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Amendment 1
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SERIES J: CABLE NETWORKS AND TRANSMISSION
OF TELEVISION, SOUND PROGRAMME AND OTHER
MULTIMEDIA SIGNALS

Measurement of the quality of service - Part 3

Hybrid perceptual bitstream models for objective
video quality measurements

Amendment 1

Recommendation ITU-T J.343 (2014) – Amendment 1

ITU-T

Recommendation ITU-T J.343

Hybrid perceptual bitstream models for objective video quality measurements

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Summary

Recommendation ITU-T J.343 specifies objective video quality measurement methods which use bitstream data in addition to processed video sequences. From bitstream data, the models can obtain additional information on the codec type, bit rate, frame rate, some transmission errors and spatial/temporal shifts. Consequently, such models may provide improved performance compared to objective video quality models, which use only processed video sequences.

Amendment 1 adds a new Appendix I containing information about test vectors for the ITU-T J.343 family of Recommendations.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T J.343	2014-11-29	9	11.1002/1000/12315
1.1	ITU-T J.343 (2014) Amd. 1	2018-05-10	12	11.1002/1000/13619

Keywords

Bitstream data, objective methods, test vectors, video.

* To access the Recommendation, type the URL <http://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID. For example, <http://handle.itu.int/11.1002/1000/11830-en>.

FOREWORD

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Introduction

Generally video quality estimation models are, depending upon the required input signals, categorized as no reference (NR), reduced reference (RR) and full reference (FR) models. NR models are provided with the processed video sequences only. RR models require that features extracted from the reference video sequences and the processed video sequences are provided. For FR models, the unimpaired reference and the processed video sequences must be provided.

In addition, the models described in this Recommendation need access to the received bitstream data from which the model can obtain information on transmission errors (e.g., delay, packet loss), codec (e.g., type, bit-rates, frame rates, codec parameters), etc.

Consequently, the models described here are categorized as hybrid models (i.e., Hybrid-NR, Hybrid-RR and Hybrid-FR).

Recommendation ITU-T J.343

Hybrid perceptual bitstream models for objective video quality measurements

Amendment 1

Editorial note: This is a complete-text publication. Modifications introduced by this amendment are shown in revision marks relative to Recommendation ITU-T J.343 (2014).

1 Scope

This Recommendation describes recommended objective models for non-intrusive monitoring of the video quality of IP-based video services based on the decoded video frames and packet-header. Some types of models also utilize the reference video or bitstream information. This Recommendation addresses six application areas:

- [ITU-T J.343.1] specifies Hybrid-NRe models
- [ITU-T J.343.2] specifies Hybrid-NR models
- [ITU-T J.343.3] specifies Hybrid-RRe models
- [ITU-T J.343.4] specifies Hybrid-RR models
- [ITU-T J.343.5] specifies Hybrid-FRe models
- [ITU-T J.343.6] specifies Hybrid-FR models

[ITU-T J.343.1] includes two models, [ITU-T J.343.2] includes one model, [ITU-T J.343.3] includes one model that operates at multiple side channel bandwidths to transmit the reduced reference information, [ITU-T J.343.4] includes one model that operates at multiple side channel bandwidths to transmit the reduced reference information, [ITU-T J.343.5] includes two models and [ITU-T J.343.6] includes two models.

All of these models predict video quality in terms of mean opinion score (MOS), for example on a five-level absolute category rating (ACR) scale (see [ITU-T P.910] or [ITU-T P.913]).

1.1 Applications

This Recommendation describes models that estimate perceptual video quality. The applications for the estimation models described in this Recommendation include, but are not limited to:

- real-time, in-service quality monitoring at the source;
- remote destination quality monitoring;
- quality measurement of transmission systems that utilize video compression and decompression techniques, including concatenations of such techniques.

