CCITT SGXV DOCUMENT # 316

Working Party XV/1 January 1988

Specialists Group of Coding for Visual Telephony

SOURCE: Delta Information Systems, Inc.; USA

TITLE: Objective Testing of Motion Performance of Teleconferencing Video Codecs

Past experience has shown the motion rendition of a teleconferencing video codec to be the most important parameter which affects overall picture quality and user acceptance. One procedure for quantitatively measuring the picture quality performance of a codec is to use subjective testing techniques which is complex, time consuming and costly. It is desirable to develop an objective test procedure to measure the motion performance of teleconferencing video codecs. Two test sequences are presently under consideration to fulfill this requirement. The first, which is entitled the "Scene Cut" test, measures the codec's ability to respond to an instantaneous change such as a scene cut. The second which is defined as the "Rotating Wheel" test measures the codec's ability to reproduce "typical" teleconferencing motion.

The "Scene Cut" test is implemented with simple patterns, such as a checkerboard or circles. Figure 1 illustrates a possible pattern consisting of circles. Circles are probably preferable to squares since they are more challenging for codecs employing transform coding. The preferred size of the circle, and

the gray or color values of the circle and background, would be determined experimentally. When the pattern changes, the color value of the circle is extinguished - made coincident with the background. The rate of change of the pattern would be adjustable.

Figure 2.0 illustrates a possible "Rotating Wheel" test pattern. The number of spokes in the wheel, and the gray or color values of the spokes, would be determined experimentally. It would be possible to break up each spoke into multiple gray or color values. The pattern would rotate clockwise. The speed of rotation would be adjustable.

A line waveform monitor would examine the output of the video decoder for both tests at the locations shown in Figures 1 and 2. In the case of the Scene Cut Test the switching rate would first be made sufficiently low so that the codec would respond fully to the reverse. The rate would be increased to the point where the system no longer reproduces the full dynamic range of the change. This rate of change (e.g. 4 switches/sec) is the objective measurement which results from the test.

In the case of the Rotating Wheel Test a similar test procedure is employed. The rotation speed is made very slow initially. The rotation speed threshold is increased to the point where the codec begins to fail to reproduce the full dynamic range. This rotation speed is the objective measurement which results from the test. (e.g. 4 sec/rotation)

Delta Information Systems is experimentally evaluating techniques of this type to determine their effectiveness to objectively measure codec motion performance. A tape will be shown to illustrate the appearance and quality of the test signals. The attached tables define contents on the tape.

