Temporally Coherent Video De-Anaglyph

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Anaglyph Images

Right view

Right view (G+B)

Anaglyph image

Left view

Left view (R)
Lots of Legacy Imagery

Mars photos

Old 3D movies
(Dial M for Murder)

User content
Video De-Anaglyph

How can we reconstruct the full colors from anaglyph input?

Challenges:
- Multimodal Input
- Channel Alignment
- Occlusions
- Temporal Consistency
Challenge 1: Multimodal Input

Left view (R)

Right view (G+B)
Challenge 1: Multimodal Input

Left view (R to grayscale)

Right view (B+G to grayscale)

(Increased brightness and contrast for visualisation)
Challenge 2: Channel Alignment

Anaglyph image
Challenge 2: Channel Alignment

Disparity map
Challenge 3: Occlusions

Left image

Right image
Challenge 3: Occlusions

Left image

Right image

Occluded areas
Challenge 4: Temporal Consistency

Disparity using SIFT flow
[Liu et al. 2011]

Ground-truth disparity
Related Work

[http://www.3dtv.at/Knowhow/DeAnaglyph_en.aspx]
Related Work

[Joulin & Kang 2013]
Our Approach

Matching
SIFT Flow
[Liu et al. 2011]

Temporal Coherence
[Lang et al. 2012]

Colorization
Domain Transform
[Gastal & Oliveira 2011]

Left view
Right view
Correspondence: SIFT Flow

[Liu et al. 2011]
Correspondence: SIFT Flow

[Liu et al. 2011]
Temporal Coherence

[Lang et al. 2012]

Temporal propagation
Temporal Coherence

[Lang et al. 2012]

Anaglyph views

Disparity maps

SIFT flow

Ground truth
Colorization

Left view

Red

Cyan

Combined RGB

Right view

(=input anaglyph)
Colorization

Red
Left view

Cyan
Right view warped using disparity

Combined RGB
Left view reconstruction
Colorization

Red

Cyan

Combined RGB

Left view

Discard occlusions

Left image reconstruction
Colorization Example

Reference image
Colorization Example

Scribbles
Colorization Example

Scribbles

Colorized image
Colorization

- Red
- Cyan
- Combined RGB

Left view

Discard occlusions

Left image reconstruction
Colorization

Left view

With colorized occlusions

[Gastal & Oliveira 2011]

Left image reconstruction

Red

Cyan

Combined RGB
Reconstruction Results

- Per-frame SIFT flow
- Filtered SIFT flow
- GT disparities
- Original left view
# Summary of Solutions

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More Results

Input anaglyph video

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Input Anaglyph Views

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Disparity Maps

Per-frame SIFT flow disparity [Liu et al. 2011]

Temporally coherent disparity [Lang et al. 2012]
Optical Flow

Per-frame Farnebäck flow  
[Farnebäck 2003]

Temporally coherent flow  
[Lang et al. 2012]

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Reconstructed Views

Left view

Right view

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More Results

Input anaglyph video

© Eric Deren, Dzignlight Studios
Reconstructed Views

Left view

Right view

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More Results

Input anaglyph video

© Eric Deren, Dzignlight Studios
Reconstructed Views

Left view

Right view

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Source Code

- all C++ code available under BSD-like license
- including efficient implementations of:
  - SIFT Flow [Liu et al. 2011]
  - Domain Transform [Gastal & Oliveira 2011]
  - Temporal Consistency [Lang et al. 2012]
- plus our De-Anaglyph tool and example projects
- Project website: richardt.name/video-deanaglyph
Limitations

unreliable disparity maps may produce poor results

large occlusions are difficult to fill without inpainting
Conclusion

- achieve good reconstruction of full-color stereo views from anaglyph 3D videos:
  - focusing on temporal coherence
  - using state-of-the-art techniques
- also compute temporally coherent flows + disparities
- can be used for post-processing tasks

richardt.name/video-deanaglyph