

Image Capture and Problems

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A reasonable capture

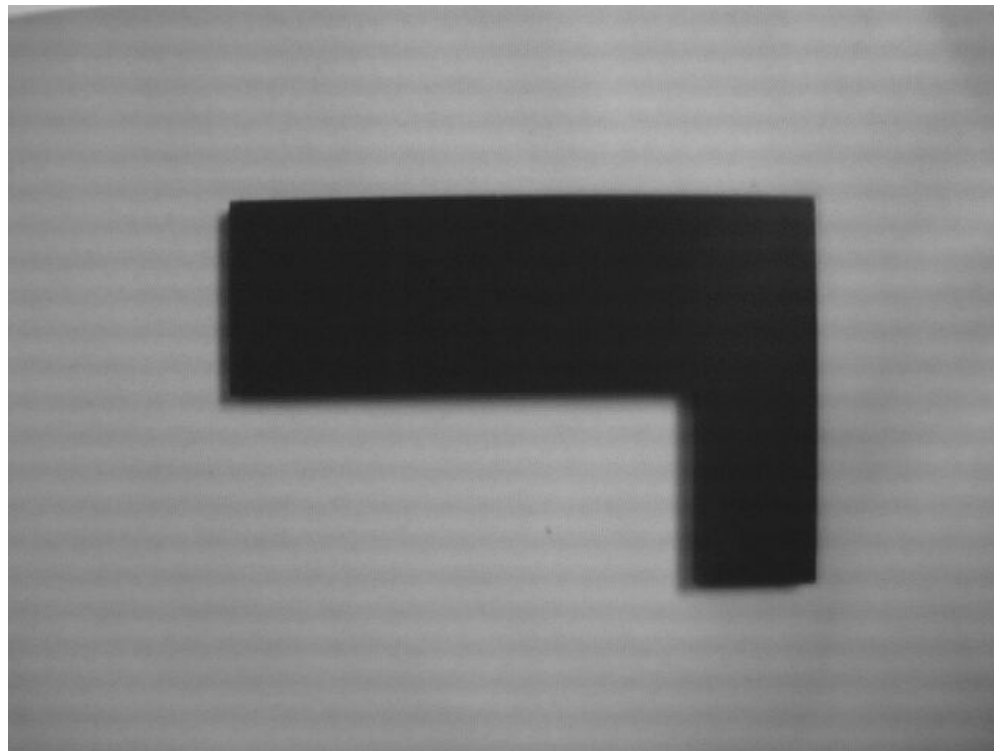


Image Capture: Focus problems



<http://www.cambridgeincolour.com/tutorials/depth-of-field.htm>

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

Image Capture: Shadow problems

False colour to emphasise the shadow location.

Often hard to separate from part.

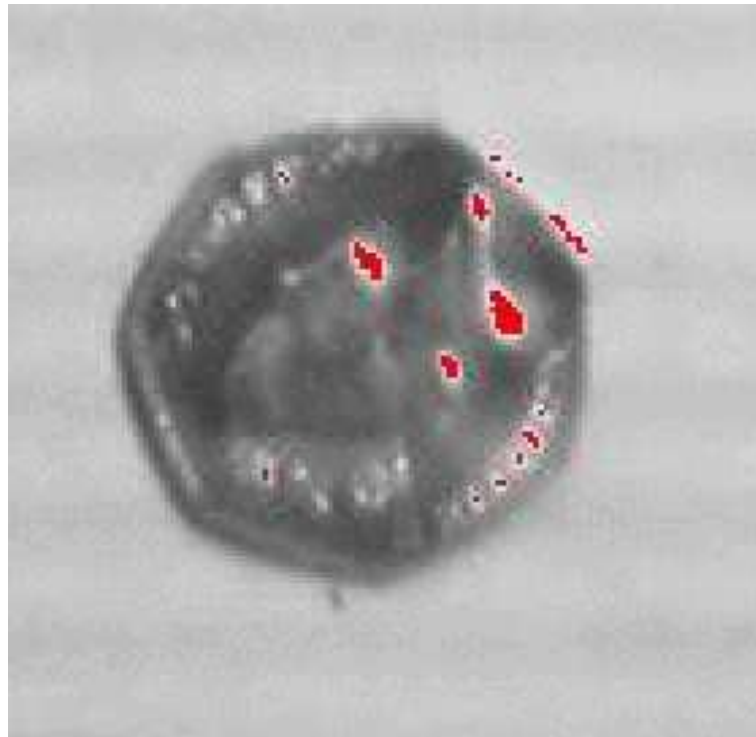


Image Capture: Saturation problems



Pixels clip at 255.

