

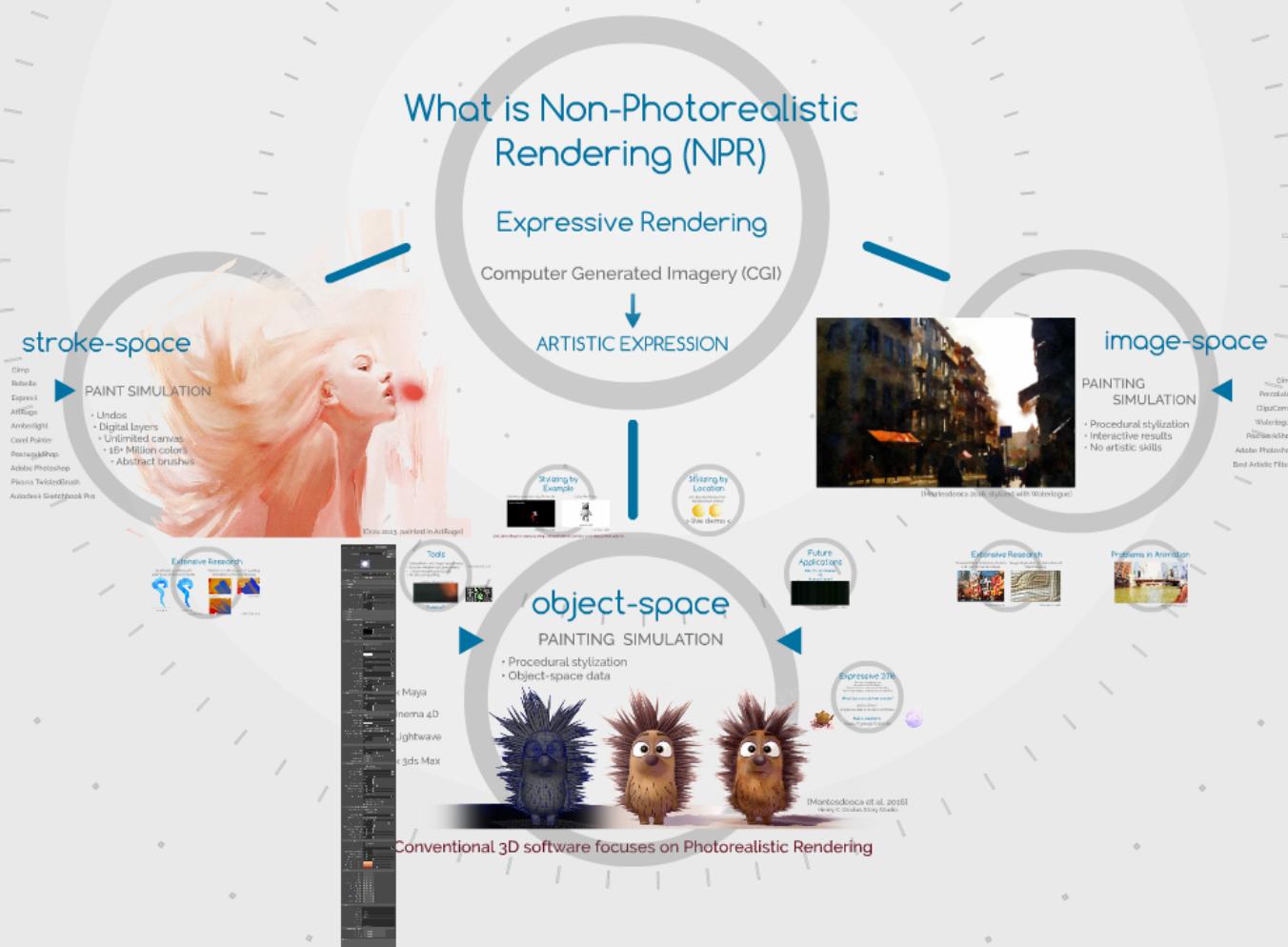


Artistically Driven Non-Photorealistic Computer Animation

S. E. Montesdeoca

H. S. Seah

D. Benvenuti

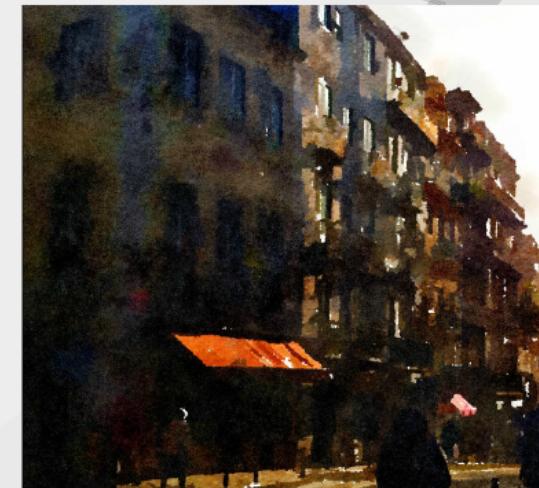


What is Non-Photorealistic Rendering (NPR)

Expressive Rendering

Computer Generated Imagery (CGI)

ARTISTIC EXPRESSION



S. E. Montesdeoca

H. S. Seah

D. Benvenuti

What is Non-Photorealistic Rendering (NPR)

Expressive Rendering

Computer Generated Imagery (CGI)

ARTISTIC EXPRESSION

stroke-space

Gimp
Rebelle
Expressi
ArtRage
Amberlight
Corel Painter
PostworkShop
Adobe Photoshop
Pixarra TwistedBrush
Autodesk Sketchbook Pro

PAINT SIMULATION

- Undos
- Digital layers
- Unlimited canvas
- 16+ Million colors
- Abstract brushes



[Orzu 2013, painted in ArtRage]



Extensive Research



object-space PAINTING SIMULATION

- Procedural stylization
- Object-space data



Conventional 3D software focuses on Photorealistic Rendering

image-space

PAINTING SIMULATION

- Procedural stylization
- Interactive results
- No artistic skills



[Montesdeoca 2016, styled with Waterlogue]

Gimp
Percolator
ClipzComic
Waterlogue
PostworkShop
Adobe Photoshop
Best Artistic Filters

Stylizing by Example

Stylizing by Location

Future Applications

Extensive Research

Problems in Animation



stroke-space

PAINT SIMULATION

- Undos
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- 16+ Million colors
- Abstract brushes

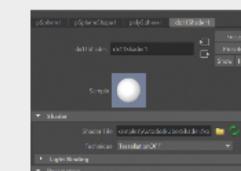
Gimp
Rebelle
Expresii
ArtRage
Amberlight
Corel Painter
PostworkShop
Adobe Photoshop
Pixarra TwistedBrush
Autodesk Sketchbook Pro

[Orzu 2013, painted in ArtRage!]

