Poisson Image Editing
The Challenge

- Cut-and-paste of dissimilar regions
The Approach

• Modify colors within each pasted region to agree with destination at boundary

• Want smoothest-possible change to colors
  – In general, can’t simply offset colors by a constant
  – But still want spatial smoothness (low-frequency)
  – This is less perceptible to human visual system
Digression: Contrast Sensitivity

• Ideal contrast sensitivity for humans about 1%
  – 8-bit image (barely) adequate

• But: frequency dependent
  – sensitivity lower for high and very low frequencies
Digression: Contrast Sensitivity

- Campbell-Robson contrast sensitivity chart
The Approach

• Modify colors within each pasted region to agree with destination at boundary
  – For each color channel (R, G, B), let \( g(x, y) = \) source, \( f^*(x, y) = \) destination, \( f(x, y) = \) modified
  – Let \( \Omega = \) region, \( \partial \Omega = \) boundary
The Approach

• Key idea: satisfy Poisson equation within $\Omega$

$$\frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2} = \nabla \cdot g$$

– with boundary conditions

$$f = f^* \big|_{\partial \Omega}$$

• Yields a function that is smooth overall ("soap bubble") but contains details of $g$
Other Results from Paper

poisson-image-editing.pdf