITRATE: 300KBITS/SEC
BUFFER SIZE: 30000

FRAME RATE: 15 FRAMES / S
CODED FRAMES: 57



Mean value of reference = 7.5
Mean value of modified = 5.946429

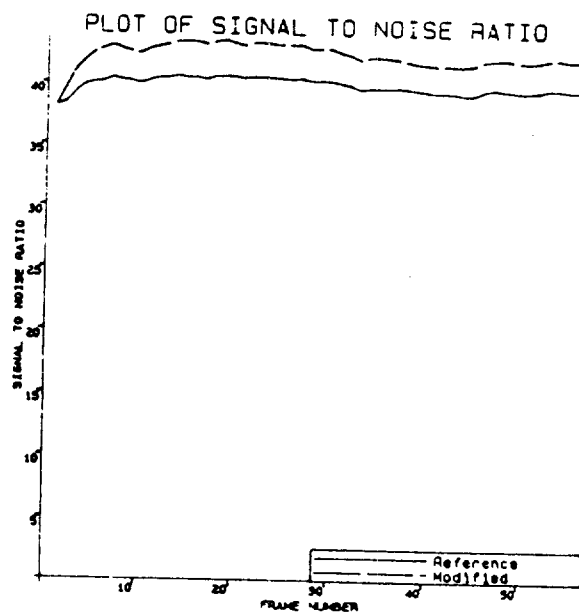
DATE: 4/2/87
SOURCE: BTRL UK
AUTHOR: G SEXTON

CODER SOFTWARE: CODEC6 V1.3 (OKUBO
REFERENCE MODEL3

MODIFICATIONS: TEMPORAL PREFILTER

SOURCE SEQUENCE: NOISE REDUCED MISSA
FRAME SIZE: 352 * 288
BITRATE: 300KBITS/SEC
BUFFER SIZE: 30000

FRAME RATE: 15 FRAMES / S
CODED FRAMES: 57



Mean value of reference = 40
Mean value of modified = 42.409271

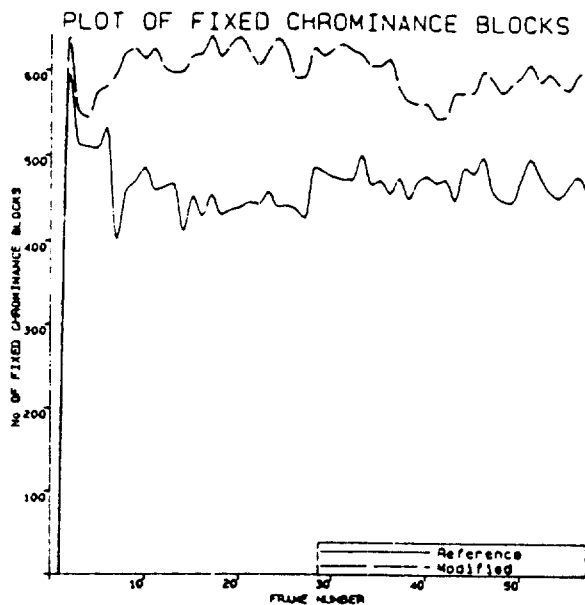
DATE: 4/2/87
 SOURCE: BTRL UK
 AUTHOR: G SEXTON

CODER SOFTWARE: CODEC6 V1.3 (OKUBO
 REFERENCE MODEL3)