Extensive Research

RealBrush: painting with examples of physical media

Wetbrush: CPU-based 3D painting simulation at the bristle level



Tools

- Using filters and image-processing
- Custom shaders (cel, barycentric)
- Texture mapping stylization
- Artistic compositing

Art&Craft - The Leafcutter 2018

Extensive Research

RealBrush: painting with examples of physical media



(a) exemplar



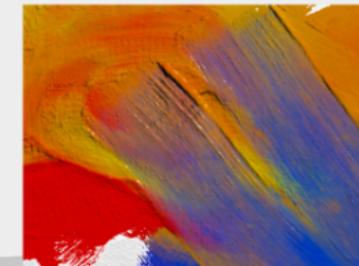
(b) RealBrush

[Lu et al. 2013]

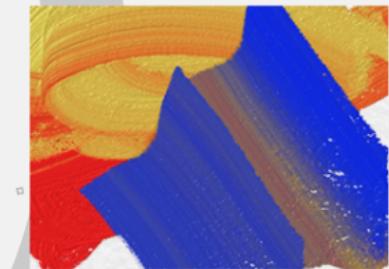
Wetbrush: CPU-based 3D painting simulation at the bristle level



(a) ArtRage 4



(c) Wetbrush



(b) Fresh Paint

[Chen et al. 2015]

S. E. Montesdeoca

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What is Non-Photorealistic Rendering (NPR)

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[Orzu 2013, painted in ArtRage]

Extensive Research



Maya
Cinema 4D
Lightwave
3ds Max

object-space

PAINTING SIMULATION

- Procedural stylization
- Object-space data



[Montesdeoca et al. 2016]
Henry © Oculus Story Studio

Conventional 3D software focuses on Photorealistic Rendering



Stylizing by Example
Stylizing by Location



[Montesdeoca 2016, styled with Waterlogue]

image-space

PAINTING SIMULATION

- Procedural stylization
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- No artistic skills



Extensive Research



Problems in Animation

Gimp
Percolator
ClipzComic
Waterlogue
PostworkShop
Adobe Photoshop
Best Artistic Filters

