DRAFT MEETING RECORD

Video Compression Measurements Subcommittee G-2.1.6

Audio Video Techniques Committee G-2.1

Broadcast Technology Society

Institute of Electrical and Electronics Engineers

Seventh Meeting

Advanced Television Technology Center

1330 Braddock Place, Suite 200

Alexandria, VA

January 26, 1998

Item 1 - Welcome and Introduction by Interim Chairman, of IEEE G-2.1.6.

Alan Godber called the meeting to order at 2:05 PM.

Item 2 – Approval of Draft Agenda.

Item 8, Viewing of Possible Subjective/Objective Test Images, was conducted in the ATTC viewing room prior to the start of the meeting. Item 13, Discrete Cosine Transform Accuracy Test, was moved up to Item 5A. Item 5B, T1A1 Project – Qualification Process for Video Performance Measurements, was added.

Item 3 – Review and Approval of Minutes of the Previous Meeting #6, October 27th, 1997

The minutes were approved as submitted.

Item 4 – Matters Arising from the Minutes

No matters arose from the minutes.

Item 5 – Report of the Meetings of ITU Joint Rapporteurs Group, Experts Group, Recommendations of Ad Hoc Groups – Arthur Webster and other participants.

Subjective Test Plan

Al Morton reported on the *ITU VQEG Subjective Test Plan* (Doc. G-2.1.6/65). He noted they made a choice to run the test at three labs and divide it by HRCs. Therefore some labs won't see some of the HRCs. Some HRCs overlap. These will be seen at two or all three labs.

Further Discussion and Recommendations from the Subcommittee

There was concern that this part of the plan may contain a mistake. There may not be enough common points to compare lab results. Al Morton observed that in the T1A1 tests, when they went to great pains to specify equal test conditions, correlation between labs was very good. In this test plan, they haven't specified it to the same degree.

In reference to the difference in correlation of the T1A1 tests and the correlation achieved in the IRT tests, after looking at the data, we may not be talking about the same thing. A correlation of 0.91 should have a larger RMS error than the 3% value reported.

Al Morton presented an alternative proposal for part of the subjective test plan. Viewers at each lab are divided into teams, with each team seeing all scenes combined with a subset of HRCs. The HRCs are numbered by increasing quality and divided among the teams. [A full description of this method and the associated illustration is contained in Morton's comments to the VQEG, *Alternative Assignment of Scenes to Labs and Viewers – Multiple Team Proposal*, (Doc. G-2.1.6/76). This document was posted on the ITU Joint Rapporteurs Group e-mail reflector and is available on the IEEE G-2.1.6 web site.]

This approach provides a wide range of combinations over which lab-to-lab comparisons may be evaluated and evenly distributes any bias among ratings from a particular lab over all combinations. There was concern that with scenes divided into two quality ranges to avoid the compression resulting from too wide of a range of scenes, the middle scenes would be rated differently. This is because in one set they would be compared with worse scenes and in the other set they would be compared with better ones. It was suggested that if the objective method is valid, it could be used to calibrate the subjective tests.

There was a discussion of how the end result would be generated and how it would be correlated to JND. It was suggested that a five-category impairment scale might have been a better choice than the DSCQS method chosen. However, it was noted that the assumption is viewers won't be able to discern specific impairments, so a mapping function is needed to turn the JND into a number that matches perceived quality differences. It was also argued that in the middle areas, annoying, very annoying or slightly annoying can have a variety of interpretations. Processed material may look better, but a measurement device will see the processing as an impairment.

Al Morton will prepare comments and make them available to the VQEG (Video Quality Experts Group). **[ACTION ITEM]** Other members were encouraged to submit comments to the VQEG through Arthur Webster.

Objective Test Plan

Copies of the *ITU VQEG Objective Video Quality Test Plan, V3.0,* prepared by Mihir Ravel and John Beerends, (Doc. G-2.1.6/66) were distributed.

Further Discussion and Recommendations from the Subcommittee

Some errors in the Kurtosis formula on page 9 of the document were mentioned, including missing parenthesis and a bracket.

It was questioned why multiple metrics were needed to evaluate test results. The idea was to collect the data first and not nail down a specific metric until the data could be analyzed. It was acknowledged that proponents would prefer the metric that proves their system works best.

