SURE-based Optimization for Adaptive Sampling and Reconstruction

Supplementary Materials

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PART I
Equal-Time Comparison

Compared Methods:
• Monte Carlo
• Greedy Error Minimization [Rousselle et al., SIGGRAPH Asia 2011]
• Random Parameter Filtering [Sen and Darabi, ACM TOG 2012]
• SURE-based Optimization (our approach, using cross bilateral filters)
Global Illumination (Path Tracing)

Motion Blur

1600 x 1200
SPONZA

Equal-time Monte Carlo, 68 spp, 890.5 sec.
SPONZA
Greedy Error Minimization [Rousselle et al., SIGGRAPH Asia 2011], 63.84 spp, 906.2 sec.
SPONZA
SURE-based Optimization (Our Approach), 63.24 spp, 896.0 sec.
SPONZA Reference, 8192 spp
Environment Lighting
Area Lighting
Motion Blur

800 x 600
TOWN
Equal-time Monte Carlo, 82 spp, 59.9 sec.
Greedy Error Minimization [Rousselle et al., SIGGRAPH Asia 2011], 51.82 spp, 61.8 sec.
Random Parameter Filtering [Sen and Darabi, ACMTOG 2012], 8 spp, 272.4 sec.
SURE-based Optimization (Our Approach), 39.79 spp, 59.6 sec.
TOWN
Reference, 4096 spp
Global Illumination (One-Bounce Path Tracing)
Depth of Field

1024 x 1024
SIBENIK
Equal-time Monte Carlo, 44 spp, 140.0 sec.
SIBENIK
Greedy Error Minimization [Rousselle et al., SIGGRAPH Asia 2011], 39.86 spp, 135.0 sec.
SIBENIK
Random Parameter Filtering [Sen and Darabi, ACMTOG 2012], 8 spp, 363.0 sec.
SURE-based Optimization (Our Approach), 26.69 spp, 140 sec.
SIBENIK Reference, 4096 spp
Environment Lighting
Glossy Reflection

800 x 800
TEAPOT
Equal-time Monte Carlo, 35 spp, 42.0 sec.
Greedy Error Minimization [Rousselle et al., SIGGRAPH Asia 2011], 23.96 spp, 44.3 sec.
Random Parameter Filtering [Sen and Darabi, ACMTOG 2012], 8 spp, 374.4 sec.
SURE-based Optimization (Our Approach), 8 spp, 40.4 sec.
TEAPOT
Reference, 4096 spp
Global Illumination (One-Bounce Path Tracing)
GARGOYLE
Equal-time Monte Carlo, 56 spp, 161.7 sec.
GARGOYLE
Greedy Error Minimization [Rousselle et al., SIGGRAPH Asia 2011], 43.92 spp, 167.4 sec.
GARGOYLE
Random Parameter Filtering [Sen and Darabi, ACMTOG 2012], 8 spp, 608.3 sec.
GARGOYLE
SURE-based Optimization (Our Approach), 30.90 spp, 160.0 sec.
GARGOYLE
Reference, 4096 spp
Global Illumination (Path Tracing)
SANMIGUEL
Equal-time Monte Carlo, 70 spp, 1209.4 sec.
SANMIGUEL
Greedy Error Minimization [Rousselle et al., SIGGRAPH Asia 2011], 63.59 spp, 1239.9 sec.
Random Parameter Filtering [Sen and Darabi, ACMTOG 2012], 16 spp, 2617.9 sec.
SANMIGUEL
SURE-based Optimization (Our Approach), 61.69 spp, 1228.9 sec.
SANMIGUEL
Reference, 8192 spp
PART II
Equal-Sample Comparison

Compared Methods:

• Greedy Error Minimization [Rousselle et al., SIGGRAPH Asia 2011]
• Random Parameter Filtering [Sen and Darabi, ACMTOG 2012]
• SURE-based Optimization (our approach, using cross bilateral filters)
Global Illumination (Path Tracing)
Motion Blur