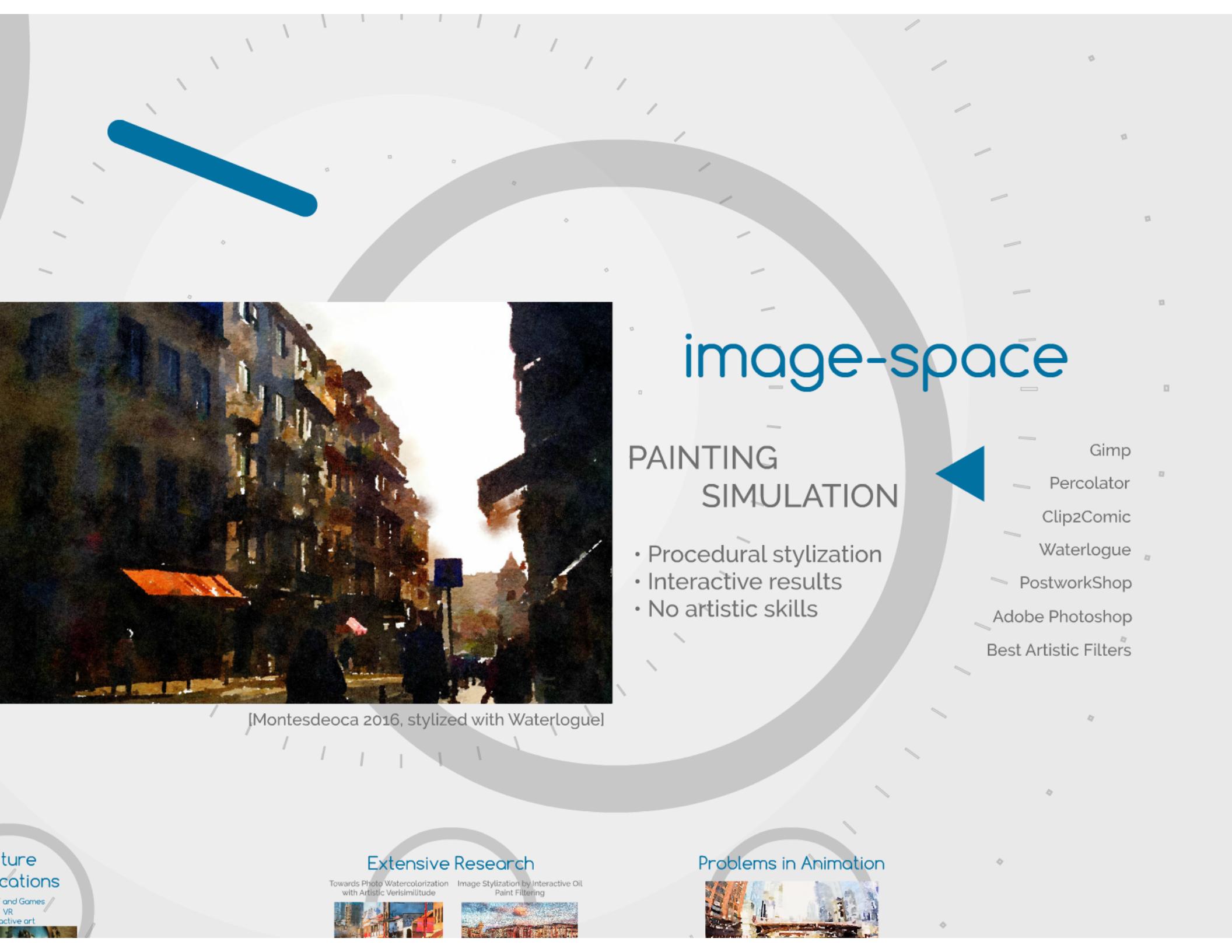


image-space

PAINTING SIMULATION

- Procedural stylization
- Interactive results
- No artistic skills

Gimp

Percolator

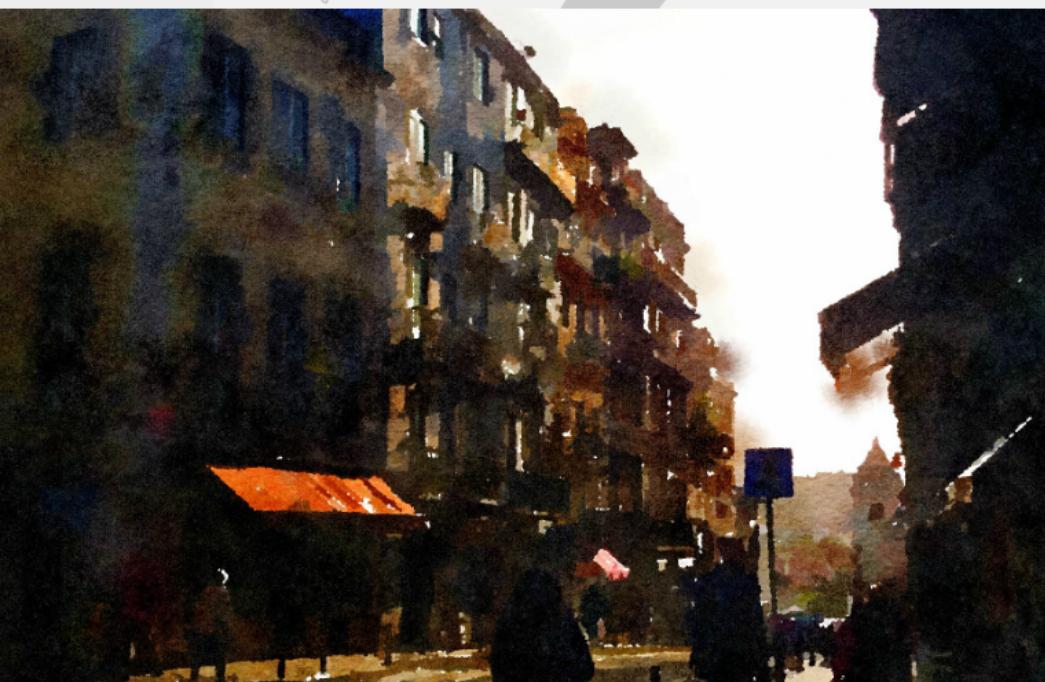
Clip2Comic

Waterlogue

PostworkShop

Adobe Photoshop

Best Artistic Filters



JMontesdeoca 2016, stylized with Waterlogue

Extensive Research

Towards Photo Watercolorization
with Artistic Verisimilitude



Image Stylization by Interactive Oil
Paint Filtering



Problems in Animation



Extensive Research

Towards Photo Watercolorization
with Artistic Verisimilitude



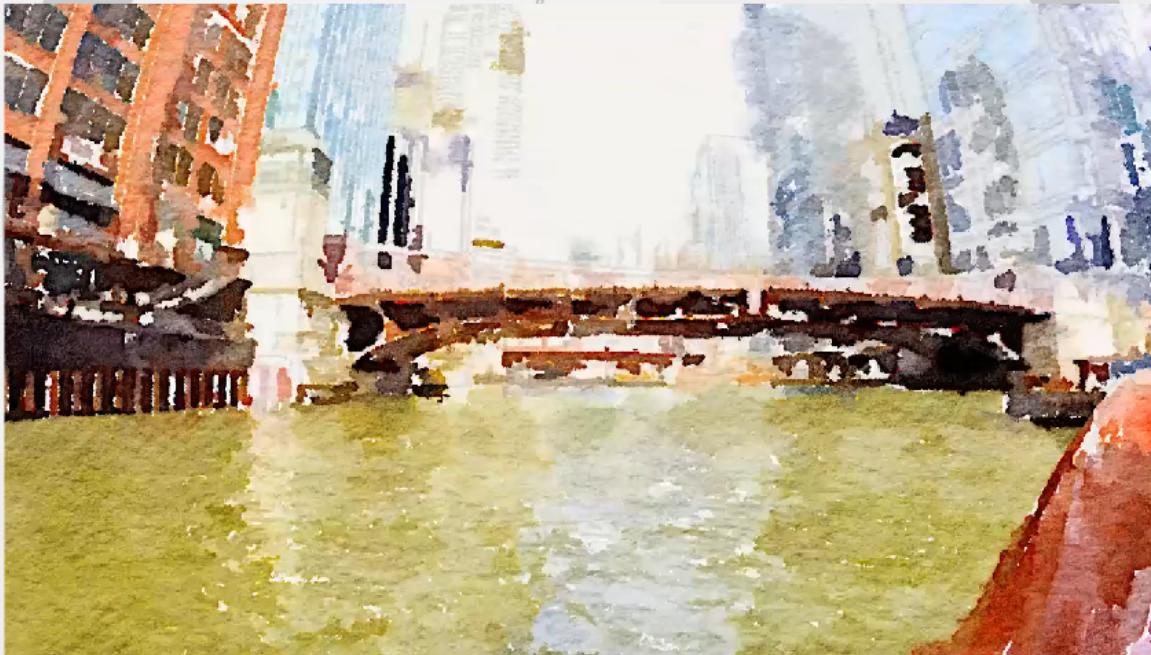
[Wang et al. 2014]

