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International Telecommunication Union

Perceived quality of channel zapping

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Context

- Joint work with
  - Robert Kooij (TNO)
  - Kjell Brunnström (ACREO, Sweden)
- Work carried out in the FP6 Integrated project MUSE
  - Multi-Service Access Everywhere
  - www.ist-muse.org
- Contribution to ITU-T SG 12
- Presentation at ITU-T QoS workshop, June 2006
- Paper: 5th IASTED International Conference, Communication Systems and Networks, August 2006

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Outline

- Motivation
- Experiment
- Demo
- Model
- Validation
- Conclusions
- Further research

Motivation

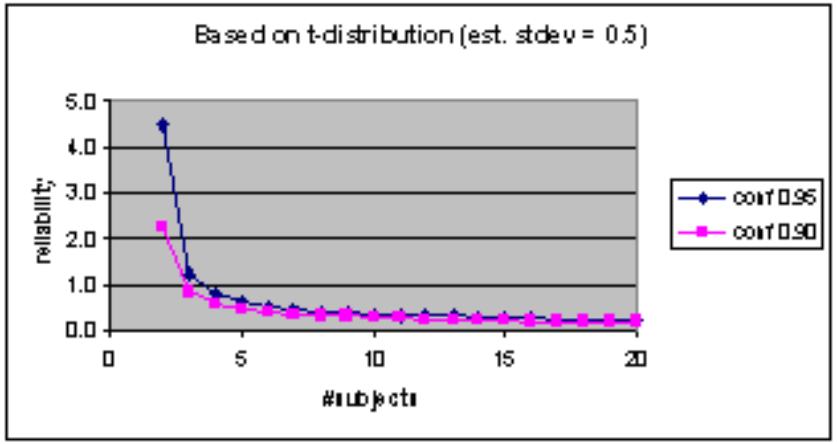
- Key element IPTV Quality of Experience
  - Zapping Time (time to switch between channels)
- Relation between zapping time and QoE
  - no explicit mapping
    - QoE ↔ Session time, see “opinion model for web-browsing applications – ITU-T G.1030”
  - only rough guidelines
    - “satisfactory if zapping is below 1 second”
- Aim of this talk
  - describe conducted subjective tests
  - mapping between zapping time and MOS

Experiment (1/2)

- Test set up
  - Laptop: serving as TV set
  - Mouse: serving as remote control
  - Local web page
    - Containing 5 “video clips”
      - preloaded animated gifs
    - Buttons to switch between “channels”

Experiment (2/2)

- Test subjects assess QoE according to *Absolute Category Rating Scale*
- Absolute Category Rating scale
  - 5 = “excellent”
  - 4 = “good”
  - 3 = “fair”
  - 2 = “poor”
  - 1 = “bad”



- 21 test subjects
- 10 zapping times
  - ranging from 0 to 5 seconds (0, 0.1 , 0.2 (2x), 0.5 (2x), 1.0 , 2.0 (2x), 5.0 s.)

