



## 3D – New? Acquisition Systems

# Golden Rule No1

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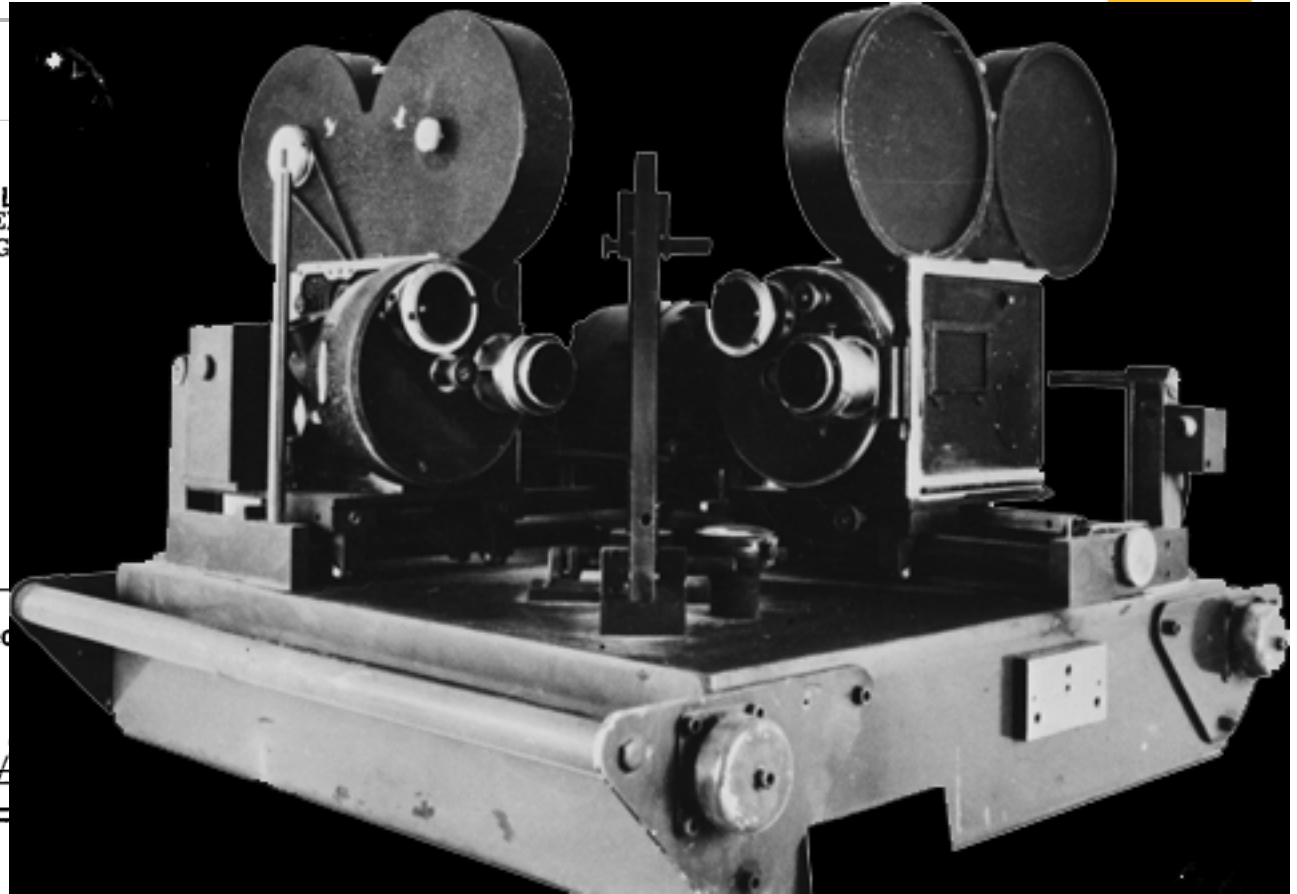
# Cameras – old

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## What's New?