Image Stylization by Interactive Oil
Paint Filtering



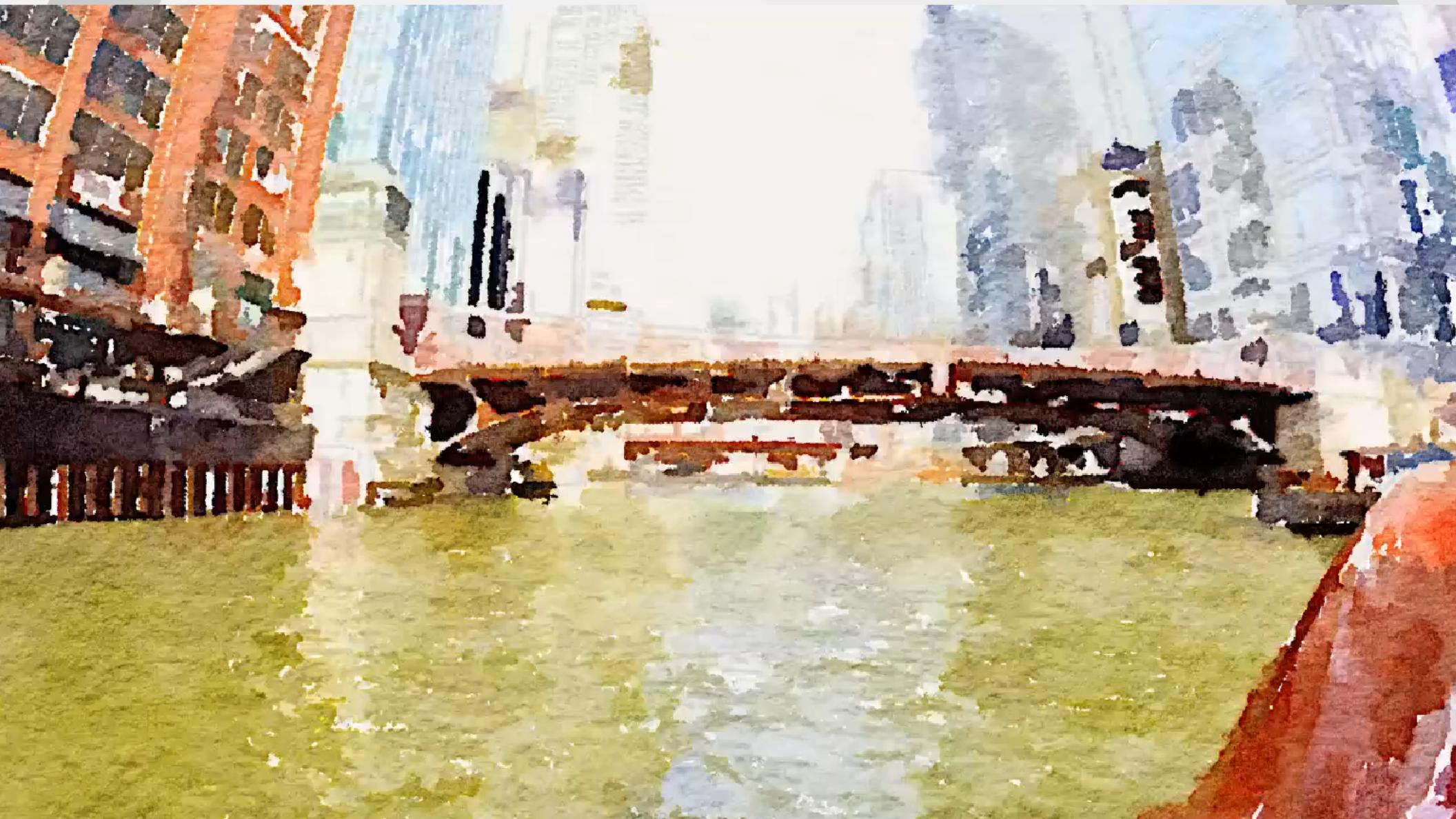
[Semmo et al. 2016]

Problems in Animation



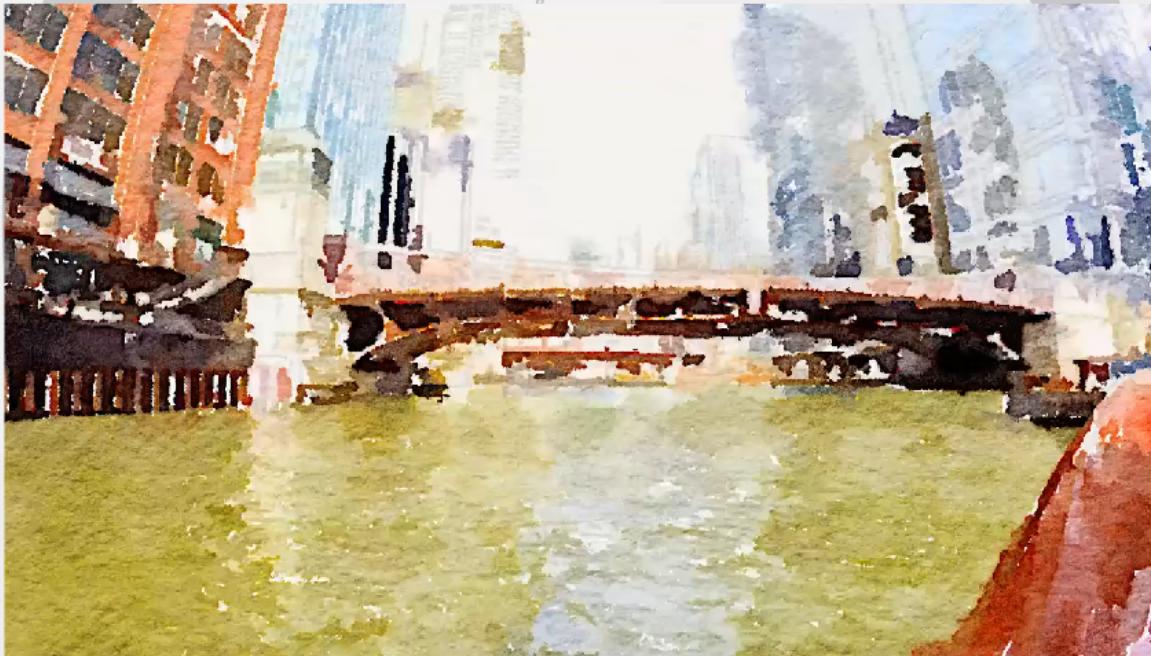
stylized with Waterlogue

FOOTPRINTS IN THE MIST



stylized with Waterlogue

Problems in Animation



stylized with Waterlogue

S. E. Montesdeoca

H. S. Seah

D. Benvenuti

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[Orzu 2013, painted in ArtRage]

Extensive Research

Tools

Future Applications

Problems in Animation

Expressive 2016

Extensive Research

Problems in Animation

[Orzu 2013, painted in ArtRage]



Tools

- Using filters and image-processing
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- Texture mapping stylization
- Artistic compositing



Future?

Bisousou et al. 2016



ArtCraft - The Lost Cities 2016

Dorothy, Marley

object-space

PAINTING SIMULATION

- Procedural stylization
- Object-space data



[Montesdeoca et al. 2016]
Henry © Oculus Story Studio

Conventional 3D software focuses on Photorealistic Rendering

Stylizing by Example

Stylizing Animation by Example



[Baudot et al. 2013]

Color Me Noisy



[Föller et al. 2014]

Stylizing by Location

Art-directed Watercolor Rendered Animation



> live demo <

Future Applications

Film, TV and Games
VR
Interactive art



The Fat Lady © Warner Bros.