MODIFICATIONS: TEMPORAL PREFILTER

SOURCE SEQUENCE: NOISE REDUCED MISSA
 FRAME SIZE: 352 * 288
 BITRATE: 300KBITS/SEC
 BUFFER SIZE: 30000

FRAME RATE: 15 FRAMES / S
 CODED FRAMES: 57



Mean value of reference = 465.875
 Mean value of modified = 600

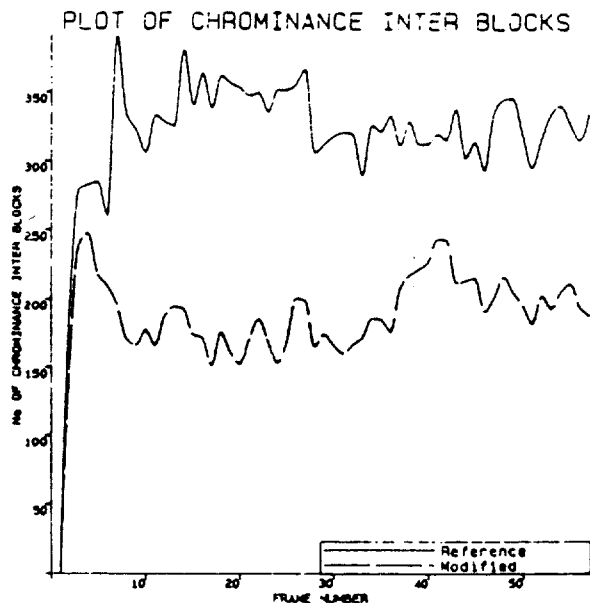
DATE: 4/2/87
 SOURCE: BTRL UK
 AUTHOR: G SEXTON

CODER SOFTWARE: CODEC6 V1.3 (OKUBO
 REFERENCE MODEL3)

MODIFICATIONS: TEMPORAL PREFILTER

SOURCE SEQUENCE: NOISE REDUCED MISSA
 FRAME SIZE: 352 * 288
 BITRATE: 300KBITS/SEC
 BUFFER SIZE: 30000

FRAME RATE: 15 FRAMES / S
 CODED FRAMES: 57



Mean value of reference = 324.89285
 Mean value of modified = 191.0893

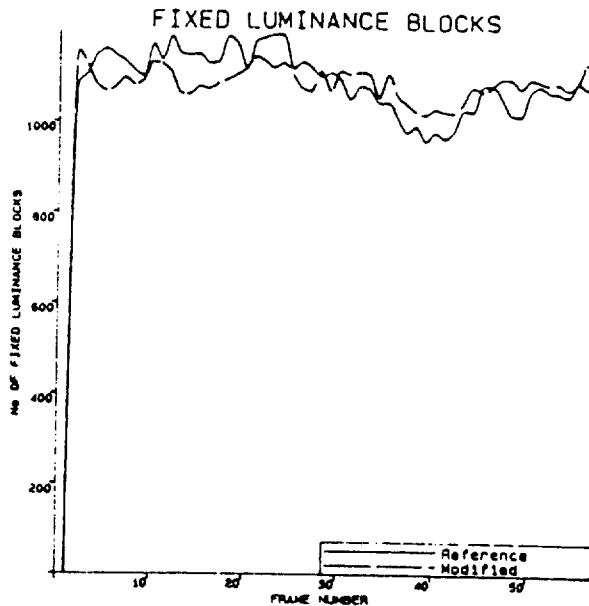
DATE: 4/2/87
 SOURCE: BTRL UK
 AUTHOR: G SEXTON

CODER SOFTWARE: CODEC6 V1.3 (OKUBO
 REFERENCE MODEL3)

MODIFICATIONS: TEMPORAL PREFILTER

SOURCE SEQUENCE: NOISE REDUCED MISSA
 FRAME SIZE: 352 * 288
 BITRATE: 300KBITS/SEC
 BUFFER SIZE: 30000

FRAME RATE: 15 FRAMES / S
 CODED FRAMES: 57



Mean value of reference = 1093.6785
 Mean value of modified = 1089.2857

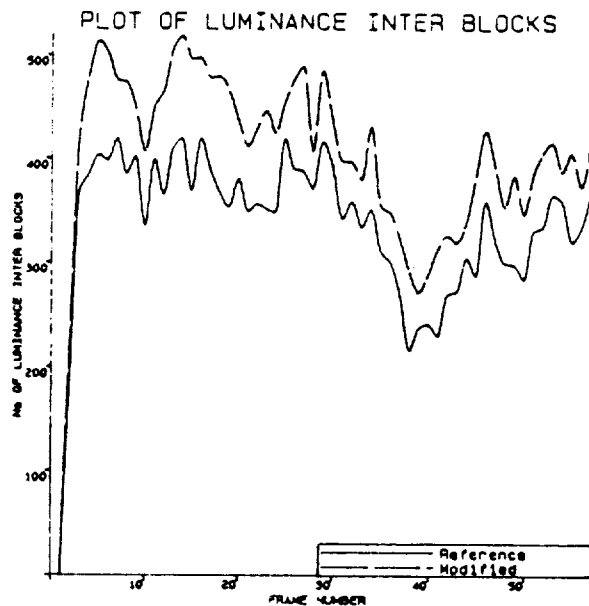
DATE: 4/2/87
 SOURCE: BTRL UK
 AUTHOR: G SEXTON

CODER SOFTWARE: CODEC6 V1.3 (OKUBO
 REFERENCE MODEL3)