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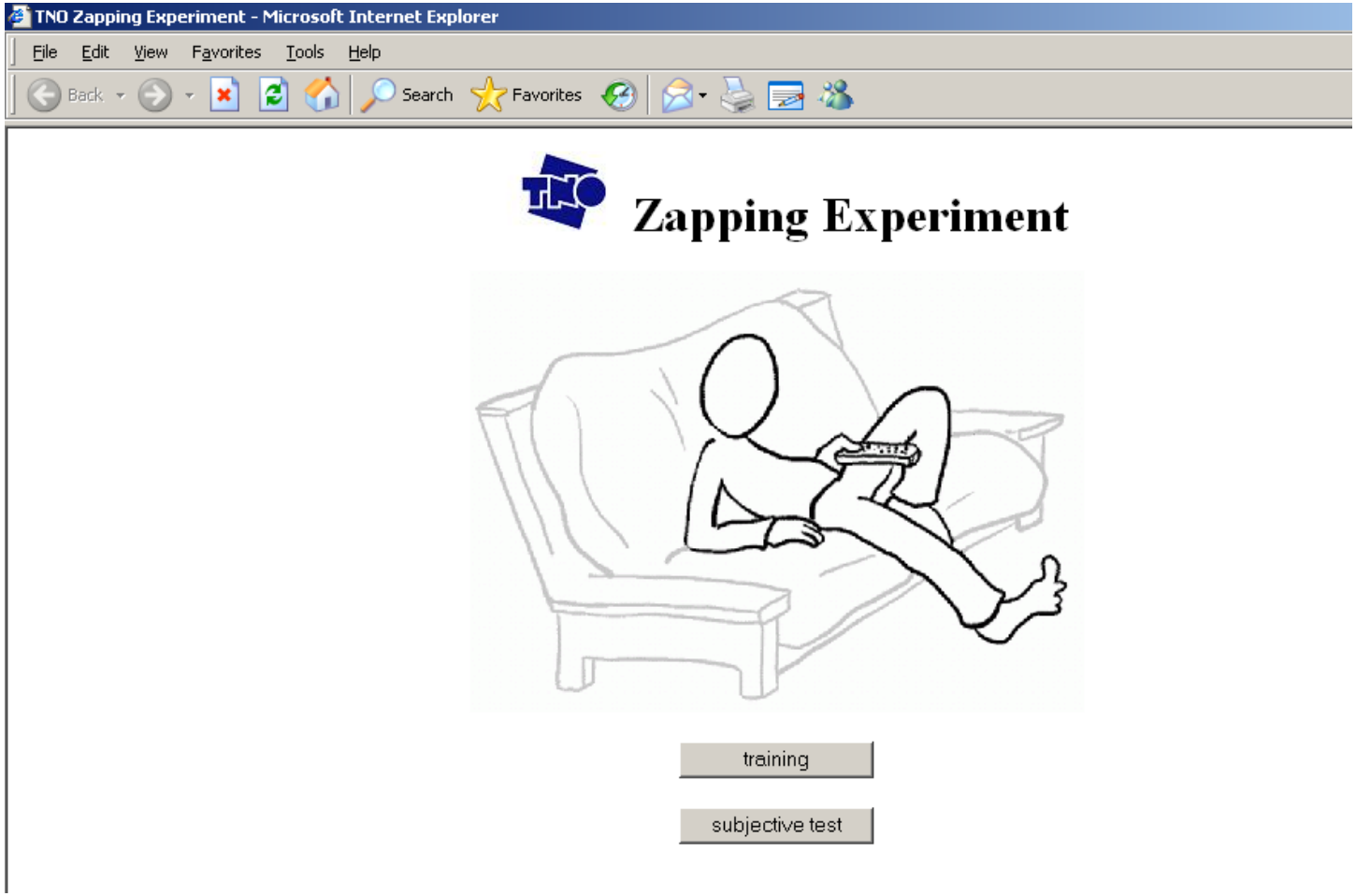
Demo


TNO Zapping Experiment - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Zapping Experiment
training
subjective test

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Model

- Based upon ITU-T G.1030 we suggest

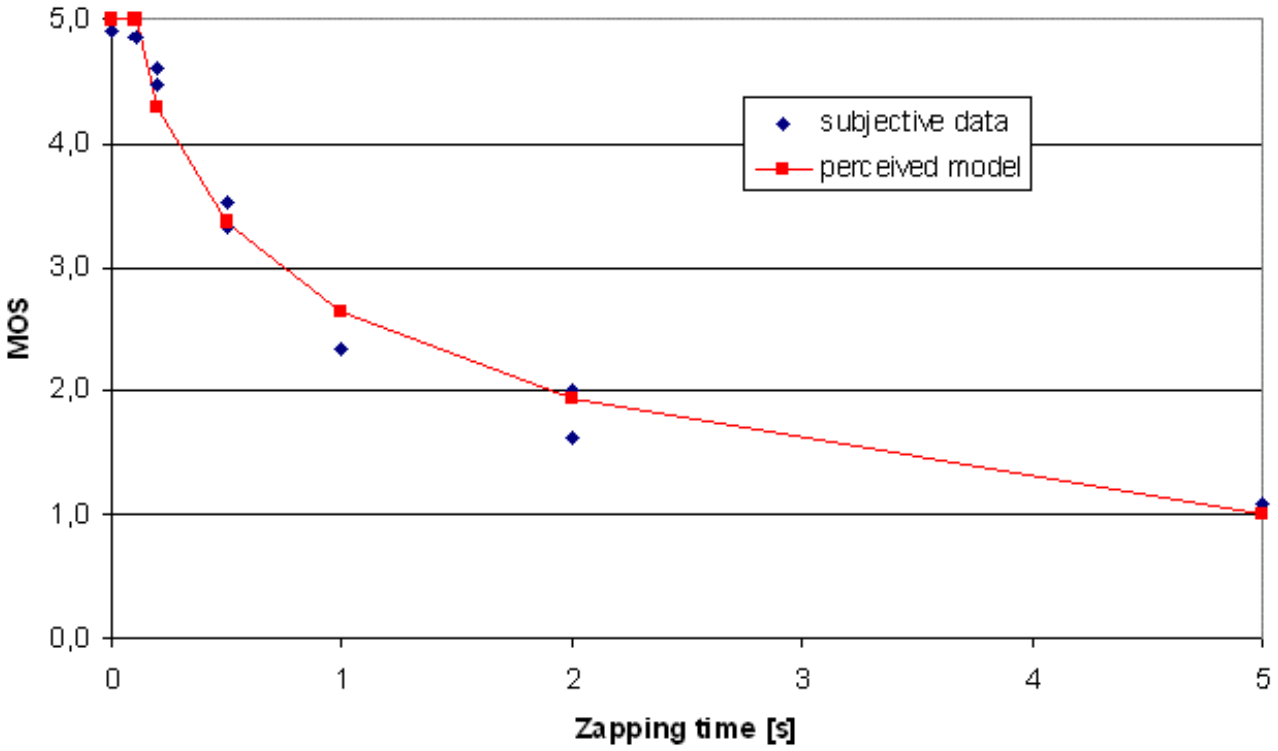
$$MOS = 4\left(\frac{\ln(ZappingTime) - \ln(Min)}{\ln(Min) - \ln(Max)}\right) + 5$$