Expressive 2016

The 2nd Symposium on Computational Aesthetics in Graphics, Modeling and Simulation
Artist-Based Interfaces and Rendering
Non-Photorealistic Animation and Rendering

What tools should we create?
artist-driven
implemented in known software



beta-testers
<https://goo.gl/CxGCOZ>



object-space PAINTING SIMULATION

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Stylizing by Example
Stylizing Animation by Example
Color Me Noisy
Limitations: Requires source paintings, not applicable in real-time, run in independent systems

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Rendered Animation
> live demo <

Future Applications
Film, TV and Games
VR
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Expressive 2016
The Joint Symposium on
Artistic Computing
Sketch-based Interfaces and Modeling
Input/Performance, Animation and Rendering
What tools should we create?
artist-driven
implemented in known software
beta-testers
<https://goo.gl/CxGCQ7>

Tools
Using filters and image-processing
Custom Shaders (soft, barycentric)
Texture mapping stylization
Artistic compositing
Antiblur - The Leatherface tool
Shady's Meander

Maya
cinema 4D
lightwave
3ds Max

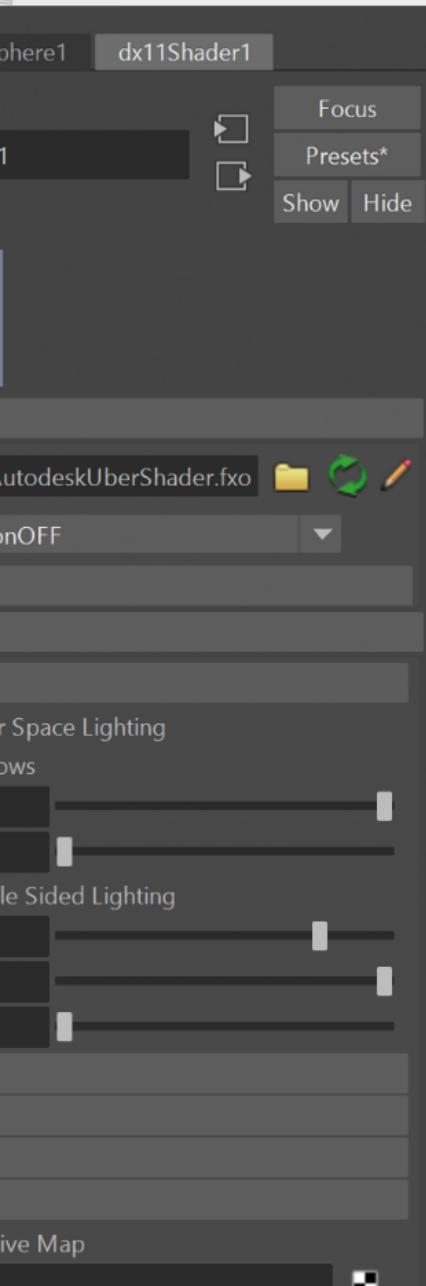
Conventional 3D software focuses on Photorealistic Rendering

[Montesdeoca et al. 2016] Henry © Oculus Story Studio

[Montesdeoca 2016, stylized city night]

Extensive
Towards Photo Watercolorization
with Artistic Verisimilitude

erzu 2013, painted in ArtRage]



Tools

- Using filters and image-processing
- Custom shaders (cel, barycentric)
- Texture mapping stylization
- Artistic compositing

Art&Graft - The Leafcutter 2016



Future?

[Bousseau et al. 2006]



Disney's Meander



Limita

Art&Graft - The Leafcutter 2016



Future?

Tools

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- Artistic compositing

Art&Graft - The Leafcutter 2016



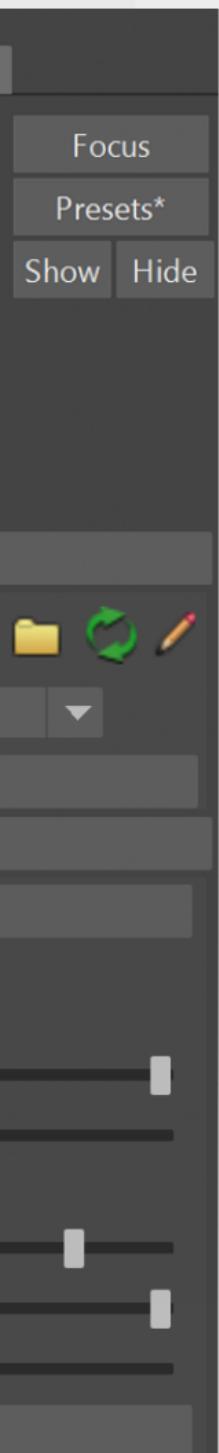
[Bousseau et al. 2016]