MODIFICATIONS: TEMPORAL PREFILTER

SOURCE SEQUENCE: NOISE REDUCED MISSA
 FRAME SIZE: 352 * 288
 BITRATE: 300KBITS/SEC
 BUFFER SIZE: 30000

FRAME RATE: 15 FRAMES / S
 CODED FRAMES: 57



Mean value of reference = 343.8
 Mean value of modified = 412.10714

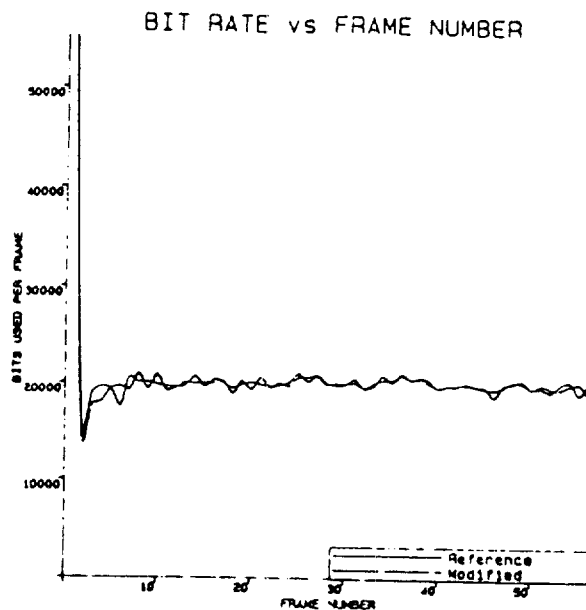
DATE: 4/2/87
 SOURCE: BTRL UK
 AUTHOR: G SEXTON

CODER SOFTWARE: CODEC6 V1.3 (OKUBO
 REFERENCE MODEL3)

MODIFICATIONS: TEMPORAL PREFILTER

SOURCE SEQUENCE: NOISE REDUCED MISSA
 FRAME SIZE: 352 * 288
 BITRATE: 300KBITS/SEC
 BUFFER SIZE: 30000

FRAME RATE: 15 FRAMES / S
 CODED FRAMES: 57



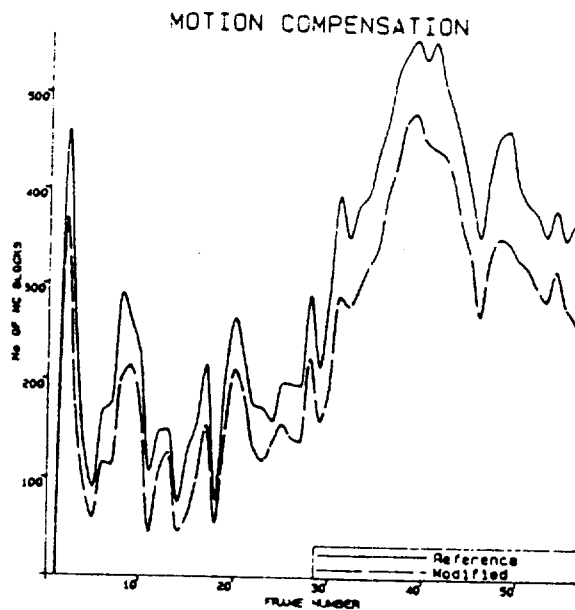
DATE: 4/2/87
 SOURCE: BTRL UK
 AUTHOR: G SEXTON

CODER SOFTWARE: CODEC6 V1.3 (OKUBO
 REFERENCE MODEL3)

