SUBJECTIVE QUALITY OF SVC-CODED VIDEOS WITH DIFFERENT ERROR-PATTERNS CONCEALED USING SPATIAL SCALABILITY

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Subjective quality of SVC-coded videos with different error-patterns concealed using spatial scalability

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Network impairments and video transmission

How to minimize visual distortions?

- Stream protection
- Error-concealment

Network impairment → Packet loss → Reordering → Corruption → Delay → Missing or corrupted data during decoding → Error Propagation → Visual distortions
SVC-based error-concealment

• 2 SVC spatial layers
  – BL : 320x240
  – EL : 640x480

• Loss only in EL

• Hypothesis
  – No loss in base layer (base layer protection)
Snapshot examples

upscaled base layer  enhancement layer
Factors having an impact on perceived quality

Length of impairment

Number of impairments

Interval between impairments

Base Layer Quality
Experimental setup

• Content generation:
  • 9 video contents
    12 sec, 30 fps
  • 26 impairment patterns
    + 1 reference
  • SVC reference encoder
    JSVM v9.18
  • Lanczos upscaler
    QVGA → VGA
  • Impairment simulated on
    the decoded videos (YUV)
  • first and last second not
    impaired

• Test conditions:
  • ACR 5-levels scale
    (ITU-T P.910)
  • Standard viewing conditions
    (ITU-R BT.500)
  • 42” reference screen
  • 28 naïve viewers
  • 2 sessions of 45min with
    5 min break after 20 min
Impairment patterns

• Systematic approach:
  Several conditions for each influence factor

• Considered values for each influence factor:
  • Length: \{2,8,16,32,64,128\}
  • Number: \{1,2,3,4\}
  • Interval: \{8,16,32,64,128\}
  • BL Quality: QP = \{38,44\}
Experimental results

- Wide and balanced range of qualities
- Statistical significance analysis:
  - Student-t test
  - 95% intervals of confidence (displayed on next slides)
Impact of base layer quality

- Significant impact of base layer QP
- Stronger impact for long impairments

95% intervals of confidence displayed as error bars
Impact of length of impairments

- Significant impact
- Linear decrease of quality / exp. increase of duration
- Slope of the decrease depends on base layer QP
Impact of number of impairments

- Significant but limited impact
- Depends on base layer QP
Impact of interval between impairments

- No significant impact!
Conclusion

• Ordering the influence on quality of the 4 factors:
  1. quality of the base layer > 2. length of impairments
  3. number of impairments > 4. interval between impairments

• Modeling the influence of the parameters
  – Linear decrease with the length of impairments
  – Significant dependence on the base layer coding quality
  – Joint impact of factors

• To be investigated:
  – Influence of the source content
  – Bit-rate constraints

• Publication of video database
Thank you for your attention

Questions?
Impact of impairments on perceived quality

Our goal: *Study the factors that influence visual quality in this context*

4 factors:

- Impairments distribution:
  - *Length* of impairments (cumulated)
  - *Number* of impairments
  - *Interval* between impairments

- SVC error concealment:
  - *Quality of the base layer* (QP)