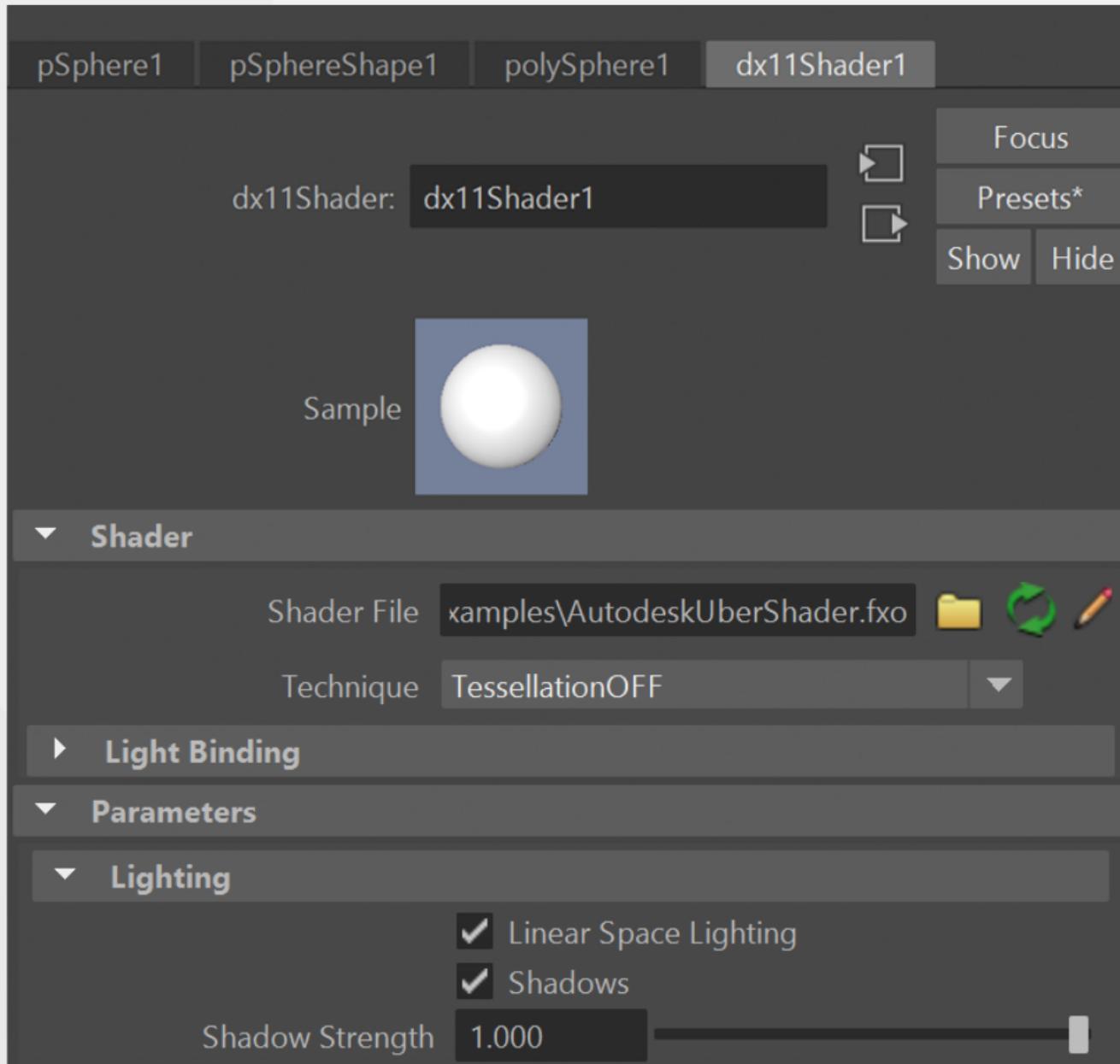
Disney's Meander



Future?



Orzu 2013, pair



Shader File

xamples\AutodeskUberShader.fxo



Technique

TessellationOFF

▶ Light Binding

▼ Parameters

▼ Lighting

 Linear Space Lighting Shadows

Shadow Strength

1.000



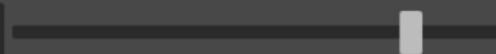
Shadow Bias

0.010

 Double Sided Lighting

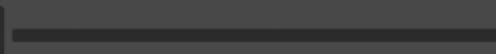
Rim Light Min

0.800



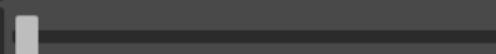
Rim Light Max

1.000



Rim Light Brightness

0.000



▶ Light 0

▶ Light 1

▶ Light 2

▼ Ambient and Emissive

 Emissive Map

Emissive Map

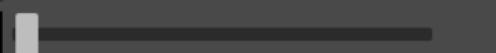


Emissive Intensity

1.000



Ambient Sky Color



Ambient Ground Color

 Ambient Occlusion Map

Ambient Occlusion Map



▶ Light 2

▼ Ambient and Emissive

Emissive Map	<input type="checkbox"/>
Emissive Intensity	1.000
Ambient Sky Color	<input type="checkbox"/>
Ambient Ground Color	<input type="checkbox"/>
Ambient Occlusion Map	<input type="checkbox"/>
Ambient Occlusion Map	<input type="checkbox"/>

▼ Diffuse

Diffuse Model	Lambert	<input type="button" value="▼"/>
Diffuse Map	<input type="checkbox"/>	<input type="checkbox"/>
Diffuse Color	<input type="color"/>	<input type="checkbox"/>
Lightmap Map	<input type="checkbox"/>	<input type="checkbox"/>
Lightmap Map	<input type="checkbox"/>	<input type="checkbox"/>
Blended Normal Mask	<input type="checkbox"/>	<input type="checkbox"/>
Blended Normal	0.150	<input type="checkbox"/>
IBL Map	<input type="checkbox"/>	<input type="checkbox"/>
IBL Cube Map	<input type="checkbox"/>	<input type="checkbox"/>
IBL 2D Map	<input type="checkbox"/>	<input type="checkbox"/>
IBL Type	Cube	<input type="button" value="▼"/>
IBL Intensity	0.500	<input type="checkbox"/>

Lightmap Map

Blended Normal Mask

Blended Normal Mask

Blended Normal

0.150



IBL Map

IBL Cube Map



IBL 2D Map



IBL Type

Cube



IBL Intensity

0.500

IBL Blur

5.000

IBL Rotation

0.000

IBL Spherical Pinch

1.100

▼ Opacity

Opacity

1.000

Opacity Mask

Opacity Mask



Opacity Mask Bias

0.100

Opacity Fresnel Min

0.000

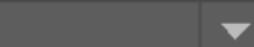
Opacity Fresnel Max

0.000

▼ Specular

Specular Model

Blinn



Specular Map

Specular Color



Opacity Mask Bias

0.100



Opacity Fresnel Min

0.000



Opacity Fresnel Max

0.000



Specular

Specular Model

Blinn

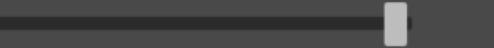


Specular Map



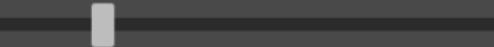
Specular Map

Specular Color



Specular Power

20.000



Anisotropic Direction Map



Anisotropic Direction Type

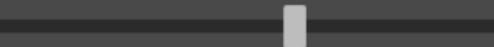
Tangent space (Comb/Flow map)



Anisotropic Direction Map

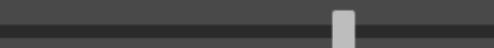
Anisotropic Spread X

0.200



Anisotropic Spread Y

0.400



Mix Blinn-Anisotropic by Direction Alpha

Normal

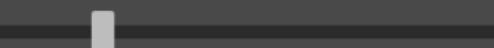
Normal Map



Normal Map

Normal Height

1.000



Support Non-Uniform Scale

Normal X (Red)

Positive

Normal Y (Green)

Positive

Reflection

Reflection Map



Normal

Normal Map

Normal Map

Normal Height

1.000



Support Non-Uniform Scale

Normal X (Red)

Positive



Normal Y (Green)