Filed June 25, 1949



*Fig. 1.*



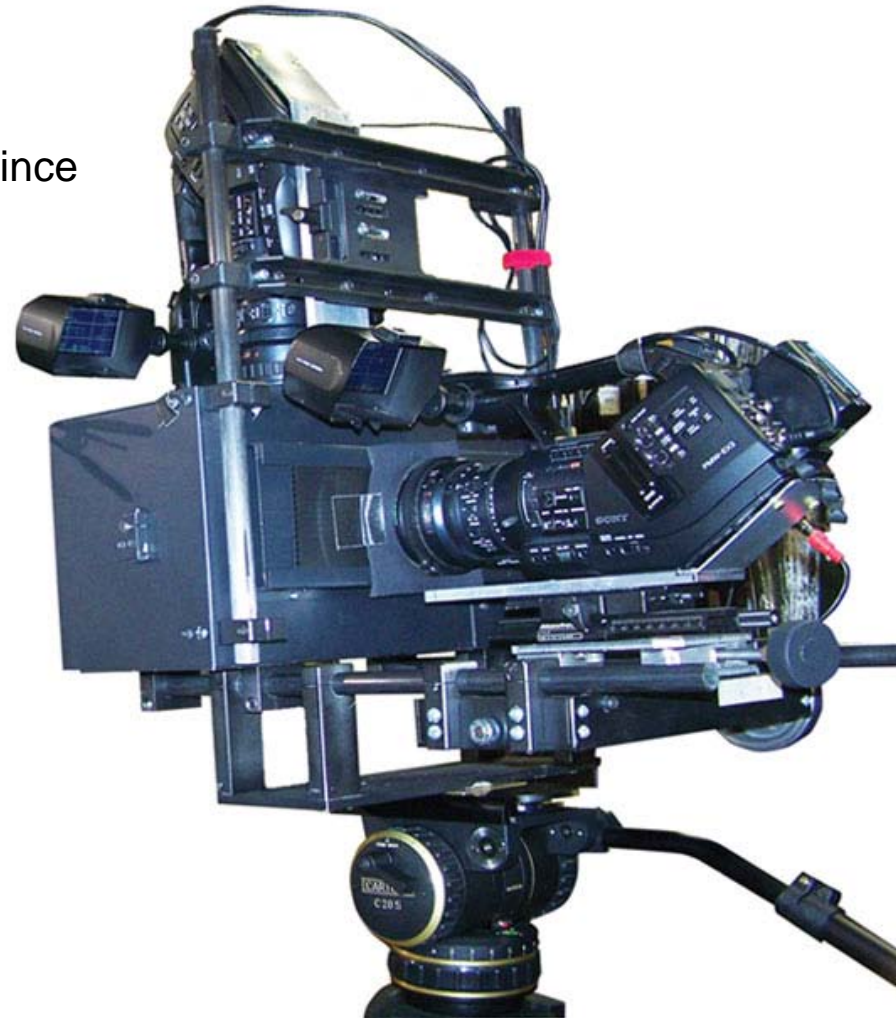


# Cameras – new

## But how far have we come

### Big and Bulky

- Beam splitters have changed little since first patented
- But TV production has moved on



# Cameras – going wrong

## Mirror Rigs and Side by Side

### Common Camera Errors

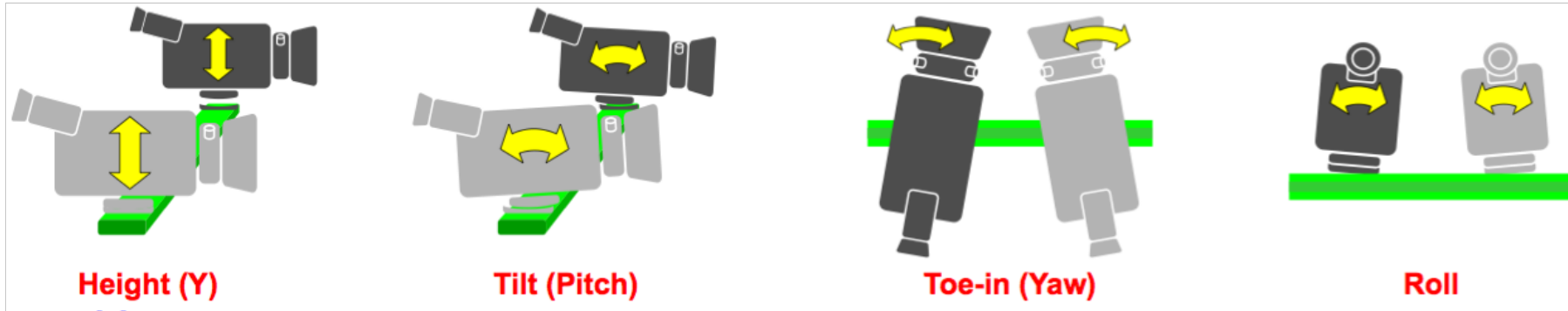
- Tilt
- Toe
- Roll
- Height



# Cameras – common issues

## Correction

### Common camera errors



With thanks to Sony

# Cameras – getting corrected

## Live Correction

### Live Adjustments

- Once a camera is on location you can't take screwdriver to it!
- Outside Broadcasts are hostile environments for delicate equipment

## Electronic

Sony offer a real time correction device  
MPE-200 running 3D alignment software.