MODIFICATIONS: TEMPORAL PREFILTER

SOURCE SEQUENCE: NOISE REDUCED MISSA
 FRAME SIZE: 352 * 288
 BITRATE: 300KBITS/SEC
 BUFFER SIZE: 30000

FRAME RATE: 15 FRAMES / S
 CODED FRAMES: 57



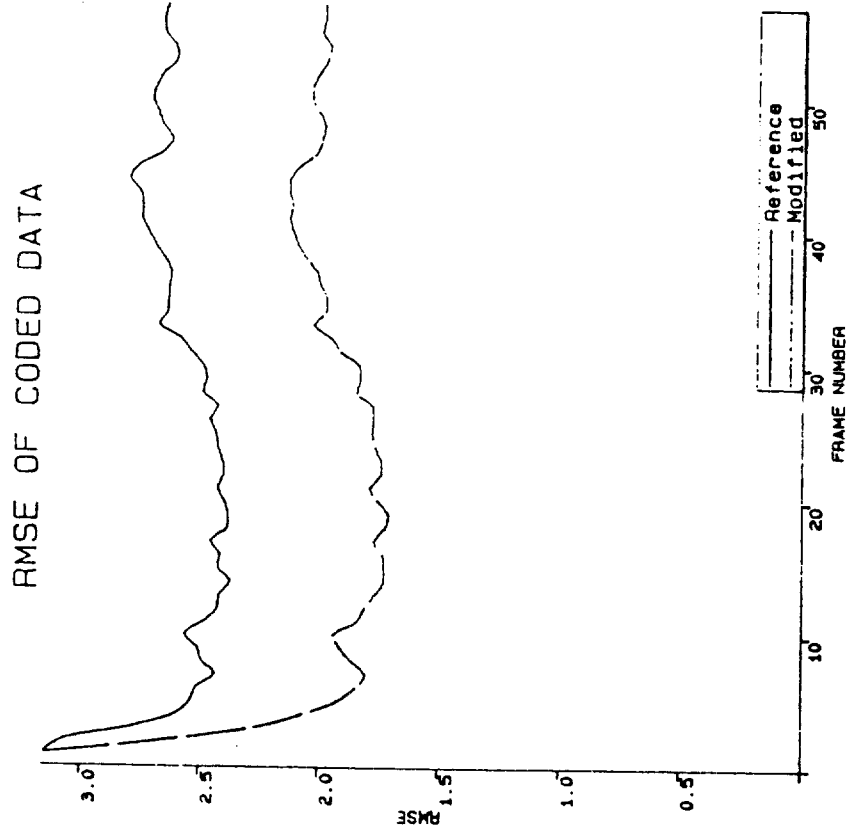
DATE: 4/2/87
SOURCE: BTRL UK
AUTHOR: G SEXTON

CODER SOFTWARE: CODEC6 V1.3 (OKUBO
REFERENCE MODEL3

MODIFICATIONS: TEMPORAL PREFILTER

SOURCE SEQUENCE: NOISE REDUCED MISSA
FRAME SIZE: 352 * 288
BITRATE: 300KBITS/SEC
BUFFER SIZE: 30000

FRAME RATE: 15 FRAMES / S
CODED FRAMES: 57



Mean value of reference = 2.5775256
Mean value of modified = 1.93913

PLOT OF ABSOLUTE MOTION VECTOR USAGE

FIGURE: 4

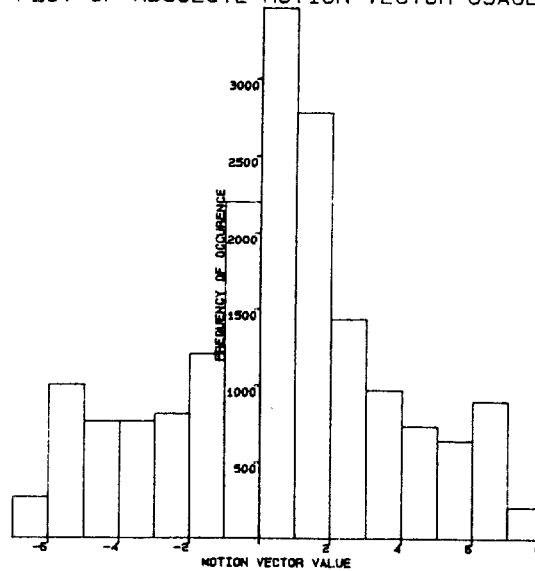
DATE: 28/1/87
SOURCE: BTRL UK
AUTHOR: G SEXTON

CODER SOFTWARE: CODEC6 V1.2 (OKUBO
REFERENCE MODEL 3)