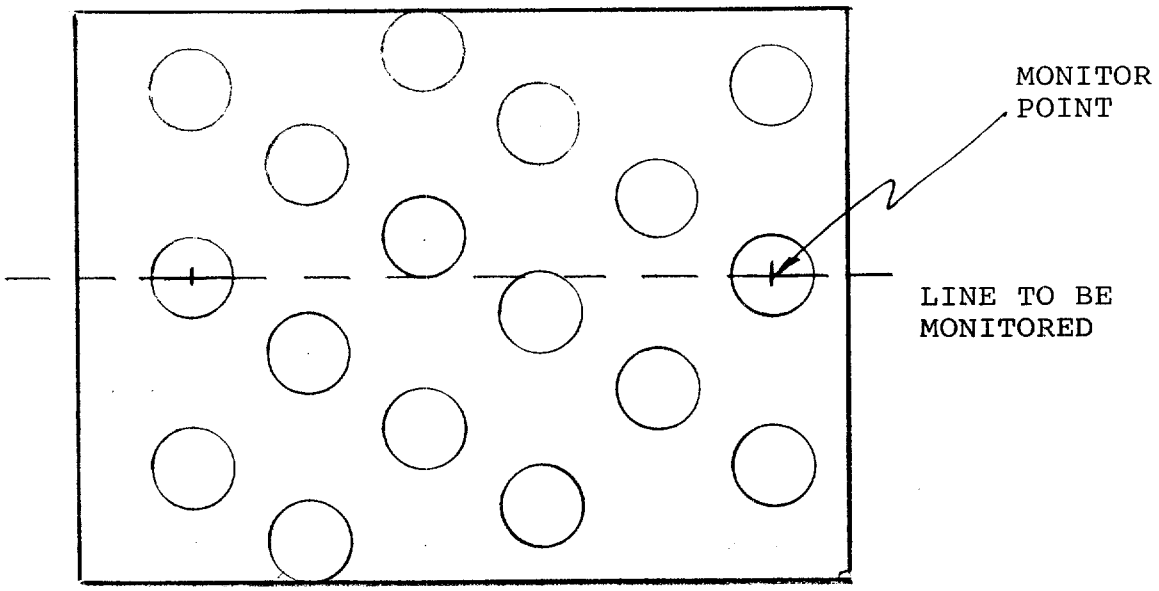

FIGURE 1 SCENE CUT PATTERN

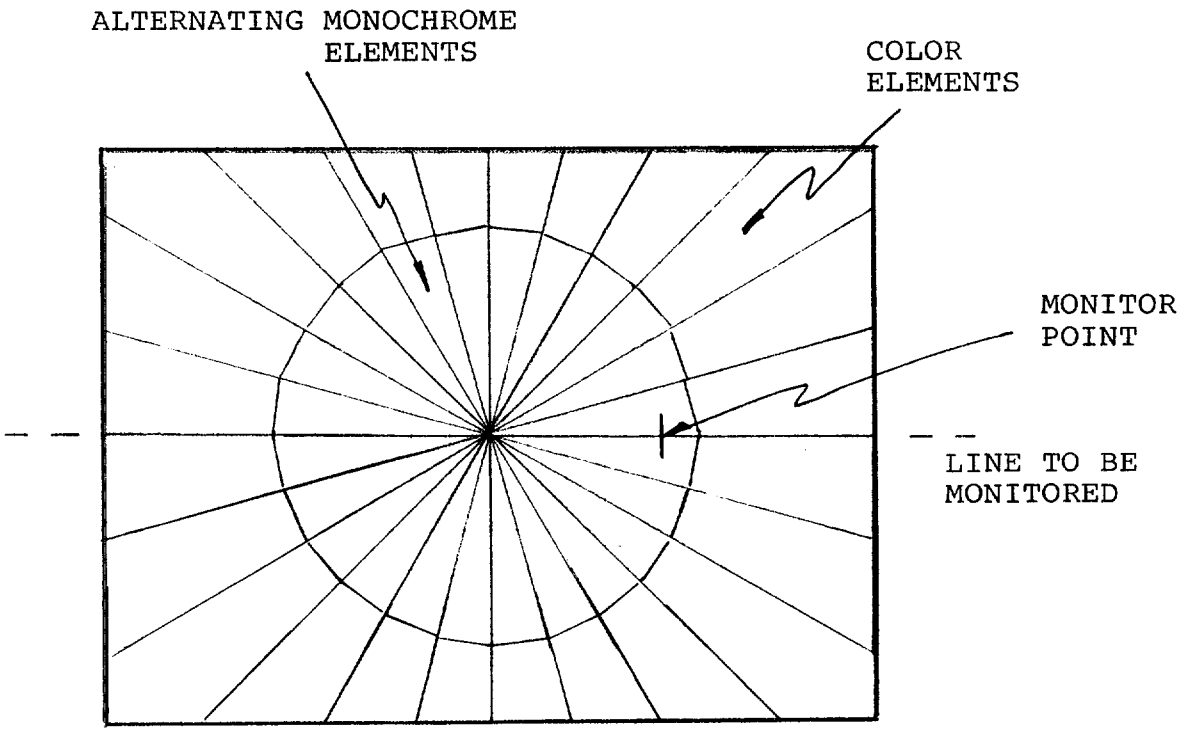

FIGURE 2 ROTATING WHEEL PATTERN

CIRCLE SPACING(%)		7		4		2.25	
CIRCLE RADIUS(%)		3.25	2.25	1.75	1.25	1	.75
SWITCHING RATE (FRAMES)	120	A-1	-	A-13	-	A-25	-
	60	A-2	-	A-14	-	A-26	-
	30	A-3	-	A-15	-	A-27	-
	15	A-4	-	A-16	-	A-28	-
	8	A-5	A-9	A-17	A-21	A-29	A-33
	4	A-6	A-10	A-18	~~A-22~~	A-30	A-34
	2	A-7	A-11	A-19	~~A-23~~	~~A-31~~	~~A-35~~
	1	A-8	A-12	~~A-20~~	~~A-24~~	~~A-32~~	~~A-36~~

TABLE 1

SCENE CUT PATTERNS

SPOKE WIDTH 30°

SCENE NO.	B-1	B-2	B-3	B-4	B-5	B-6	B-7	B-8	B-9
FRAMES/REVOL.	540	360	240	180	144	120	90	72	60
DEGREES/SEC	20	30	45	60	75	90	120	150	180
% PIXEL CHANGE PER FRAME	2.2	3.3	5	6.7	8.3	10	12.5	16.7	20

SPOKE WIDTH 18°

SCENE NO.	B-10	B-11	B-12	B-13	B-14	B-15	B-16	B-17
FRAMES/REVOL.	720	540	360	240	180	144	120	90
DEGREES/SEC	15	20	30	45	60	75	90	120
% PIXEL CHANGE PER FRAME	2.8	3.7	5.6	8.3	11.1	13.9	16.7	22.2

SPOKE WIDTH 10°

SCENE NO.	B-18	B-19	B-20	B-21	B-22	B-23
FRAMES/REVOL.	720	540	360	240	180	144
DEGREES/SEC	15	20	30	45	60	75
% PIXEL CHANGE PER FRAME	5	6.7	10	15	20	25

TABLE 2

ROTATING WHEEL PARAMETERS