3D WORKSHOP WITH JAKE SEAL

Overview

- Our eyes are very used to adapting themselves in a sophisticated way to deal with 2D images; however, when it comes to 3D we need to come back to the "natural" way we see things.
- Our mind is capable of compensating for abnormalities; but it can only do so comfortably for a short period of time.
- 3D doesn't give people headache; bad 3D does.

When shooting in 3D we must consider:

1. how to capture, store and process
2. what cameras to use
3. how to project (or view)

Things that one needs to get right while shooting 3D

- Same color balance on both cameras
- Quality, matched lenses to avoid distortions
- Perfect alignment
- Adequate capture resolution
- Proper encoding
- A robust workflow to store and process the heavy data

Options on what cameras to use:

- Low quality, simple cameras can be used side by side, but it is difficult to achieve high image quality with cameras this size
- High quality cinema cameras can accomplish the needed quality, but cannot be placed side by side due to their size
    - (http://www.red.com/products/epic)
    - (http://www.arri.com/camera/digital_cameras/cameras/camera_details.html?product=7&cHash=bb2adbaa9d)
- The typical solution is to use large cameras that shoot via a mirror, but it is still quite difficult to get all the above elements right. Also, the mirror rig introduces new problems in matching the images from the two cameras:
    - Reflections and flares come out differently between the two images
    - Color between the two images can be different
    - Brightness can vary
    - Alignment of the mirror unit is difficult

Converting 2D to 3D

- An alternative for producing 3D movies is to convert 2D images into 3D. Jake believes that this is the most efficient way to avoid the pitfalls of the elements above.
- It is true that the technology is moving quickly in the way that 3D images are captured and to avoid these pitfalls, but Jake thinks that it will take some time before those advancements exceed the consumer level.
- *Crash of the Titans* is a bad example of how to convert 2D to 3D and it almost killed industry enthusiasm in the conversion process.
- Today, most big Hollywood productions have at least part of their 3D content done through converting 2D images. For example, about 30% of *Pirates of Caribbean was converted from 2D, and even some of the live action for Avatar*.

Note: The 3D versions of movies were responsible for 80% of the total Box office for the top 5 Hollywood films in 2009.

How is it done

- Most of the time the way to convert 2D to 3D is by separating each element of the frame into an individual layer. A full object is easier to be separated from the background than hair for example. That is why if you do have a scene with too many people or rain for example, shooting in 3D directly would be most wise.
- Afterwards, most of the time, one can geometry warp the layered elements to give a 3D feel.
- However, the way Jake's company (Ormaq) converts 2D images to 3D is by actually creating a 3D geometry for each element and then "shooting" the film through these elements with a virtual camera.

How to View 3D

The three major 3D projection companies:

- Master image: http://masterimage3d.com/
- Real D: http://reald.com/content/consumer-electronics.aspx
- Expand: http://www.xpand.me/

Viewing formats for moving 3D (video):

- Interlaced half resolution video
    - Each eye is ½ the width or height of the full image (squeezed)
        - Left/Right (each image is 960x1080 in HD) – most common
        - Up/Down (each image is 1920x540 in HD)
        - Checkerboard – not really used any longer
    - These formats are used for passive polarized systems
- Full resolution video with alternating frames for each eye

    - This format is full resolution, but double frame rate
    - It requires a shuttered or active system for viewing

Viewing systems for moving 3D (video):

- Polarized projection with passive glasses – ATLAS Visitor Center
- Projection with shuttered (active) glasses that obscure each eye in an alternating pattern
- Polarized screens with passive glasses – also AVC
- Normal screens with active glasses (normally proprietary)
- Auto-stereoscopic screens
    - Complex lensing layer on screen
    - Not yet of sufficient quality or low enough price to be popular

Other 3D visualization techniques

- Holograms
- Lenticular displays
    - For still images only
    - But you can look at these all day long without headaches
- Lenticular postcards

Content advice for CERN Projects' use of 3D

A lot of thought must go into what do we want to show:

- What do we want to convey?
- What material do we have or can make that can exploit stereoscopic viewing?
- What will leave an impact on visitors?
- How can we show the enthusiasm of everyone involved in the experiment(s)?

Ideas

- 3D contains more information than 2D images, and is more interesting to look at – it doesn't need to be as "fast" as 2D images to be interesting
    - Freeze the event displays
    - Slow down collisions
- Use full body and/or small holograms of physicists all over the world to talk to the visitors here at CERN;
    - besides being impressed they can feel what it means to be part of the multicultural collaboration of scientists.
    - Solutions as such are being considered by CEO's of multinational companies in order to ensure real time presence at remote locations avoiding waste of time and cost involved in traveling.