1600 x 1200
Greedy Error Minimization [Rousselle et al., SIGGRAPH Asia 2011], 16 spp, 210.0 sec.
SPONZA
Random Parameter Filtering [Sen and Darabi, ACMTOG 2012], 16 spp, 1676.1 sec.
SPONZA
SURE-based Optimization (Our Approach), 16 spp, 273.3 sec.
SPONZA
Reference, 8192 spp
Environment Lighting
Area Lighting
Motion Blur

800 x 600
TOWN
Greedy Error Minimization [Rousselle et al., SIGGRAPH Asia 2011], 8 spp, 9.4 sec.
Random Parameter Filtering [Sen and Darabi, ACMTOG 2012], 8 spp, 272.4 sec.
TOWN
SURE-based Optimization (Our Approach), 8 spp, 20.0 sec.
TOWN Reference, 4096 spp
Global Illumination (One-Bounce Path Tracing)
Depth of Field

1024 x 1024
SIBENIK
Greedy Error Minimization [Rousselle et al., SIGGRAPH Asia 2011], 8 spp, 27.6 sec.
Random Parameter Filtering [Sen and Darabi, ACMTOG 2012], 8 spp, 363.0 sec.
SURE-based Optimization (Our Approach), 8 spp, 64.2 sec.
SIBENIK
Reference, 4096 spp
Environment Lighting
Glossy Reflection

800 x 800
TEAPOT
Greedy Error Minimization [Rousselle et al., SIGGRAPH Asia 2011], 8 spp, 14.1 sec.
TEAPOT
Random Parameter Filtering [Sen and Darabi, ACMTOG 2012], 8 spp, 374.4 sec.
TEAPOT
SURE-based Optimization (Our Approach), 8 spp, 40.4 sec.
Global Illumination (One-Bounce Path Tracing)

1024 x 1024
GARGOYLE
Greedy Error Minimization [Rousselle et al., SIGGRAPH Asia 2011], 8 spp, 28.6 sec.
GARGOYLE
Random Parameter Filtering [Sen and Darabi, ACMTOG 2012], 8 spp, 608.3 sec.
GARGOYLE
SURE-based Optimization (Our Approach), 8 spp, 68.3 sec.
GARGOYLE
Reference, 4096 spp
Global Illumination (Path Tracing)
SANMIGUEL
Greedy Error Minimization [Rousselle et al., SIGGRAPH Asia 2011], 16 spp, 304.4 sec.
SANMIGUEL
Random Parameter Filtering [Sen and Darabi, ACMTOG 2012], 16 spp, 2617.9 sec.
SANMIGUEL
SURE-based Optimization (Our Approach), 16 spp, 336.3 sec.
SANMIGUEL Reference, 8192 spp
PART III
Equal-Time Comparison for Isotropic Gaussian Filters

Compared Methods:
• Greedy Error Minimization [Rousselle et al., SIGGRAPH Asia 2011]
• SURE-based Optimization (our approach, using isotropic Gaussian filters)
TOASTERS

Area Lighting
Depth of Field

1024 x 1024
TOASTERS
Greedy Error Minimization [Rousselle et al., SIGGRAPH Asia 2011]
SURE-based Optimization (Our Approach), using Isotropic Gaussian Filters
TOASTERS
Reference, 4096 spp
TOASTERS – Scale Selection Map
Greedy Error Minimization [Rousselle et al., SIGGRAPH Asia 2011]
TOASTERS - Scale Selection Map
SURE-based Optimization (Our Approach), using Isotropic Gaussian Filters
PART IV
Equal-Time Comparison for Cross Non-local Means Filters

Compared Methods:

• Global cross non-local means filters
• SURE-based Optimization (our approach, using cross non-local means filters)
Environment Lighting
Area Lighting
Motion Blur

800 x 600
TOWN
Global Non-local Means Filter, 41.2 spp
SURE-based Optimization (Our Approach), using Cross Non-local Means Filters, 41.2 spp, 244.7 sec.
TOWN Reference, 4096 spp