Members were encouraged to send their input directly to the VQEG. Contact Arthur Webster. Some issues may be resolved at the ITU SG12 meeting. There may be another VQEG meeting in May.

Classes Document

Copies of *ITU VQEG Video Classes Table and Definitions* (Doc. G-2.1.6/67) were distributed. David Fibush commented that the HRCs are being kept secret from the proponents. More information may be available at the next meeting.

Further Discussion and Recommendations from the Subcommittee

Members should send contributions to the VQEG as soon as possible.

Item 5A – Discrete Cosine Transform Accuracy Test – Dr. Ken Vollmar

Dr. Ken Vollmar, Department of Computer Science at Southwest Missouri State University, delivered his *Presentation to IEEE G-2.1.6, Video Compression Measurements Subcommittee, on IEEE 1180-1990 Standard Discrete Cosine Transform Accuracy Test* (Doc. G-2.1.6/68 - available on the G-2.1.6 web site). After a description of the DCT Accuracy Test, Dr. Vollmar observed that "known practical algorithms can't comply with IEEE-1180 using 16 bits for internal arithmetic." He also noted that IEEE-1180's "use of random pixels as input to the FDCT does not result in extreme ranges of possible IDCT inputs. Therefore, a "barely" 1180-compliant IDCT could have catastrophic failure on a typical input. He recommended that instead of setting a solid pass/fail cutoff, we should have an open-ended score on the metric. [Thie presentation is available in at http://stdsbbs.ieee.org/groups/videocomp/v2-1180.pdf in Adobe Acrobat format or at http://stdsbbs.ieee.org/groups/videocomp/v2-1180.doc in Microsoft Word format.

5A.1 Further Discussion and Recommendations from the Subcommittee

There was interest in having a copy of IEEE-1180 posted electronically. Dr. Vollmar will send Alan Godber information on the IEEE contact and Alan Godber will contact them to see if it is possible to get permission to post the standard on the G-2.1.6 web site. **[ACTION ITEM]**

Item 5B – Qualification Process for Video Performance Measurements, T1A1 Project – Al Morton

Al Morton distributed *Examination of Agreement Between Laboratories Conducting Identical Subjective Video Quality Experiments*, January 1998 (Doc. G-2.1.6/69).

This report was based on data collected as part of the T1A1.5 video performance research project, which involved several laboratories. Using a graph, Morton compared the Mean Opinion Scores (MOS) of subjective test laboratories at NTIA/ITS and GTE Labs. The correlation coefficient (r) was 0.966 and the RMS difference between these two labs was 0.302. The worst lab correlation was r = 0.941. This was the reason why he was surprised with the KDD correlation numbers. This may be due to KDD using a different method, such as comparing residual errors. His conclusion was that it is possible to run a subjective test with very good agreement,in these dimensions.

5B.1 Further Discussion and Recommendations from the Subcommittee

Al Morton was asked if this method could be used to discriminate between quality measurement techniques. He replied it could be used, but because this was controversial, it was excluded from the document.

Al Morton will submit this report to the ITU-T SG12.

Item 6 – Report of Task Force on Test Imaging Materials – Chair, David Fibush

David Fibush reported that they looked at the down converted scenes and felt they would be appropriate for evaluating measurement systems. The font size of the text in some scenes could be a problem at lower resolutions. The task force concluded that we couldn't make 625-line video from 1080I sources because there is no equipment to do that. There was also concern whether the tube cameras used to make some of these scenes were representative of what was in use today.

6.1 Further Discussion and Action

At this point, it isn't clear that there is something else to do. It was suggested we could contribute this information to the VQEG. David Fibush proposed we dissolve the task force. There were no further comments. Alan Godber thanked the task force for their work.

The types of scenes that stress compression systems were discussed. Dissolves between scenes and fades to black were mentioned. There was concern these images did not have a lot of noisy material, which causes problems particularly on flat backgrounds. Flashes, such as the lightning in *Dante's Peak* where there is a dark scene with flashes, also caused problems. While we shouldn't be trying to break compression systems, we do need scenes that are moderately stressful.

