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**COMMITTEE T1 - TELECOMMUNICATIONS
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SUBJECT: Preliminary work to include jerky motion impairment in VIRIS 1

SOURCE: Bellcore

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ABSTRACT: This is a proposed contribution to ITU-T Study Group 12 which addresses that portion of Question 22 dealing with a video reference impairment system. We are seeking approval from T1A1.5 to submit it as a Bellcore contribution. The contribution reports preliminary work to include a jerky motion impairment in Bellcore's video reference impairment system, VIRIS.

DISTRIBUTION: T1A1.5

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TELECOMMUNICATION
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STUDY GROUP 12 - CONTRIBUTION**Source* : BELLCORE****Title: PRELIMINARY WORK TO INCLUDE JERKY MOTION IMPAIRMENT IN VIRIS1****1. INTRODUCTION**

A video reference impairment system, VIRIS^[1], was created in 1992 to simulate the digital video coder impairment artifacts of blocking, blurring, mosquitoes and noise. A companion contribution^[2] reports on changes made in the VIRIS program to improve the mosquito impairment simulation. The resulting program was referred to as VIRIS1. The purpose of this contribution is to report preliminary results of adding a jerky motion impairment simulation to VIRIS1.

Jerky motion, or jerkiness, is nonsmooth or noncontinuous motion perceived as a series of distinct 'snapshots'. It is commonly observed on picture telephones and on some low-bit rate video teleconferencing systems. It is the result of repeating video frames to reduce the amount of video information that a system is required to transmit or process.

The next section discusses the method used to simulate jerky motion in VIRIS1. The impairment is objectively characterized in terms of Peak Signal-to-Noise Ratio, PSNR, for one picture sequence. This work is preliminary since no subjective characterizations have been obtained and objective results have been obtained for only one picture sequence.

2. JERKY MOTION IMPAIRMENT SIMULATION

Jerky motion is created in VIRIS1 by repeating video frames. The frame repetition factor, FRF, is input as a command line variable to the UNIX shell script program (see Reference 1) that controls the flow of data and image files to the VIRIS1 program. An FRF of 3, for example, results in every third frame input to VIRIS1 and each of these is used in succession, three times. The effective frame rate, EFR, is calculated as $30/\text{FRF}$. The EFR for the example FRF of 3 would, thus, be 10 frames per second.

The PSNR for jerky motion is calculated in the same manner as for the other VIRIS1 impairments (See Reference 1). The PSNR calculation involves, among other things, the determination of the difference between the pel values of the unimpaired input frame to VIRIS1 and the impaired output frame. With the

addition of jerky motion to VIRIS1, it was necessary for the shell script program to input two files to VIRIS1, one file being the actual frame of the sequence which is used as the unimpaired frame in VIRIS1 and the other file being the repeated frame which is used as the impaired frame

The PSNR for various FRFs was determined for one 5-second picture sequence, Football, which is described elsewhere^{[1][2]}. Results are shown in Figure 1. The FRFs ranged from 2 to 15 and this resulted in PSNRs ranging from 29.4 to 17.5 dB. The PSNR-FRF characteristic for other picture sequences will depend significantly on the amount of motion in the sequence.

3. CONCLUSION

A simulated jerky motion impairment has been added to the VIRIS1 program. Further work needs to be performed to obtain additional objective characterizations of PSNR and FRF for other picture sequences and to obtain subjective quality characterizations of PSNR.

REFERENCES

1. Contribution ITU-T, COM 12-20-E, "VIRIS, AN EXPERIMENTAL VIDEO REFERENCE SYSTEM," Question 22/12, December, 1993.
2. Contribution ITU-T, "MODIFICATION OF VIDEO REFERENCE IMPAIRMENT SYSTEM (VIRIS) TO IMPROVE MOSQUITO NOISE SIMULATION," Question 22/12, Date, 1994.

Figure 1