Positive



Reflection

Reflection Map

Reflection Type

Cube



Reflection CubeMap



Reflection 2D Map

Reflection Intensity

0.200



Reflection Blur

0.000



Reflection Rotation

0.000



Reflection Spherical Pinch

1.100



Reflection Fresnel Min

0.000



Reflection Fresnel Max

0.000



Reflection Mask

Reflection Mask



Spec Alpha For Reflection Blur

Spec Color to Tint Reflection

Reflections Affect Opacity

Tessellation and Displacement

Displacement Model Grayscale



Reflection Fresnel Min 0.000
Reflection Fresnel Max 0.000
Reflection Mask 
Spec Alpha For Reflection Blur
Spec Color to Tint Reflection
 Reflections Affect Opacity

▼ Tessellation and Displacement

Displacement Model Grayscale 
Displacement Map 
Displacement Map
Displacement Coordsys Mudbox (XZY) 
Displacement Height 0.500
Displacement Offset 0.500
Displacement Clipping Bias 5.000
Bounding Box Extra Scale 1.000
Tessellation Range 0.000
Tessellation Minimum 3.000
Flat Tessellation 0.000

▼ Translucency

Translucency
Thickness Mask 
Thickness Mask
Light Translucent Distortion 0.200

Tessellation Range

0.000

Tessellation Minimum

3.000

Flat Tessellation

0.000

▼ Translucency

Translucency

Thickness Mask

Thickness Mask

Light Translucent Distortion

0.200

Light Translucent Power

3.000

Light Translucent Scale

1.000

Translucent Minimum

0.000

Outer Translucent Color



Medium Translucent Color



Inner Translucent Color



▼ UV

Emissive Map UV

TexCoord0



Diffuse Map UV

TexCoord0



Light Map UV

TexCoord1



Ambient Occlusion Map UV

TexCoord1



Blended Normal Mask UV

TexCoord0



Opacity Mask UV

TexCoord0



Specular Map UV

TexCoord0



Anisotropic Dir Map UV

TexCoord0



Normal Map UV

TexCoord0



Emissive Map UV	TexCoord0	▼
Diffuse Map UV	TexCoord0	▼
Light Map UV	TexCoord1	▼
Ambient Occlusion Map UV	TexCoord1	▼
Blended Normal Mask UV	TexCoord0	▼
Opacity Mask UV	TexCoord0	▼
Specular Map UV	TexCoord0	▼
Anisotropic Dir Map UV	TexCoord0	▼
Normal Map UV	TexCoord0	▼
Reflection Mask UV	TexCoord0	▼
Displacement Map UV	TexCoord0	▼
Translucency Mask UV	TexCoord0	▼

▼ Surface Data

Position	position
TexCoord0	uv:map1
TexCoord1	uv:map2
TexCoord2	uv:map3
Normal	normal
Binormal0	binormal:map1
Tangent0	tangent:map1

▼ Default Texture Data

TexCoord0	DiffuseTexture	▼
TexCoord1	DiffuseTexture	▼
TexCoord2	DiffuseTexture	▼

Surface Data

Position	position
TexCoord0	uv:map1
TexCoord1	uv:map2
TexCoord2	uv:map3
Normal	normal
Binormal0	binormal:map1
Tangent0	tangent:map1

Default Texture Data

TexCoord0	DiffuseTexture
TexCoord1	DiffuseTexture
TexCoord2	DiffuseTexture

Diagnostics

Node Behavior

UUID

Extra Attributes

object-space PAINTING SIMULATION

• Procedural stylization
• Object-space data

[Orzu 2013, painted in ArtRage]

Stylizing by Example
Stylizing Animation by Example
Color Me Noisy
Limitations: Requires source paintings, not applicable in real-time, run in independent systems

Stylizing by Location
Art-directed Watercolor
Rendered Animation
> live demo <

Future Applications
Film, TV and Games
VR
Interactive art

Expressive 2016
The Joint Symposium on
Artistic Computing
Sketch-based Interfaces and Modeling
Image Processing, Analysis and Rendering
What tools should we create?
artist-driven
implemented in known software
[beta-testers](https://goo.gl/CxGCQ7)
<https://goo.gl/CxGCQ7>

Extensive
Towards Photo Watercolorists with Artistic Verisimilitude
Montesdeoca et al. 2016

Tools
Using filters and image-processing
Custom Shaders (soft, barycentric)
Texture mapping stylization
Artistic compositing
Antibody - The Painter's tool
Shady's Meander
Future?

Maya
cinema 4D
lightwave
3ds Max

Conventional 3D software focuses on Photorealistic Rendering

[Montesdeoca 2016, stylized scene]

[Montesdeoca et al. 2016, Henry © Oculus Story Studio]

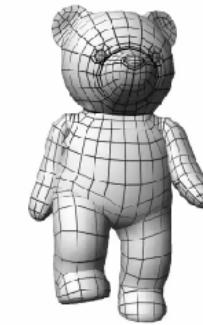
Stylizing by Example

Stylizing Animation by Example

Input animation



[Bénard et al. 2013]



Animated 3D Model

[Fišer et al. 2014]

Limitations: Requires source paintings, not applicable in real-time, run in independent systems

Stylizing Animation by Example

Input animation



[Bénard et al. 2013]

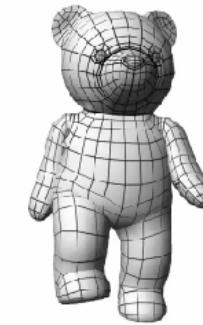
Stylizing by Example

Stylizing Animation by Example

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[Bénard et al. 2013]

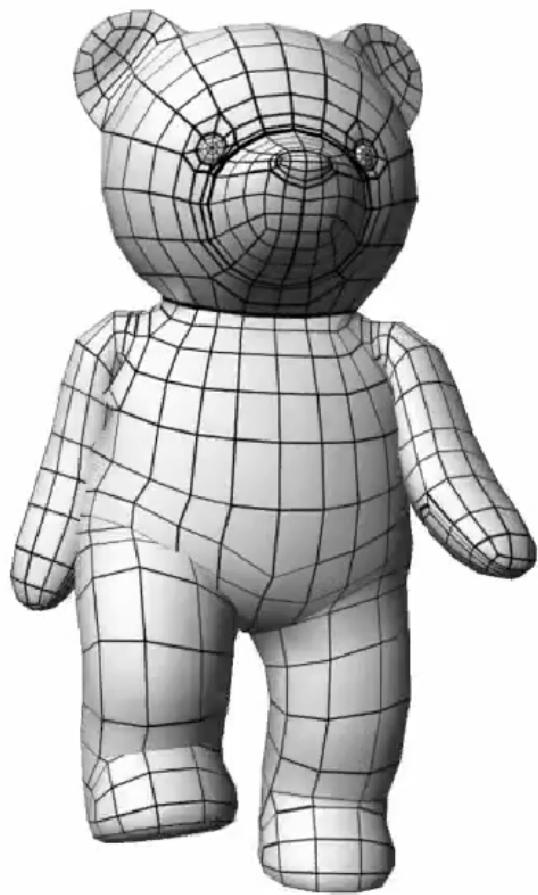


Animated 3D Model

[Fišer et al. 2014]

