Subjective and Objective Quality Assessment of Tone-Mapped Images

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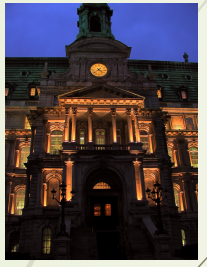
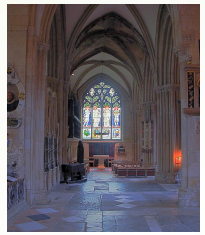
Outline

- HDR Image and applications
- Tone-Mapping
- Need for Tone-Mapping
- State of the art Objective Quality metrics
- Disadvantages of full reference and no reference metrics
- Dynamic range independent metrics
- Visual model
- Learning based

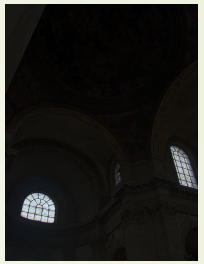
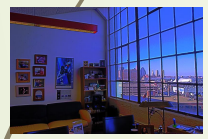
Tone-mapped images

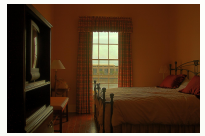
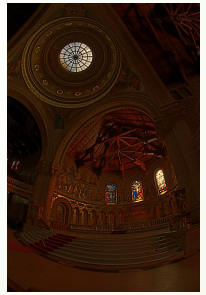
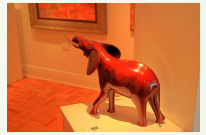
Image Selection







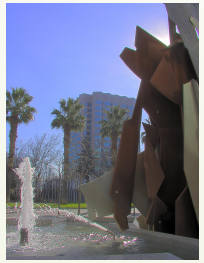



Image selection

- Standard images
- Varying scene contents and illuminations
- Number of images
- Wide spread of dynamic range of the image set
- Time duration
- Questions to ask
- Tone-mapping operators
- Image resolution

Subjective evaluation

- Sorting and database
  - Number of subjects
  - Spread of dynamic range
  - Sorting into different dynamic range sets
  - Selection from each set
  - Tone-mapping operators input parameter
    - Ashikhmin [5], Banterle [6], Durand [8], Fattal [9], Ferwerda [10], Kim [11], Krawczy [12], Kuang [13], Lischinsk i[14], Schlick [16], Drago [7], Ward [18], [21] ,Pattanaik [19], Reinhard [15],[20], Tumblin [22]
- Experimental setup
  - GUI
  - Time slots
  - Scale
  - Random ordering
- Removal of outliers

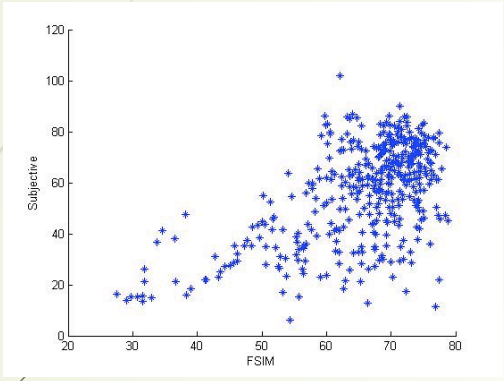
GUI

GUI

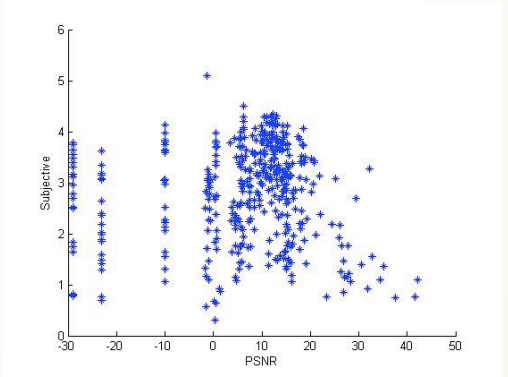
Objective quality assessment

- Full reference and no-reference
- FSIM [28]
- PSNR
- SBIQE [26]
- QAC [25]
- NIQE [27]

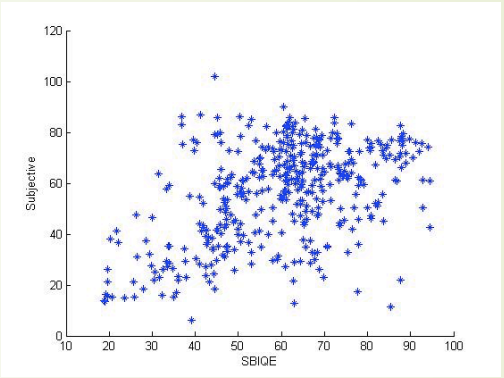
Results



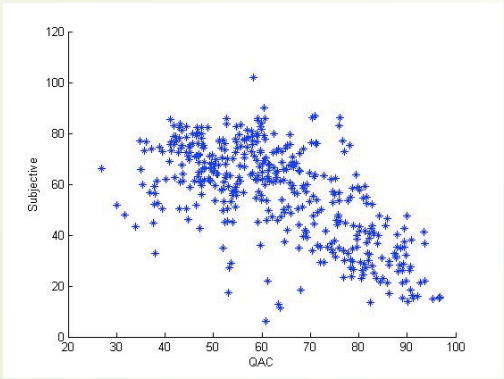
FSIM



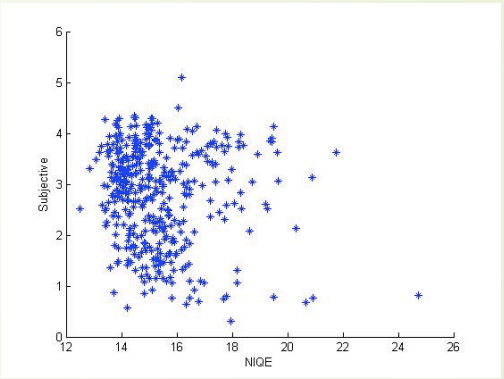
PSNR



SBIQE



QAC



NIQE

Correlation scores

Algorithm	Subject1	Subject2	Subject3	Subject4	Subject5	Subject6	Subject7	Subject8	Subject9	mean
QAC LCC	0.2024	0.3344	0.3184	0.1862	0.3517	0.4129	0.3770	0.5761	0.2652	0.6008
SBIQE LCC	0.2421	0.3764	0.3773	0.1386	0.3271	0.4057	0.3595	0.5503	0.2592	0.5336
NIQE LCC	0.0094	0.1586	0.1577	0.0763	0.1532	0.2069	0.1395	0.1794	0.0229	0.2054
FSIM LCC	0.3158	0.4753	0.4256	0.1803	0.4109	0.5325	0.4032	0.6544	0.2645	0.6973

Conclusions and future work

- Evaluation of State-of-the-art objective quality metrics
- Need for improvement of the objective quality assessment algorithms
- Some parameters from each tone-mapping operator can still be used
- Parameter selection
- Create a learning based visual model for full reference dynamic range independent tone-mapped image quality assessment
- No reference dynamic range independent quality metric
- Updating the database
- The database and subjective scores will soon be made available online at [31]

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