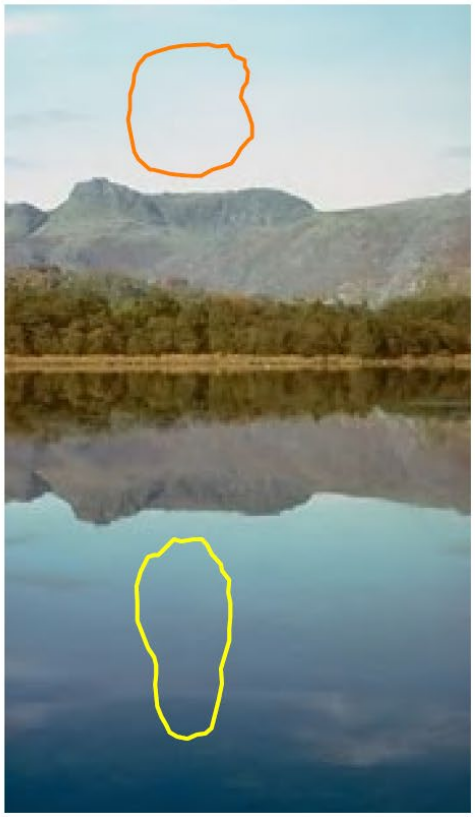
Poisson Image Editing

The Challenge

- Cut-and-paste of dissimilar regions

sources



destinations

cloning

The Approach

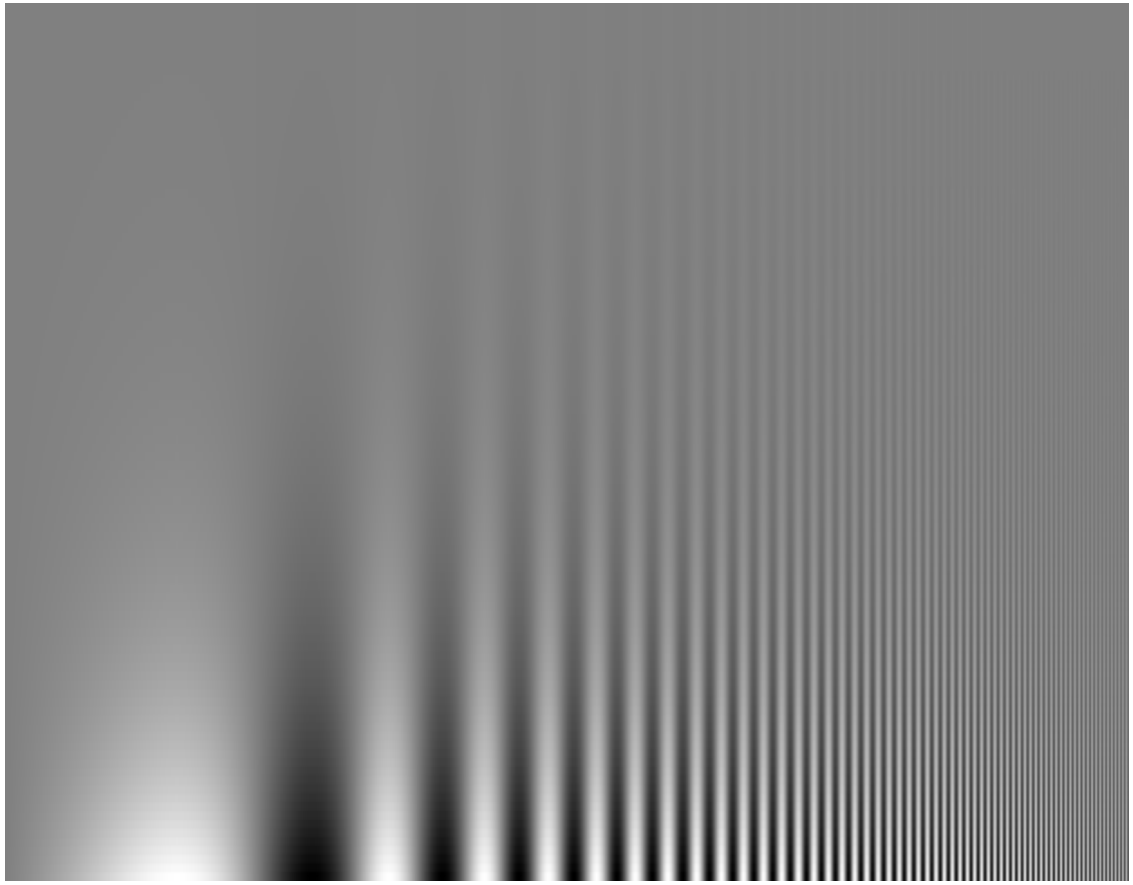
- Modify colors within each pasted region to agree with destination *at boundary*
- Want smoothest-possible change to colors
  - In general, can't simply offset colors by a constant
  - But still want spatial smoothness (low-frequency)
  - This is less perceptible to human visual system

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

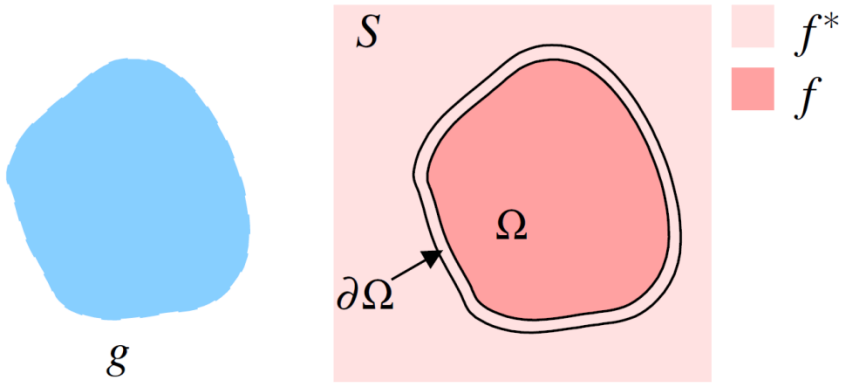
Digression: Contrast Sensitivity

- 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 Ω = region, $\partial\Omega$ = boundary



The Approach

- Key idea: satisfy Poisson equation within Ω

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

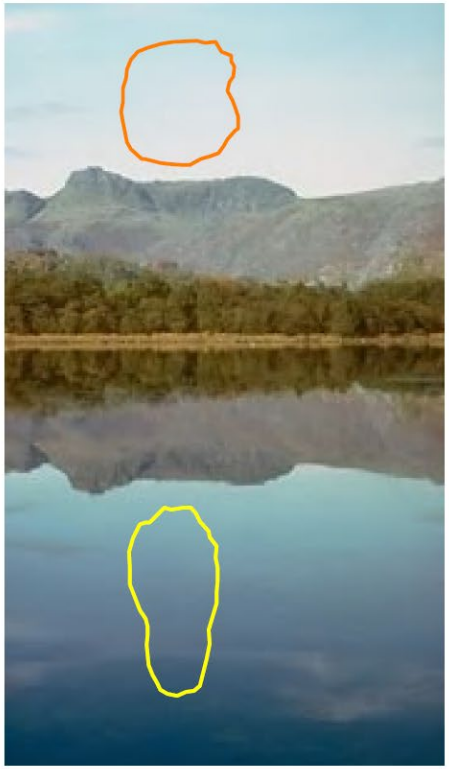
  - with boundary conditions

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

- Yields a function that is smooth overall ("soap bubble") but contains details of g

Result

sources



destinations

cloning

seamless cloning

Other Results from Paper

poisson-image-editing.pdf