How to create “Bad” 3D Films & TV

Chris Haws
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Define “BAD”

Poorly conceived
Poorly executed
Poorly displayed
Poorly received
Conception

Image ‘Volume’
Conception

‘Screen Space’ & ‘Theater Space’
Conception

Positive Parallax
(Screen Space)

Negative Parallax
(Theater Space)
Conception

‘Depth Budgets’
Conception

Choose a subject where 3D enhances the storytelling - and the story.
Are there ‘Ideal’ 3D Subjects?
‘Ideal’ 3D Subjects?

Animation and CGI rich programming.
‘Ideal’ 3D Subjects?

Studio (esp. ‘green screen’) drama.
‘Ideal’ 3D Subjects?
Space, astronomy, cosmology.
‘Ideal’ 3D Subjects?

Underwater – wildlife, shipwrecks, etc.
‘Ideal’ 3D Subjects?

Staged events – ballet, opera, concerts.
‘Ideal’ 3D Subjects?

Close Up Wildlife ... (but not long lens ‘Blue Chip’)

![Spider Image]
‘Ideal’ 3D Subjects?

Special Effects, Fantasy, Thrillers, Horror
Execution?
Execution?

What makes a good 3D shot?
What makes a good 3D shot?

- Backgrounds are at optical infinity.
- Action occurs within 15m of camera.
- Action can be choreographed.
- Scene can be lit for depth.
- Camera motion can be carefully controlled.
Worries ...
Worries ... 

Are the two lenses identical? 
(distortions, aberrations, speed, etc)
Worries ...

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Can they be controlled together? (convergence, divergence, zooms, aperture)
Worries ...

Are the two lenses identical?
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Can they be controlled together?
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Are the two recordings identical?
(brightness, contrast, color, resolution, etc).
Worries ...

Are the two lenses identical?
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Can they be controlled together?
(convergence, divergence, zooms, aperture)

Are the two recordings identical?
(brightness, contrast, color, resolution, etc).

Are the images ‘in synch’?
(frame rate, phase,)
Unwanted Effects

“Ghosting” or “Crosstalk”
Extreme Parallax
Edge Violations
Stereo - anomalies
“Cardboarding”
“Giantism”
“Lilliputism”
Unwanted Effects
Defining “BAD”

- Poorly conceived ✓
- Poorly executed ✓
- Poorly displayed ?
Stereography
Stereography
Stereography
3D Movies
Early 3D Moviegoing
“The Power of Love”
Anaglyph glasses
Polarizing glasses
‘Bwana Devil’ 1952

Dir: Arch Oboler
‘House of Wax’ 1953

Dir: Andre de Toth
‘House of Wax’ 1953
Dir: Andre de Toth
‘Dial M for Murder’ 1954

Dir: Alfred Hitchcock
‘Dial M for Murder’ 1954

Dir: Alfred Hitchcock
Today ...
After the ‘digital revolution’
‘Avatar’ 2010

Dir: James Cameron
And now 3D TV
Which (mostly) needs ...
3D is now everywhere ...
But the Display Worries continue ...
Display Worries ...

(Movies) Projectors identical?
(brightness, focus, color temperature, etc)

(Movies) Films identical?
(Frame perfect, identical grading, running in synch)

(Overall) Viewing position?
(‘Sweet Spot’, obliquity, head angle, etc)

(Overall) Screen size?
(Subtended angle, ‘retinal occupancy’)

Screen size varies ...

- IMAX Movies
- Standard Movies
- 3D TV
- 3D Computer Displays
- Handheld 3D
- Autostereoscopy
Defining “BAD”

- Poorly conceived ✓
- Poorly executed ✓
- Poorly displayed ✓
- Poorly received ?
The Audience
The Audience

3% - 8% are stereo-blind
The Audience

3% - 8% are stereo-blind
25% are stereo-impaired
WHY?
Stereopsis requires...
Eventually 90% of the population develop...

- Ciliary control
- Extra-ocular control
- Mid-brain processing
- Visual Cortex analysis
- Forebrain / Midbrain referencing
But, if the audience suffers from ...
But, if the audience suffers from ...

Refractive Errors
But, if the audience suffers from ...

Refractive Errors
Convergence Insufficiency
But, if the audience suffers from ... 

Refractive Errors
Convergence Insufficiency
Strabismus
But, if the audience suffers from …

Refractive Errors
Convergence Insufficiency
Strabismus
Amblyopia
They will experience

The 3 ‘D’s of 3D
They will experience

The 3 ‘D’s of 3D

Diminished Depth Perception
They will experience

The 3 ‘D’s of 3D

Diminished Depth Perception
Discomfort
They will experience

The 3 ‘D’s of 3D

Diminished Depth Perception
Discomfort
Dizziness
So, ‘Good’ 3D requires

Careful Conception & Planning
Perfect Technical Execution
Ideal display conditions
A visually healthy audience
Future Research?

1. Reliable metrics on the general audience’s stereo-capability and vision health, by age / gender / ethnicity / etc.
2. Measurement of the negative and positive parallax ‘comfort zones’ (with ref to Panum’s Fusional area?).
3. Guidelines for shot pacing, 3D ‘endurance’ and depth changes.
4. Analysis of screen size on the 3D experience.
5. Predictors for asthenopia / vertigo / nausea?
6. …and many more.
Thank You

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