NEWS RELEASE

NTT

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Objective Video Quality Assessment Technology Developed by NTT Adopted in an International Standard

-Toward Sound Expansion of Reliable and Quality-assured Video Delivery Services-

Objective quality assessment technology for video delivery services proposed by Nippon Telegraph and Telephone Corporation (NTT; main office: Chiyoda-ku, Tokyo; President and CEO: Satoshi Miura) in ITU-T SG9[*1] has been adopted in an international standard after a worldwide performance evaluation contest[*2] and put into effect as ITU-T Recommendation J.247.
This technology was developed by NTT Service Integration Laboratories to objectively estimate the user's Quality of Experience (QoE) in IP-based video delivery services. The technology enables the quality of video delivery services to be checked and monitored, and it contributes to the sound expansion of video delivery services.

Background and Significance of Standardization

As ubiquitous-broadband services begin and the demand rises for video communications making the most of broadband-access features, video delivery services for personal-computer and cell-phone users have been expanding rapidly. Providing such new services to customers at an appropriate level of quality requires quality assessment technology that can accurately measure the quality (QoE) of video delivery services. Existing technology, however, cannot assess the effects of diverse coding systems and bit rates as used in video delivery services nor can it assess degraded video caused by packet loss characteristic of IP networks.
In response to this problem, NTT Service Integration Laboratories modeled quality degradation considering human perceptual characteristics (degradation in experienced quality due to coding and packet loss) based on a huge quality database making maximum use of NTT subjective quality assessment facilities and know-how. Then, based on this model, it developed technology to estimate QoE through the analysis of video signals. This technology enables the objective video quality assessment from the similar viewpoints of customers.
This assessment technology was proposed for standardization at ITU-T, and after a 5-year worldwide performance evaluation contest held by ITU-T, four systems (including the NTT algorithm) out of nine candidates from the same number of institutions were approved as formal Recommendation J.247 on August 13, 2008 and released on August 22, 2008.
The "pre-published" version of this recommendation can be viewed via the following link.
http://www.itu.int/rec/T-REC-J.247/en

* Although minor modifications may be made until the official "published" version, the "pre-published" version is still effective as a recommendation.

The development of this objective quality assessment technology and its international

standardization will help provide reliable video delivery services by ensuring service quality. It will also promote the further expansion of compelling video delivery services that exploit the potential of the ubiquitous-broadband network to provide diverse and sophisticated video communication services.

Technical Features

This technology, which has now become an international standard, quantifies quality by comparing pixel information between reference video and degraded video. As such, it is a full-reference-type[*3] objective quality assessment technology (Fig. 1). It computes a video-quality estimation value by weighted addition over steps (1) - (3) below and estimates the effect of quality degradation on subjective quality (Fig. 2).

(1) Temporal-spatial alignment processing of reference/degraded video
Establish a correspondence between the frames and pixels of the reference and degraded videos so that an appropriate comparison can be made.

(2) Coding-related degradation estimation model
Calculate the amount of degradation generated throughout the entire video, calculate the amount of degradation caused by block distortion, and calculate the amount of degradation associated with blurring.

(3) Packet-loss-related degradation estimation model
Calculate the amount of local spatial degradation[*4] and calculate the amount of freeze degradation.

Benefits

The monitoring and management of QoE while providing services or "in-service quality management" is an important application of media quality assessment technology. Adoption of this technology approved as an international standard can be expected to provide the following benefits.

(1) Raise customer satisfaction (CS) by speedy troubleshooting and response to customer claims

(2) Reduce extent of quality degradation on customers by monitoring quality experienced by customers in terms of "customer sensations"

(3) Reduce personnel expenses incurred by service providers by automating the "pre-delivery content quality check" that is currently performed visually

Future Developments

In addition to continuing the research and development of quality assessment technology, NTT Service Integration Laboratories intends to contribute to the sound expansion of video delivery services in the ubiquitous-broadband era by introducing video-quality monitoring systems in service-providing companies and expanding into quality-estimation-device and quality assessment businesses.

Terminology

*1 ITU-T SG9
The 9th Study Group (SG9) of the Telecommunication Standardization Sector of the International Telecommunication Union (ITU), a specialized agency of the United Nations. SG9 deals mainly with standardization related to cable television.

*2 Performance evaluation contest
An international standardization contest in the ITU Video Quality Experts Group

(http://www.its.bldrdoc.gov/vqeg/) judging the validity of algorithms aiming for international standardization from the viewpoint of quality estimation performance. Seventeen institutions from ten countries throughout the world contribute to this contest, which is of a scale never seen before as a performance evaluation contest of quality assessment technology.

*3 Full-reference type
An objective quality assessment technology that compares information between reference video and degraded video. It achieves high-accuracy quality estimation by considering the difference of various video scenes.

*4 Amount of spatial degradation
The numerical amount of spatial degradation such as block distortion and blurring as physical feature quantities generated in one video frame as opposed to time-dependent degradation such as freezing and skipping.

- Figure 1: a full-reference-type objective quality assessment technology
- Figure 2: Video quality objective assessment model

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