Image Capture: Specularities/highlights



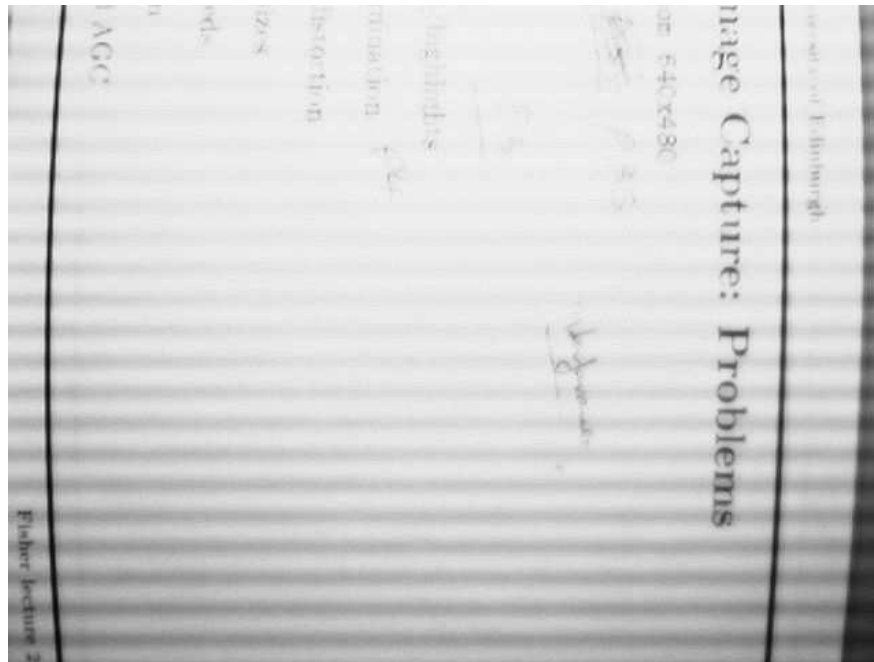
Saturated pixels set to red.

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

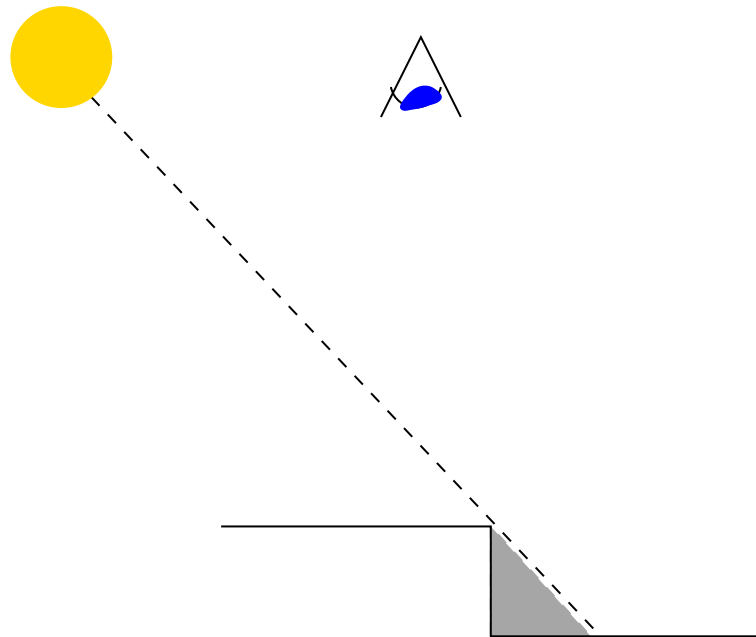
- **Lens Distortion:** more expensive lenses, view from further away
- **Aliasing:** use incandescent lights

Illumination control techniques

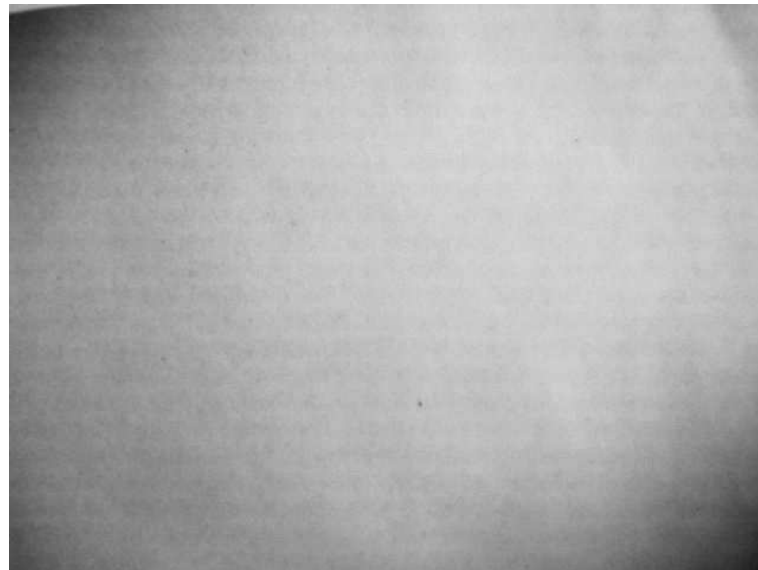
Main cause of problem: point light sources

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

Sharp shadows:

