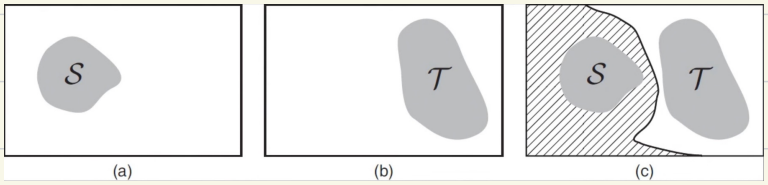
last time: image blending
today: photomontage



goal: find a good seam (dividing line) between 2 images so that intensity difference across the line is imperceptible

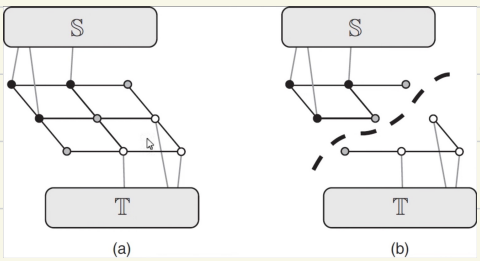
idea: “cost” of drawing a line b/w pixels i and j
$||S(i) - T(i)|| + ||S(j) - T(j)||$
or could modify this w.r.t image gradient

$$w_{ij} = \frac{||S(i) - T(i)|| + ||S(j) - T(j)||}{|d^* \nabla S(i)| + |d^* \nabla T(i)| + |d^* \nabla S(j)| + |d^* \nabla T(j)|}$$

numerator: pixels should be the same on either side
denominator: d is the vector pointing from i to j

weight will be small if seam passes through gradients

we can find best seam using graph cuts



idea: “scribble” on regions of image that we want to keep in the final composite; let graph-cuts algo decides what to do with the other pixels

α-expansion for > 2 images

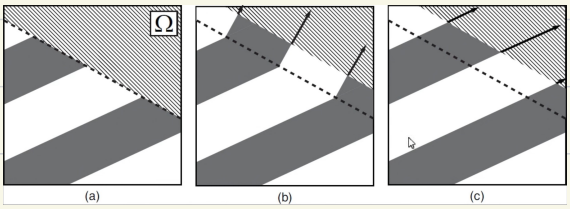
Image inpainting
eg. wire removal, removing artifacts/creases from old portraits
two approaches: - pde based
- patch based
pde-based approach:
a differential equation that tries to “push” good colour from the boundary into the hole.

edges are particularly important; we want to make they continue into the hole:
key equation:

$$\nabla(\nabla^2 I) \cdot \nabla^\perp I = 0$$

isophote direction - going along the edge
laplacian(edges)
changes in the edge

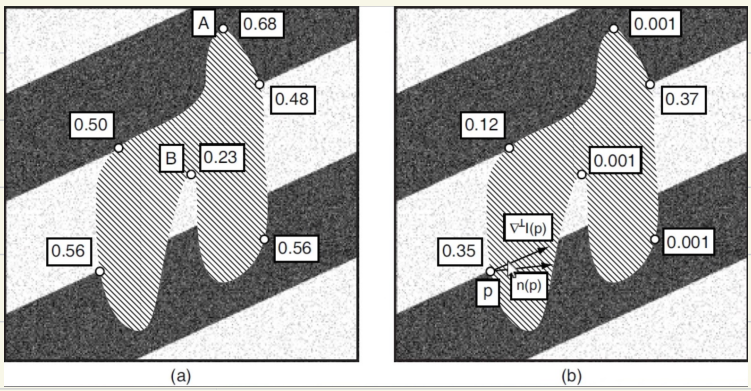
inspiration: change in laplacian along isophote direction should be 0



PDE stuff work ok for very thin holes, low-texture region, but can’t hallucinate high detail

patch-based method:
1) determine a priority for each pixel on the hole boundary
2) select patch around pixel p with highest priority Ψp
3) search remainder of image for the best matching batch Ψq
4) overwrite hole pixels in Ψp with corresponding pixels from Ψq, shrink the hole, update priorities

which pixels should have highest priority?



2 consideration:
1) confidence term: high confidence if pixel is surrounded by known pixels
C(p)

2) data term: high if strong edges from outside the hole hit the hole at right angle

$D(p) = \| \nabla I(p) \| * (\nabla^{\perp} I(p) * n(p))$ — $n(p)$: normal to hole edge direction

Ψq: sum of squared difference between corresponding pixels

patch-based idea will be extended next time (patch-match)

some user guidance is usually required to get really nice images