Inservice measurements of IPTV quality degradations during network transmissions

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Show video
Quality issues

Many things can affect the perceived quality
  - Content
  - Codec
  - Transmission errors
  - Post-filtering
  - Display
  - ...

Is it possible to quantify?
  - Yes, but many different methods exists…
Video Quality Measurements

To measure video quality is to accurately predict the perceived quality at the receiving side.
Measurement methods groups

out-of-service

• Full reference
  needs the whole reference

in-service

• Reduced reference
  needs some reference info

• No reference
  needs no reference info

Main focus today
Reduced reference model

- Coding
- Transfer
- Decoding

Extract information

Secure channel

Extract information

Video Quality
Standards

International Telecommunication Union (ITU) ITU-T Rec. J.144 and ITU-R Rec. BT.1683

Four different models are standardised:
- BTFR: British Telecom, UK
- EPSNR: Yonsei University, South Korea
- IES: CPqD, Brazil
- VQM: National Telecommunication and Information Administration (NTIA), USA

The VQM had the overall highest score in the evaluation by Video Quality Experts Group
VQM

- VQM is a Reduced Reference method
- VQM offline version can be used for evaluating quality of different compression settings and shorter transmission test
- iVQM inservice version i.e can be used to monitor quality in networks (only for PCs with TV-cards)
- Acreo developed an IPTV-interface
IPTV Interface: functional diagram

- Video stream receiver
- MPEG demultiplexer
- Video decoder
- Real-time, in-memory recording
- Renderer

Saving to an AVI file
IPTVInterface: characteristics

• 2 programming interfaces:
  ➢ Matlab DLL (for iVQM)
  ➢ Stand-alone, command-line executable

• Written using the MS DirectShow Framework:
  ➢ Uses external, standard decoders (not limited to MPEG)
  ➢ Windows only

• The video codec used is hard-wired
  ➢ To guarantee that both probes use the same codec!
IPTV Interface: codecs

The codec affects the image quality:

• De-interlacing:
  ➢ Blend, linear, Bob, …

• Different ways of handling missing data (packet loss):
  ➢ Green background
  ➢ Frozen image
  ➢ Partly-decoded image (square artefacts)
Network architecture of the test setup

Stockholm

Hudiksvall

Probe to probe communication

iVQM Probe 2

Agama probe

iVQM Probe 1

IPTV source

IPTV source
Comparison of Agama and iVQM

Agama:
- Real-time: detects single packet losses
- Monitors at the transport layer
- Guesses the effect on video quality (no-reference method)

iVQM:
- In-Service, but not real-time
  - 10s recording, 5min analysis gives 1/30 duty cycle
- Monitors the video quality (after decoding)
  - Result depends on the decoder used!
  - Should use the same decoder as the IPTV box of the end-user
- Well-calibrated against test users
Agama monitoring: 3-day statistics
iVQM: monitored events

iVQM monitoring 2007-05-30 to 2007-06-01
Conclusion

iVQM_iptvinterface:
• Allows In-Service monitoring of IP-based video services
  ➢ Uses external, standard decoders (not limited to MPEG)
• Detects sustained degradations of video quality
• Cannot currently catch single packet errors (low duty cycles)
• Stable, but still has false positives