  - Clipped between 1 and 5

- 0.1 s: limit for having instantaneous feel
  - Min = 0.1 s
  - Max = 5 s

MOS = max{min{-1.0255*ln(ZappingTime)+2.6456,5},1}

Validation (1/2)



- Correlation coefficient = 0.99
  - Root Mean Square Error = 0.203
  - Mean Confidence Interval = 0.234

Validation (2/2)

- Lower bound for acceptable QoE
  - MOS = 3.5 $\Rightarrow$ Zapping Time = 0.43 s
- Slight change in model parameters (e.g. due to context change):
  - Min = 0.01 s
  - Max = 3 s
  - Still high correlation (0.90)

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Conclusions

- Model for perceived quality of zapping gives **high** correlation with subjective data
- For acceptable QoE the requirement is: Zapping Time < 0.43 s

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Further research

- Model for “relaxed range” of zapping times, no instantaneous zapping
  - e.g. 0.5 s - 5 s
- Impact of variation of zapping times
- Use of video clips with audio and video
- “Lean forward” experience vs. “Lean backward” experience
  - PC vs. TV
- Zapping times for real-life IPTV

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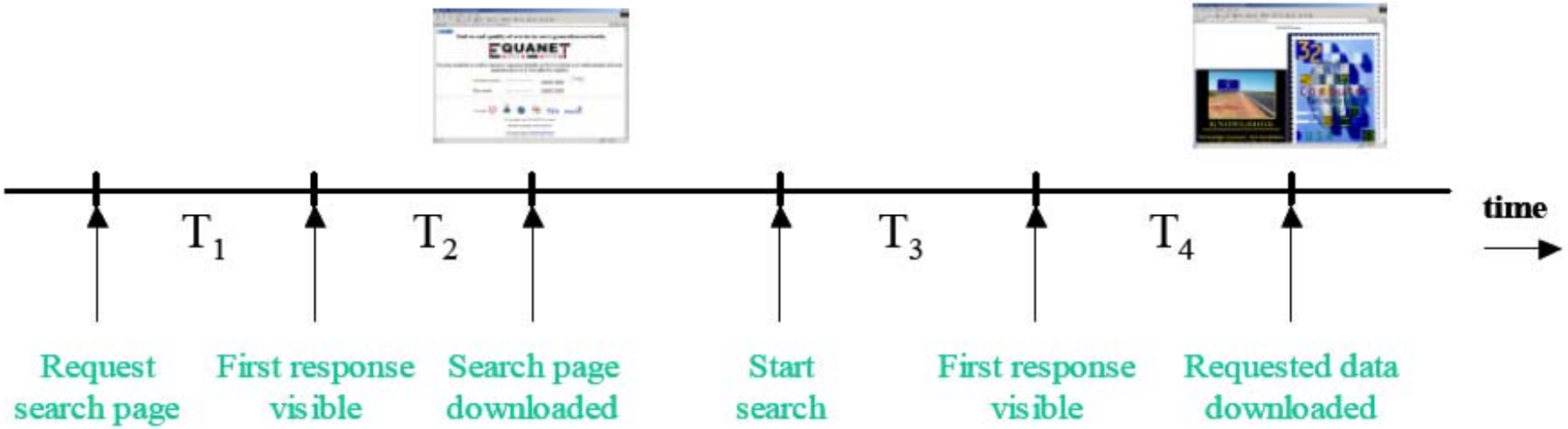
Thank you!

Back-up slide, G.1030



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Back-up slide, G.1030