MODIFICATIONS:
SOURCE SEQUENCE: MISSA

FRAME SIZE: 352 * 288
BITRATE: 300KBITS/SEC
BUFFER SIZE: 30000

FRAME RATE: 10 FRAMES / S
CODED FRAMES: 2 - 38



PLOT OF DIFFERENTIAL MOTION VECTOR USAGE

FIGURE: 5

DATE: 28/1/87
SOURCE: BTRL UK
AUTHOR: G SEXTON

CODER SOFTWARE: CODEC6 V1.2 (OKUBO
REFERENCE MODEL 3)

MODIFICATIONS:
SOURCE SEQUENCE: COSTI: SPLIT
SCREEN SEGMENT

FRAME SIZE: 352 * 288
BITRATE: 300KBITS/SEC
BUFFER SIZE: 30000

FRAME RATE: 10 FRAMES / S
CODED FRAMES: 2 - 19

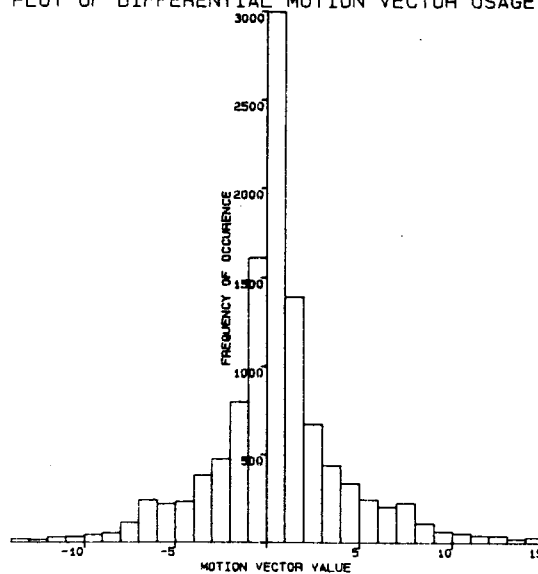


FIGURE: 6

DATE: 28/1/87
SOURCE: BTRL UK
AUTHOR: G SEXTON

CODER SOFTWARE: CODEC6 V1.2 (OKUBO
REFERENCE MODEL 3)

MODIFICATIONS:
SOURCE SEQUENCE: COSTI: TREVOR
SEGMENT

FRAME SIZE: 352 * 288
BITRATE: 300KBITS/SEC
BUFFER SIZE: 30000

FRAME RATE: 10 FRAMES / S
CODED FRAMES: 21 - 48

PLOT OF DIFFERENTIAL MOTION VECTOR USAGE

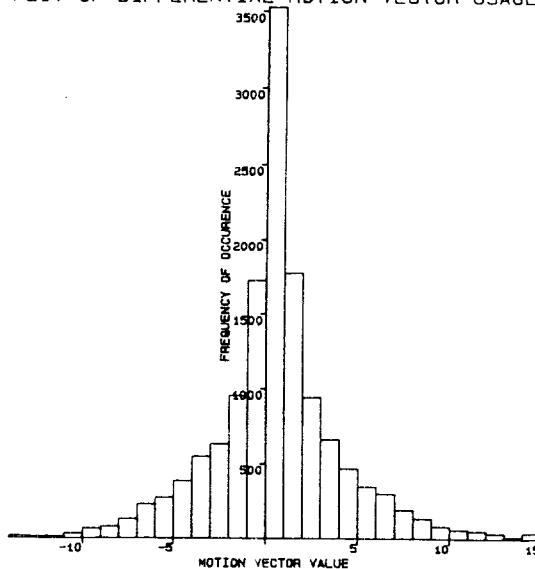


FIGURE: 7

DATE: 28/1/87
SOURCE: BTRL UK
AUTHOR: G SEXTON

CODER SOFTWARE: CODEC6 V1.2 (OKUBO
REFERENCE MODEL 3)

MODIFICATIONS:
SOURCE SEQUENCE: MISSA

FRAME SIZE: 352 * 288
BITRATE: 300KBITS/SEC
BUFFER SIZE: 30000

FRAME RATE: 10 FRAMES / S
CODED FRAMES: 2 - 38

PLOT OF DIFFERENTIAL MOTION VECTOR USAGE

