Banding Annoyance vs. Overall Quality

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VQEG May 2022
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We developed **CAMBI** to estimate the annoyance of banding.

Remaining question is how banding compares to the standard compression artifacts with respect to the overall perceived quality?

The answer will help us find a reasonable combination of CAMBI and VMAF into a banding-aware quality estimator.
Study on 8-bit videos with banding and with compression artifacts

- 14 source contents (7 from CAMBI 8-bit dataset, 7 from VMAF 4K dataset)
- 84 videos (6 per content)
- 42 observers
- Continuous quality scale
  - Quality is:
    - 100 Excellent
    - 75 Good
    - 50 Fair
    - 25 Poor
    - 0 Bad
Recovered Quality Scores

- Banding covers big portion of the quality scale
- Localized banding outside of region of interest (You), does not seem to bother observers as much as global artifacts
Sanity check

Results for the videos from Nantes 4k dataset
Sanity check: Results for the videos from VMAF 4K dataset

- No two videos with inverted order and non-overlapping CIs
- Videos distributed fairly well along the 45° line
- RMSE (8.42) < Average CI length (~11)
Sanity check: Results for the videos from VMAF 4K dataset

- The linear fit reveals slight compression of the scale
  - Scores in the cambi_vmaf study don’t go as high and as low
  - Possible explanations:
    - Continuous vs. discrete scale
    - Monitor vs. 4K display
    - Different training

...overall, the results are VERY well aligned.
Scores for banding videos

Subset of videos from CAMBI 8bit dataset
Our expectation is that the **overall quality scores** will be generally **higher** than **banding annoyance** scores. Reason being that even the most severe banding will not be as annoying as the lowest bitrate videos from VMAF 4K dataset.
Results for the subset of videos from CAMBI 8b dataset show fairly linear relationship between banding annoyance and overall quality.

- Most scores below 45° line seem to confirm our assumption
- Relationship between banding annoyance and overall quality seems fairly linear
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VMAF<sub>BA</sub>

A Banding Aware Quality Metric
Given the aforementioned linear relationship between banding annoyance and overall quality, it may be possible to estimate the quality by a linear combination of VMAF and CAMBI.
Results for VMAF

PLCC: 0.8416 | SROCC: 0.6768 | AUC_BW: 0.9117

Predictions vs MOS for 'cambi_8bit' and 'nantes_4k'.
Results for CAMBI

PLCC: 0.1016 | SROCC: 0.1409 | AUC_BW: 0.5111

- Cambi_8bit
- Nantes_4k
3D plots
Linear combination (maximizing SROCC)

\[ VMAF_{BA} = VMAF - 0.85 \times CAMBI \]
**VMAF** can improve VMAF even on datasets not targeting banding directly.

For more information check out:

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Future work

- Investigation of interaction between heavy compression and heavy banding
- Integration of CAMBI into VMAF as an elementary feature
Thank you!

VQEG December 2022
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