Enables the convergence operator to monitor and adjust the 3D within an image.  
This type of adjustment is common for live events but it's manual, requires skilled operators and you need one for each camera!

**Is it better to get it right before the signal leaves the cameras – discuss!**





# Cameras – in camera tools

## Correction tools

It does work but at what cost

- People
- Skills
- Ability

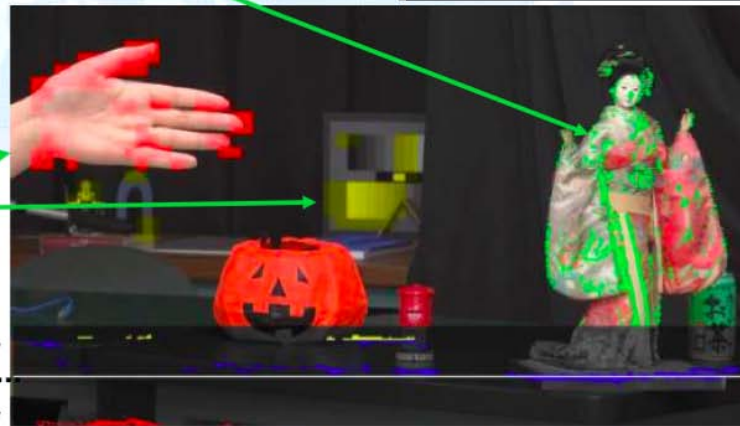


*a) Green Dots  
at Convergence Point.*

*c) Warn the object out of  
safety range. ( Too much parallax )  
Red Color at Near side  
Yellow at Far side.*

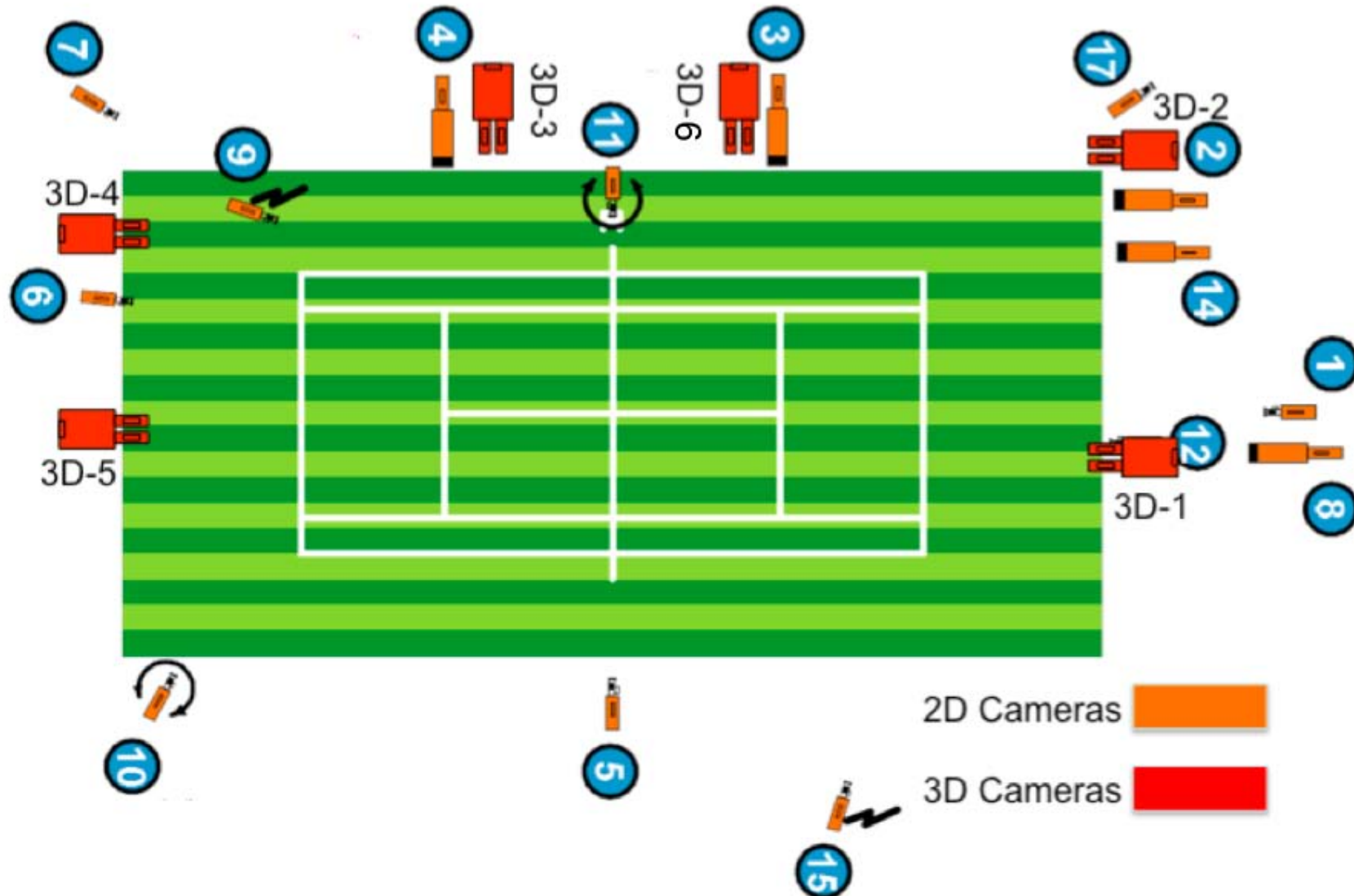
*b), c) Indicate  
the parallax  
to object.*