More information about applications can be found in the individual Recommendations that address these six application areas.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently

valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T J.340] Recommendation ITU-T J.340 (2010), *Reference algorithm for computing peak signal to noise ratio of a processed video sequence with compensation for constant spatial shifts, constant temporal shift, and constant luminance gain and offset.*
- [ITU-T J.343.1] Recommendation ITU-T J.343.1 (2014), *Hybrid-NRe objective perceptual video quality measurement for HDTV and multimedia IP-based video services in the presence of encrypted bitstream data.*
- [ITU-T J.343.2] Recommendation ITU-T J.343.2 (2014), *Hybrid-NR objective perceptual video quality measurement for HDTV and multimedia IP-based video services in the presence of non-encrypted bitstream data.*
- [ITU-T J.343.3] Recommendation ITU-T J.343.3 (2014), *Hybrid-RRe objective perceptual video quality measurement for HDTV and multimedia IP-based video services in the presence of a reduced reference signal and encrypted bitstream data.*
- [ITU-T J.343.4] Recommendation ITU-T J.343.4 (2014), *Hybrid-RR objective perceptual video quality measurement for HDTV and multimedia IP-based video services in the presence of a reduced reference signal and non-encrypted bitstream data.*
- [ITU-T J.343.5] Recommendation ITU-T J.343.5 (2014), *Hybrid-FRe objective perceptual video quality measurement for HDTV and multimedia IP-based video services in the presence of a full reference signal and encrypted bitstream data.*
- [ITU-T J.343.6] Recommendation ITU-T J.343.6 (2014), *Hybrid-FR objective perceptual video quality measurement for HDTV and multimedia IP-based video services in the presence of a full reference signal and non-encrypted bitstream data.*
- [ITU-T P.910] Recommendation ITU-T P.910 (2008), *Subjective video quality assessment methods for multimedia applications.*
- [ITU-T P.913] Recommendation ITU-T P.913 (2014), *Methods for the subjective assessment of video quality, audio quality and audiovisual quality of Internet video and distribution quality television in any environment.*

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 processed [ITU-T P.913]: The reference stimuli presented through a system under test.

3.1.2 processed video sequence [ITU-T P.913]: The processed video sequence (PVS) is the impaired version of a video sequence.

3.1.3 reference [ITU-T P.913]: The original version of each source stimulus. This is the highest quality version available of the audio sample, video clip or audiovisual sequence.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 hybrid full reference model: An objective video quality model that predicts subjective quality using the reference video, the decoded video frames, packet headers, and the video payload. Such models cannot analyse encrypted video.

3.2.2 hybrid full reference encrypted model: An objective video quality model that predicts subjective quality using the reference video, the decoded video frames, and packet headers. Such models are suitable for use with encrypted video.

3.2.3 hybrid no reference model: An objective video quality model that predicts subjective quality using the decoded video frames, packet headers, and video payload. Such models can be deployed in-service but cannot analyse encrypted video.

3.2.4 hybrid no reference encrypted model: An objective video quality model that predicts subjective quality using the decoded video frames and packet headers. Such models can be deployed in-service and are suitable for use with encrypted video.

3.2.5 hybrid reduced reference model: An objective video quality model that predicts subjective quality using the decoded video frames, packet headers, video payload and features extracted from the reference video. Such models can be deployed in-service but cannot analyse encrypted video.

3.2.6 hybrid reduced reference encrypted model: An objective video quality model that predicts subjective quality using the decoded video frames, packet headers, and features extracted from the reference video. These models can be deployed in-service and are suitable for use with encrypted video.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ACR	Absolute Category Rating
CODEC	Coder-Decoder
ES	Elementary bitstream
FR	Full Reference
Hybrid-FR	Hybrid Full Reference
Hybrid-FRe	Hybrid Full Reference encrypted
Hybrid-NR	Hybrid No Reference
Hybrid-NRe	Hybrid No Reference encrypted
Hybrid-RR	Hybrid Reduced Reference
Hybrid-RRe	Hybrid Reduced Reference encrypted
MOS	Mean Opinion Score
MPEG	Moving Picture Experts Group
NR	No (or zero) Reference
PES	Packetized Elementary bitstream
PSNR	Peak Signal to Noise Ratio
PVS	Processed Video Sequence
RMSE	Root-Mean Square Error
RR	Reduced Reference
SRC	Source Reference Channel or Circuit
VQEG	Video Quality Experts Group