Item 7 – Tour of the ATTC Laboratory Facilities

This item was dropped due to lack of time.

Item 8 – Viewing of Possible Subjective/Objective Test Images

The viewing was conducted during the lunch break prior to the official start of the meeting. The full set of 50 ACATS images was shown.

8.1 Further Discussion and Action

The scenes viewed were discussed in agenda item 6.

Item 9 – Report of Task Force on Preparation of Scope for Committee Work – Chair, Leon Stanger

Leon Stanger made the changes agreed to, posted the scope on the email reflector and sent it to ITU. If there are no further changes, it should be complete.

9.1 Further Discussion and Action

It appeared unlikely ITU would comment on this. Alan Godber thanked Leon Stanger for his work on the scope document.

Item 10 – Report of Task Force on Timetable – Chair, Leon Stanger

No work was done by this task force since the last meeting.

10.1 Further Discussion and Action

Item 11 – Report of Task Force on Compression Measurements Information Gathering – Chair, Bill Zou

Alan Godber reported for Bill Zou. Both had discussed contacting other proponents to obtain information or to come and speak to this subcommittee. They met several people at the SMPTE Conference in NYC and Bill Zou has written to them. KDD sent *Video Codec Evaluation Scheme and Implementation Based on Characteristic of Human Visual Perception*, by T.A. Hamada (Doc. G-2.1.6/72). Dr. Andrew Watson from NASA would like to give a presentation at a future meeting. Dr. Christian J. van den Branden Lambercht, of

the Imaging Technology Department at Hewlett Packard was invited to a future G-2.1.6 meeting. Godber said he had not received a reply from Beerends at KPN or from NHK.

11.1 Further Discussion and Action.

It was suggested we get papers from SMPTE for these proponents. It was noted, however, that this might be a problem since some of the papers have been published in the SMPTE Journal. If SMPTE plans to publish the other papers, we may have difficulty obtaining copies. **[ACTION ITEM]** Alan Godber will call "Leroy" about this.

There was a discussion about inviting HP and NASA to make presentations to the March G-2.1.6 meeting. John Libert commented that NASA's Andrew Watson was an expert in vision research. He will provide a URL to the web site with publications by him and others in his vision research group. **[ACTION ITEM]**
[The URL is http://vision.arc.nasa.gov/publications/publications.html]

Item 12 – Where Measurements Take Place in the Broadcast Chain – Leon Stanger

Leon Stanger distributed *Quality Measurement Needs for Digital Television Facilities*, 21 January 1998 (Doc. G-2.1.6/73). He noted that the needs can be divided in multiple ways, such as contribution / distribution / archive, but he did try to push it into different compression formats. Other members suggested adding concatenation, including end to end system or subsystem tests and non-quality issues, such as standards conversion. One problem with standard conversion measurements is that they wouldn't work with an A-B type comparison. It was noted that scanning conversions are a form of compression and could have an impact. David Fibush added that their system can easily measure composite decoding / encoding. Film conversion from 24 frame to 30 frame was another issue mentioned.

Alan Godber asked Leon Stanger to update the list and post it on the reflector and web site. **[ACTION ITEM]**

Item 13 – Discrete Cosine Transform Accuracy Test – Dr. Ken Vollmar

This item was moved to Item 5A.

Item 14 – Discussion of Compression Measurement Methodologies

This item was deferred.

14.1 Discussion of Future Work, Additional Assignments, etc.

Item 15 – Any Other Business

Leon Stanger presented a document *The Need for A Unit of Measure and Calibration for Picture Quality Degradation*, Leon Stanger, 25 January 1998 (Doc. G-2.1.6/74). He encouraged the subcommittee to focus on the unit of measure and its definition instead of focusing on the algorithm. In the discussion that followed, it was noted that we might be able to make a better contribution if we could measure specific impairments - not only if the signal is impaired, but how much it is impaired. As viewers become more familiar with the degradation caused by video compression, they will become more adept at identifying the type of degradation.

Stanger suggested a library of tapes of different material using different compression methods that instrument manufacturers can use for calibration. He asked if a group would like to sit down and try to define a "visual volt" or JND. It was noted that fidelity and quality are not the same. A 0 to 100 scale showing what percentage of viewers can perceive the degradation was suggested. It was noted that this scale would go from 100 percent to 0 percent very quickly.