Positive Parallax  
Convergence plane  
Negative Parallax



**On the LCD screen ( and EVF )**

# Cameras – how many and where



# Cameras – don't forget the glass

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## Production Techniques

### ■ The Lens Nightmare

**What if we can't get the camera where we need it?**

- Current 2D productions often employ very large lenses to obtain “reaction” shots (tight close-ups). The size and accuracy of alignment required for 3D production limits their usability in pairs for 3D rigs
- Programs originated at large venues such as sports arenas or large studios use a variety of long and wide-angle lenses to help tell the story. These shots often have to be compromised when it is not possible to match or align lenses accurately enough for good 3D coverage
- Based on existing standards Lens capabilities of 2D lenses and 3D lenses are dramatically different



# Cameras – lens matching

## Production Techniques

- **The Lens Nightmare**  
The common issues





# Cameras – getting better

- **A Start**

**It's not about lens errors**

- It's lens differences
- Zoom and focus tracking
- Mirror Flare and distortion
- Exposure tracking
- Aberration



# Cameras – what we need

## More like it

- **Simplicity**

Minimise set-up errors

Minimise image difference

Do it all in camera

WHEN



**HFR** Comfort-3D<sup>TM</sup>



# Cameras – what we never want to see

## Not again

- NOT for 2D NOT for 3D



# NO!

# Cameras – the target

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## Delivery Guidance

### ■ BSkyB

Extract from BSkyB 3D delivery Guide

- *Main subject point should nominally be within an overall “**depth budget**” of 3% within the limits below*
- *Positive disparity or image separation at distant points (into the screen) **should not exceed +2%** for majority of shots*
- *Care should be taken for images breaking the frame edges, with floating windows utilised where appropriate*
- *These are guidelines that aim to deliver managed and comfortable stereoscopic viewing. As such these limits can be exceeded for specific editorial needs, (such as prime vision graphic content or short term visual impact), managed appropriately and in line with 3D production practice. Such instances should be constrained to 4% Positive (Into Screen) and 2.5% Negative (Out of Screen)*





# Cameras – the target

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## Delivery Guidance

### ■ BBC

Extract from BBC 3D delivery Guide

- “3D images should **be comfortable to watch for the duration of the programme** and must not cause a viewer in a normal (living room) environment discomfort from excessive negative parallax
- In general the point of convergence for the main subject of interest should be kept between **1% negative** (out of the screen) to **2% positive** (into the screen) parallax. These are not absolute boundaries but more guidance to comfortable viewing
- Edge violation (images forward of the screen plane crossing the edge of screen boundary) and Divergent Parallax (trying to make the eyes diverge!) should be avoided if and where possible”

# Cameras – what we would like

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## For practical 3D

- **Three simple requirements**

- Same camera for 2D and 3D productions**

- *Separate 2D and 3D cameras can mean up to 3x the number of camera*
    - *Cost means 2D and 3D versions made at the same time*

- Standards for carriage of twin images through the programme chain**

- *With Left and Right eye signal identification*
    - *With Left and Right eye signal timing information*

- File Wrappers**

- *Container for Left and Right eye files*
    - *With Left and Right eye signal timing information*

# Cameras – What about a PTC?

Ever seen an actors eyes flipping between another actors eyes?

- **It's really distracting**

**This about the News**

- *Which lens to look at?*
- *Or stare vacantly between the two.*



EBU TECHNICAL



Thank You