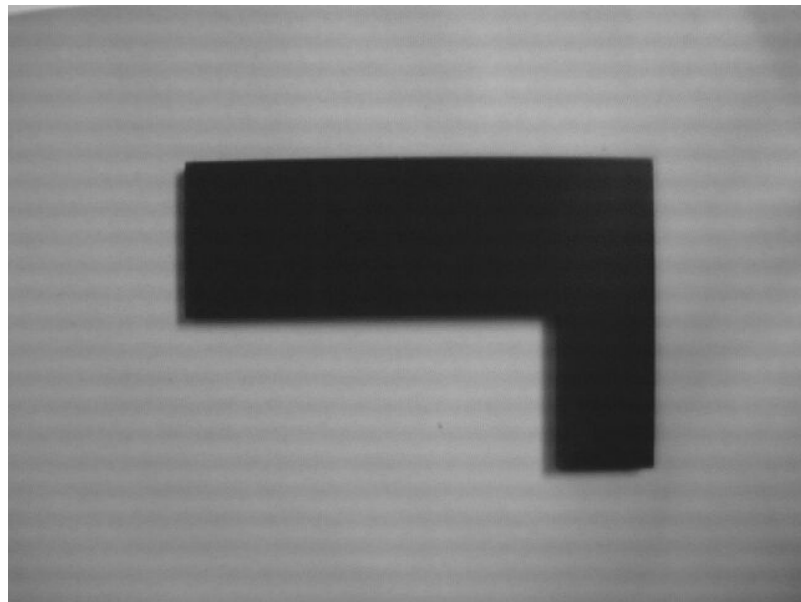


Strong illumination variations



Shadow Example

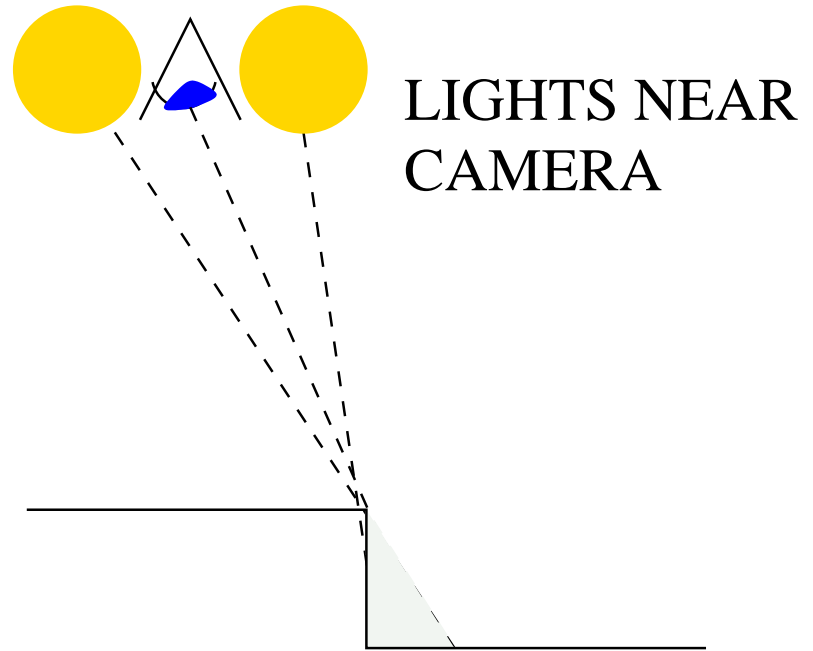
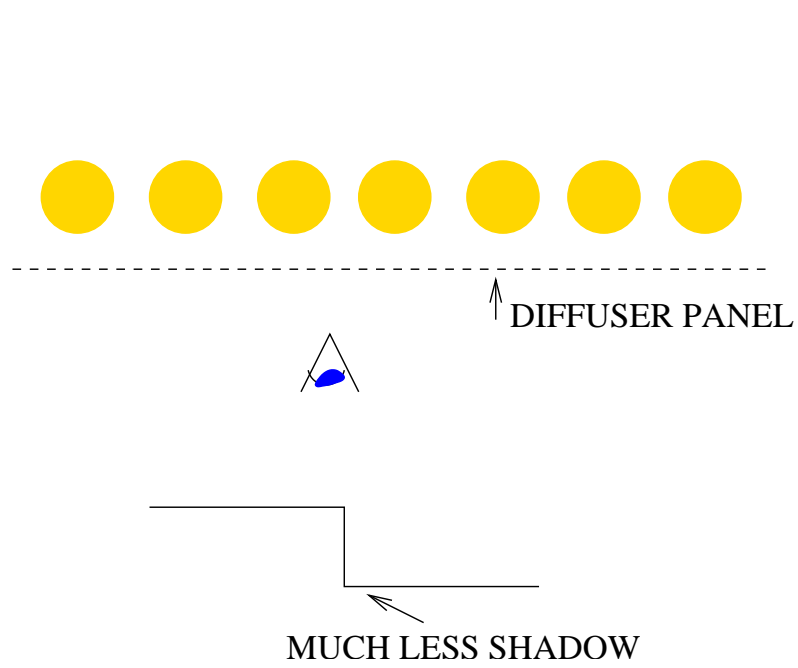
Figure and shadow at bottom left emphasised



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



Lecture Overview

- A set of typical image capture problems: focus, saturation, specularities, shadows, lens distortion, illumination
- Some approaches to overcoming the problems