[ACTION ITEM] Leon Stanger will lead a working group and come up with a straw man. John Liebert, Bruce Lilly, Al Morton, Paul Jones and Alan Godber will participate.

Item 16 – Date(s) of Future Meeting(s)

The next meeting was set for March 16, at approximately 10 AM, following the G-2.1.4 meeting.

There was a vote of thanks to the ATTC for allowing us to use their facilities for the meeting.

The meeting was adjourned at 6:50 PM.

Submitted by:

H. Douglas Lung

Secretary

APPENDIX "A"

List of Documents Distributed

26 January 1998

Draft Agenda - IEEE Compression and Processing Subcommittee G-2.1.6 Seventh Meeting, Monday, January 26, 1998, Alan Godber, Chairman, 5 December 1997.

Draft Meeting Record, G-2.1.6, Compression and Processing Subcommittee, Meeting #6, October 27, 1997, Hyatt Regency Hotel on Town Lake, 208 Barton Springs Road, Austin, Texas, Doug Lung, Secretary, Doc. G-2.1.6/62, 26 January 1998.

Report of the Task Force Meeting held at the ATTC in Alexandria, VA, November 4th, David Fibush, Tektronix, Inc., November 8, 1997, Doc G-2.1.6/63, 26 January 1998

Letter to ITU Video Quality Experts Group (Turin Experts Group) - Comments From Those Present at Meeting of IEEE G-2.1.6 Subcommittee on Video Compression Measurements in Austin, Texas on October 27th, 1997, Alan Godber, Chairman of G-2.1.6 (on behalf of those attending the Subcommittee meeting in Austin, TX on October 27th, 1997), November 12, 1997, Doc. G-2.1.6/64, 26 January 1998.

ITU VQEG Subjective Test Plan – Third Draft, Video Quality Experts Group, prepared by Phillip Corriveau and Elizabeth Barbisan, Communications Research Centre, January 24, 1998, Doc. G-2.1.6/65, 26 January 1998.

ITU VQEG Objective Video Quality Test Plan, V3.0, Video Quality Experts Group, prepared by Mihir Ravel and John Beerends, not dated, Doc. G-2.1.6/66, 26 January 1998.

ITU VQEG Video Classes Table and Definitions, Video Quality Experts Group, no author listed, not dated, Doc. G-2.1.6/67, 26 January 1998.

Presentation to IEEE G-2.1.6, Video Compression Measurements Subcommittee, on IEEE 1180-1990 Standard Discrete Cosine Transform Accuracy Test, Dr. Ken Vollmar, Southwest Missouri State University, January 26, 1998, Doc. G-2.1.6/68, 26 January 1998.

Examination of Agreement Between Laboratories Conducting Identical Subjective Video Quality Experiments, Alfred C. Morton, AT&T, January 1998, Doc. G-2.1.6/69, 26 January 1998.

APPENDIX "A"

List of Documents Distributed

26 January 1998

(Continued)

E-mail to ITU VIDQ Reflector: Re: a priori knowledge of scenes, Alan Godber, December 9, 1997, Doc. G-2.1.6/70, 26 January 1998.

Contribution to ITU Video Quality Experts Group: Viewing Distance for Subjective Observation of an SDTV Video Image, and for Establishing the Validity of a Measurement Instrument for Objective Measurements of Video Quality, Alan Godber, December 10, 1997, Doc. G-2.1.6/71, 26 January 1998.

Video Codec Evaluation Scheme and Implementation Based on Characteristic of Human Visual Perception, T.A. Hamada, KDD R&D Laboratories, not dated, Doc. G-2.1.6/72, 26 January 1998.

Quality Measurement Needs for Digital Television Facilities, Leon Stanger, 21 January 1998, Doc. G-2.1.6/73, 26 January 1998.

The Need for A Unit of Measure and Calibration for Picture Quality Degradation, Leon Stanger, 25 January 1998, Doc. G-2.1.6/74, 26 January 1998.

APPENDIX "B"

ATTENDANCE RECORD

26 January 1998

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