Image Capture and Problems

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A reasonable capture
Image Capture: Focus problems

Focus set to one distance, and other nearby distances in focus (depth of focus). Further or closer not so well focused. Compare ‘identical’ lines.

http://www.cambridgeincolour.com/tutorials/depth-of-field.htm
Image Capture: Shadow problems

False colour to emphasise the shadow location.
Often hard to separate from part.
Image Capture: Saturation problems

Pixels clip at 255.
Image Capture:
Specularities/highlights

Saturated pixels set to red.
Image Capture: Non-uniform illumination

Contrast on background enhanced: may cause analysis problems.
Image Capture: Radial lens distortion

Note ‘straight’ lines at image edge. May make accurate measurements hard.
Image Capture: Overcoming Problems

- **Shadows, specularities, non-uniform illumination**: increase ambient lighting by using light diffusing panels or lots of point lights

- **Depth of Focus**: use smaller aperture and brighter light

- **Motion Blur**: use shorter capture time and brighter light

- **Saturation**: use smaller aperture, reduce gain and adjust gamma
• **Lens Distortion**: more expensive lenses, view from further away

• **Aliasing**: use incandescent lights
Illumination control techniques

Main cause of problem: point light sources

Brightness = $B / (\text{surface distance from source})^2$

Sharp shadows: \hspace{1cm} Strong illumination variations
Shadow Example

Figure and shadow at bottom left emphasised
Lighting control

To reduce complications arising from illumination:

- Increase ambient (all direction) light with light diffuser panels
- Illumination by camera to move shadows to non-visible places
- Backlighting panel
DIFFUSER PANEL

MUCH LESS SHADOW

LIGHTS NEAR CAMERA

Slide 14/15
Slide credit: Bob Fisher
Lecture Overview

• A set of typical image capture problems: focus, saturation, specularities, shadows, lens distortion, illumination

• Some approaches to overcoming the problems