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Color Me Noisy



Animated 3D Model

[Fišer et al. 2014]

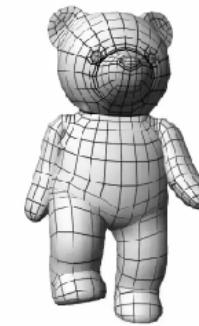
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[Bénard et al. 2013]



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Stylizing by Example

Stylizing Animation by Example
Color Me Noisy

Limitations: Requires source paintings, not applicable in real-time, run in independent systems.

Stylizing by Location

Art-directed Watercolor
Rendered Animation
> live demo <

Future Applications

Film, TV and Games
VR
Interactive art

Expressive 2016

The Joint Symposium on Expressive 3D Modeling, Sketch-based Interfaces and Modeling, Interactive Photorealistic Animation and Rendering

What tools should we create?
artist-driven
implemented in known software
beta-testers
<https://goo.gl/CxGCQ7>

Extensive

Towards Photo Watercolorists with Artistic Verisimilitude

Tools

- Using filters and image-processing
- Custom Shaders (soft, barycentric)
- Texture mapping stylization
- Artistic compositing

Antibot - The Lectorate tool
Shady's Meander

Maya

cinema 4D

lightwave

3ds Max

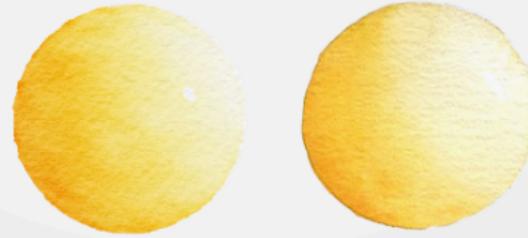
Conventional 3D software focuses on Photorealistic Rendering

[Montesdeoca et al. 2016] Henry © Oculus Story Studio

[Montesdeoca 2016, stylized]

Stylizing by Location

Art-directed Watercolor
Rendered Animation



> live demo <

object-space PAINTING SIMULATION

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[Orzu 2013, painted in ArtRage]

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Stylizing Animation by Example
Color Me Noisy
Limitations: Requires source paintings, not applicable in real-time, run in independent systems

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The Joint Symposium on
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Sketch-based Interfaces and Modeling
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<https://goo.gl/CxGCQ7>

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Towards Photo Watercolorists with Artistic Verisimilitude
Montesdeoca et al. 2016

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Custom Shaders (soft, barycentric)
Texture mapping stylization
Artistic compositing
Antibot - The Lectorate tool
Shady's Meander
Future?

Maya
cinema 4D
lightwave
3ds Max

Conventional 3D software focuses on Photorealistic Rendering

[Montesdeoca 2016, stylized night scene]

Future Applications

Film, TV and Games

VR
Interactive art



The Fat Lady © Warner Bros

object-space PAINTING SIMULATION

Conventional 3D software focuses on Photorealistic Rendering

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• Object-space data

[Orzu 2013, painted in ArtRage]

Tools

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- Custom Shaders (soft, barycentric)
- Texture mapping stylization
- Artistic compositing

Future?

Maya

cinema 4D

lightwave

3ds Max

Stylizing by Example

Stylizing Animation by Example
Peter et al. 2012

Color Me Noisy
Peter et al. 2014

Limitations: Requires source paintings, not applicable in real-time, run in independent systems

Stylizing by Location

Art-directed Watercolor: Rendered Animation
> live demo <

Future Applications

Film, TV and Games
VR
Interactive art

Expressive 2016

The Joint Symposium on Expressive 3D Modeling, Sketch-based Interfaces and Modeling, Input-Photorealistic Animation and Rendering

What tools should we create?
artist-driven
implemented in known software
[beta-testers](https://goo.gl/CxGCQ7)
<https://goo.gl/CxGCQ7>

Extensive

Towards Photo Watercolorization with Artistic Verisimilitude
Montesdeoca et al. 2016

[Montesdeoca 2016, stylized city at night]

Expressive 2016

The Joint Symposium on
Computational Aesthetics
Sketch-Based Interfaces and Modeling
Non-Photorealistic Animation and Rendering

What tools should we create?

artist-driven
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<https://goo.gl/CxGCQ7>

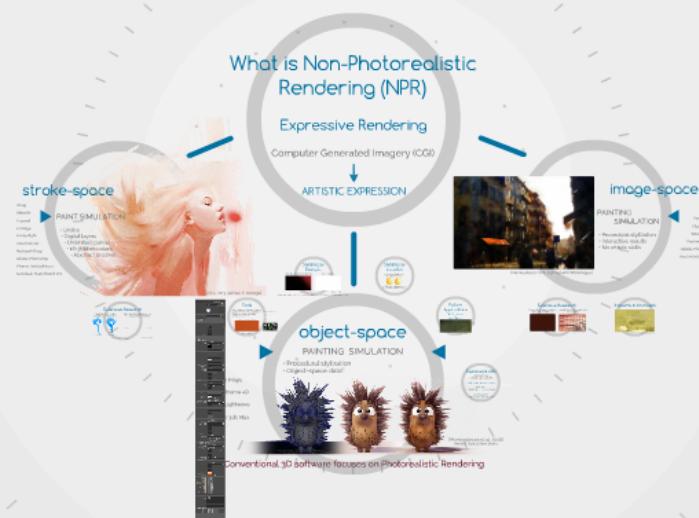


Artistically Driven Non-Photorealistic Computer Animation

S. E. Montesdeoca

H. S. Seah

D. Benvenuti



THANK YOU!

survey: <http://goo.gl/CxGCQ7>

website: <http://artineering.io>