

ITU-T and Related U.S. Standards Development

Outputs

- Leadership of ITU-T and related U.S. telecommunications standards committees.
- Technical contributions presenting U.S. standards proposals and ITS research results.
- Proposed ITU Recommendations and associated U.S. industry standards.

The Institute has a long and distinguished history of leadership, technical contributions, and advocacy of U.S. government and industry proposals in international and related national telecommunication standards committees. These activities have been focused in the International Telecommunication Union (ITU) — the United Nations-affiliated standards organization responsible for the cooperative planning and interoperation of public telecommunication systems and services worldwide. The ITU's technical work is centered in two permanent organs: the Telecommunication Standardization Sector (ITU-T), and the Radiocommunication Sector (ITU-R). The ITU-T develops international standards (Recommendations) addressing technical, operating, and tariff questions relating to all aspects of wireline telecommunications. The technical work of ITU-T is conducted in thirteen Study Groups whose responsibilities are distinguished on the basis of particular technical specialties and standards development needs. ITU-T Recommendations have a strong impact on both the evolution of U.S. telecommunications infrastructures and the competitiveness of U.S. telecommunications equipment and services in international trade.

ITS has played a strong role in ITU-T standardization work for many years. The Institute's technical goal there — and in related national standards work — has been to motivate the development and standardization of user-oriented, technology-independent measures of telecommunication service quality. Such measures promote competition and technology innovation among equipment and service providers; facilitate interworking among independently operated networks and dissimilar technologies in the

provision of end-to-end services; and give users a quantitative, practical means of defining their specific telecommunication requirements and selecting products that effectively meet them. In prior work, ITS participants have led ITU-T and related U.S. standards committees in defining the basic principles and framework that underpin a user-oriented approach to telecommunications quality assessment; developed a set of generic, user-oriented quality measures for data transfer and call processing functions; and applied those generic measures in deriving specific performance parameters and measurement methods for X.25-based packet switching, frame relay, narrowband and broadband integrated services digital network (ISDN), and asynchronous transfer mode (ATM) technologies. This work has produced over a dozen ITU-T Recommendations and related U.S. industry standards and has strongly influenced both the theory and practice of digital network performance description. In recent years, ITS participants have been working to extend the performance description principles and framework to integrated IP and telephony networks, and to develop objective, perception-based quality metrics for voice, video, and multimedia services.

In FY 2002, the Institute's ITU-T leadership was focused in two groups: Study Group 13 Working Party 4 (Network Performance and Resource Management) and Study Group 9's Working Group on Quality Assessment. SG 13/WP 4 develops performance Recommendations for high-speed synchronous digital hierarchy (SDH), ATM, wave division multiplexing (WDM), and IP-based network technologies. SG 9's Working Group on Quality Assessment defines quality objectives for integrated broadband cable networks and television and sound transmission. During 2002, ITS also provided leadership and technical contributions to the ITU affiliated Video Quality Experts Group (VQEG) and the American National Standards Institute (ANSI) accredited T1 (Telecommunications) Committee's Technical Subcommittee T1A1 (Performance, Reliability, and Signal Processing). VQEG works in conjunction with ITU-T SG 9 and ITU-R WP6Q (Broadcasting Services – Performance Assessment and Quality Control) to develop objective, computer

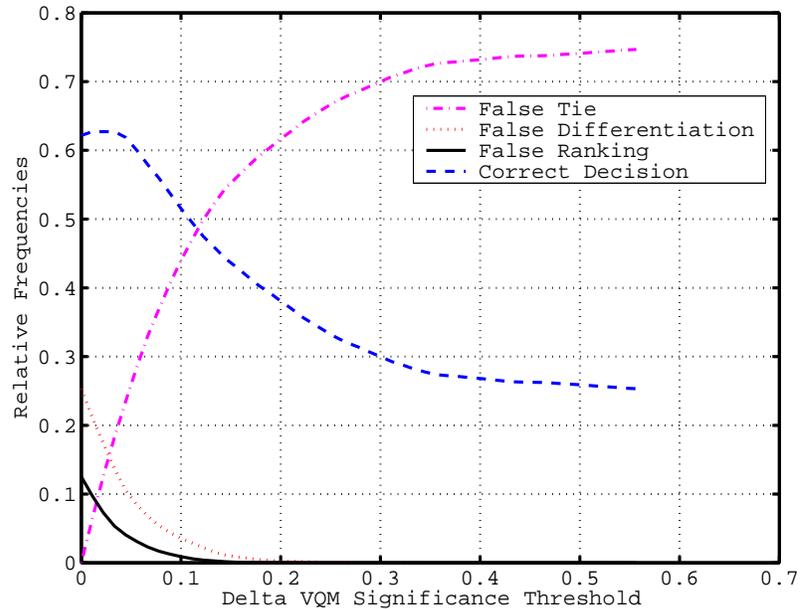
implementable, perception-based video quality metrics (VQMs) that emulate the human visual system. T1A1 contributes strongly to ITU-T in all of these technology areas.

During FY 2002, ITS led negotiations resulting in final ITU-T approval of two new Recommendations (Y.1541, Y.1221) that specify standard Quality of Service (QoS) Classes and Traffic Contracts for IP-based networks that offer assured-quality services. Y.1541 is the first ITU-T Recommendation to specifically define performance objectives for IP-based networks. Y.1221 complements Y.1541 by defining standard parameters for characterizing and limiting offered traffic.

These related Recommendations will be important in defining service level agreements (SLAs) among independent network operators that wish to cooperate in providing assured-quality IP packet flows. In related work, ITS motivated T1 and ITU-T efforts to define IP network QoS signaling standards that will facilitate such cooperation. In pursuing that goal, ITS instigated and participated in a highly successful Committee T1 “Summit” on Signaling for Voice over IP (VoIP) and contributed to several ITU-T documents that specify generic IP network QoS signaling requirements.

In the video quality area, ITS spearheaded T1A1 activities leading to Committee T1 approval of five new Technical Reports defining objective video quality metrics (VQMs). The first (TR 72) specifies a set of “meta-metrics” that can be used to evaluate the resolving power and accuracy of proposed objective VQMs. ITS presented TR 72 to ITU-T SG 9 in 2002, and that group expects to approve a new ITU-T Recommendation based on TR 72 in 2003. The new Recommendation will assist SG 9 and the VQEG in assessing objective VQMs proposed for standardization, possibly enabling ITU-T to recommend a single, optimized VQM for a wide range of quality assessment needs.

The figure illustrates an ITS-developed framework, defined in TR 72 and its counterpart draft ITU Recommendation, for evaluating the power and



ITS-developed framework can be used to evaluate the power and limitations of proposed objective video quality metrics.

limitations of particular VQMs in replicating the subjective video quality assessments of human viewer panels. The figure plots the relative frequencies of various outcomes that can occur when the VQM ranking of a pair of video signals (A,B) is compared with the subjective viewer panel ranking for the same two signals (the latter ranking assumed to be “true” by definition). Four possible outcomes of such a comparison are distinguished: false ranking (the VQM ranks A better than B, while the viewers rank B better than A); false tie (the VQM fails to recognize a difference the human viewers see); false differentiation (the VQM reports a difference human viewers do not see); and the desired outcome, correct decision (the VQM ranking agrees with the subjective ranking). The abscissa in all cases is the Delta VQM Significance Threshold, i.e., the smallest difference between VQM values that the VQM algorithm declares to be valid. This framework is useful in comparing the performance of alternative VQMs, and can be used to optimize a particular VQM by choosing the Significance Threshold that minimizes a user-specified cost function.

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