Take-home questions

1. Write down a 3x3 filter that returns a positive value if the average value of the 4-adjacent neighbors is less than the center and a negative value otherwise

2. Write down a filter that will compute the gradient in the x-direction:

```
gradx(y,x) = im(y,x+1)-im(y,x) for each x, y
```

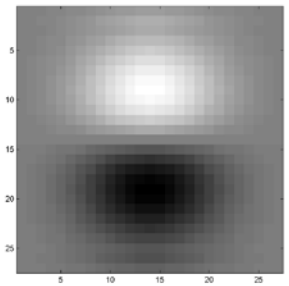
Take-home questions

Filtering Operator

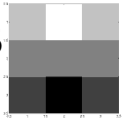
3. Fill in the blanks:

a) _ = D * B
b) A = _ * _
c) F = D * _
d) _ = D * D

A



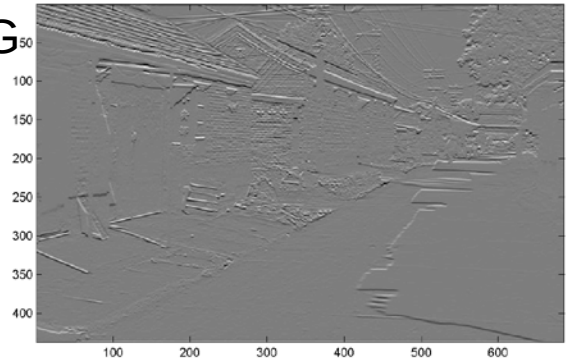
B



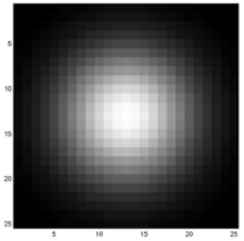
E

F

G

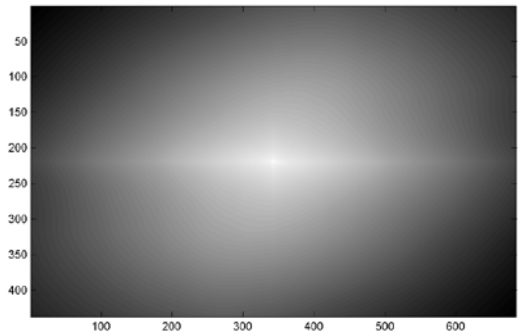


C



H

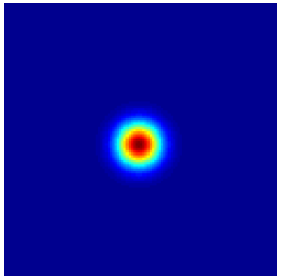
I

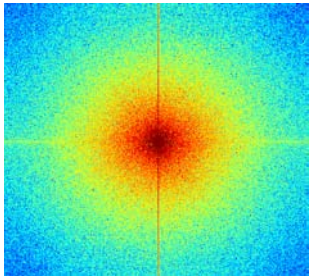


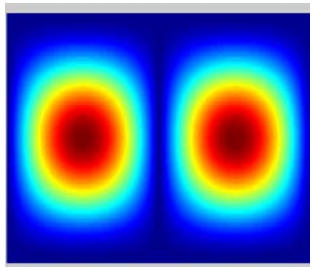
D

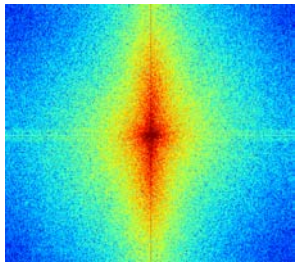
Take-home question

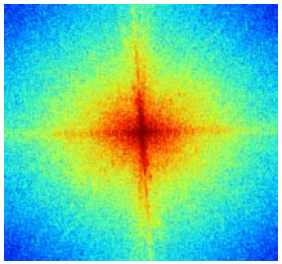
1. Match the spatial domain image to the Fourier magnitude image

1


2


3


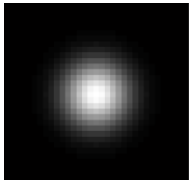
4


5


A


B

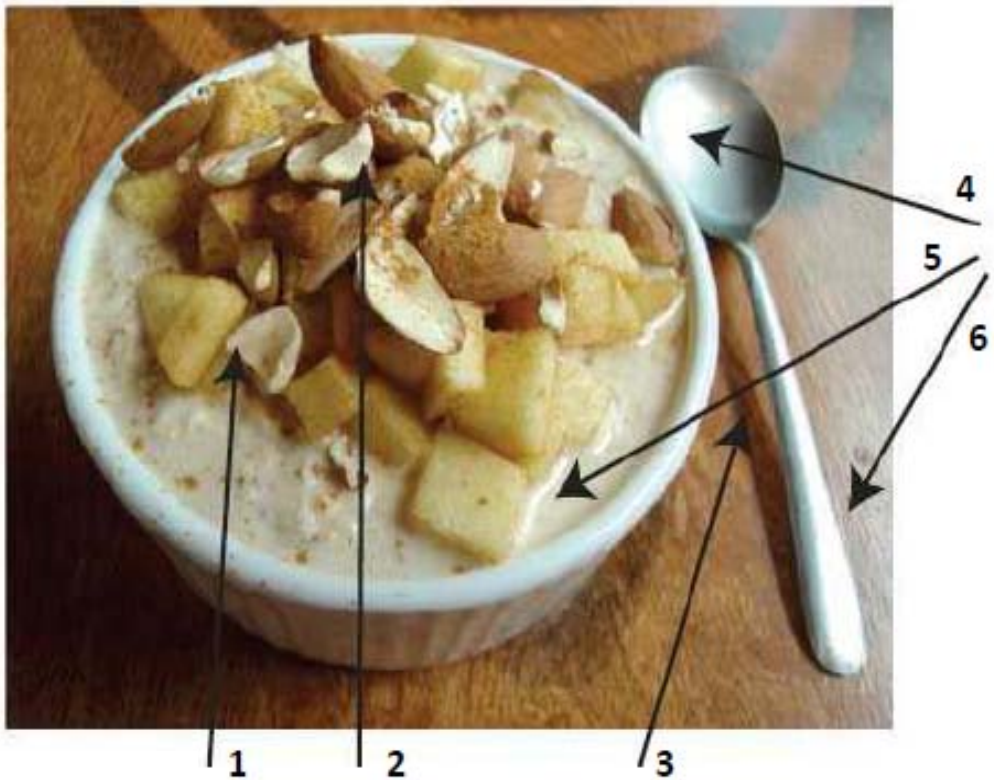

C


D


E


Take-home questions

1.



A. For each of the arrows in the above image, name the reasons the pixel near the end of the arrow has its brightness value and explain very briefly. The arrow pointing to milk is pointing to the thin bright line at the edge of the piece of apple; the arrow pointing to the spoon handle is pointing to the bright area on the handle.

Possible factors: albedo, shadows, texture, specularities, curvature, lighting direction

Slides: http://www.cs.illinois.edu/~dhoiem/courses/vision_spring10/lectures/LightandColor.pdf

Take-home questions

2. What would be the result in “Intelligent Scissors” if all of the edge costs were set to 1?

3. Typically, “GrabCut” will not work well on objects with thin structures. How could you change the boundary costs to better segment such objects?

Take-home questions

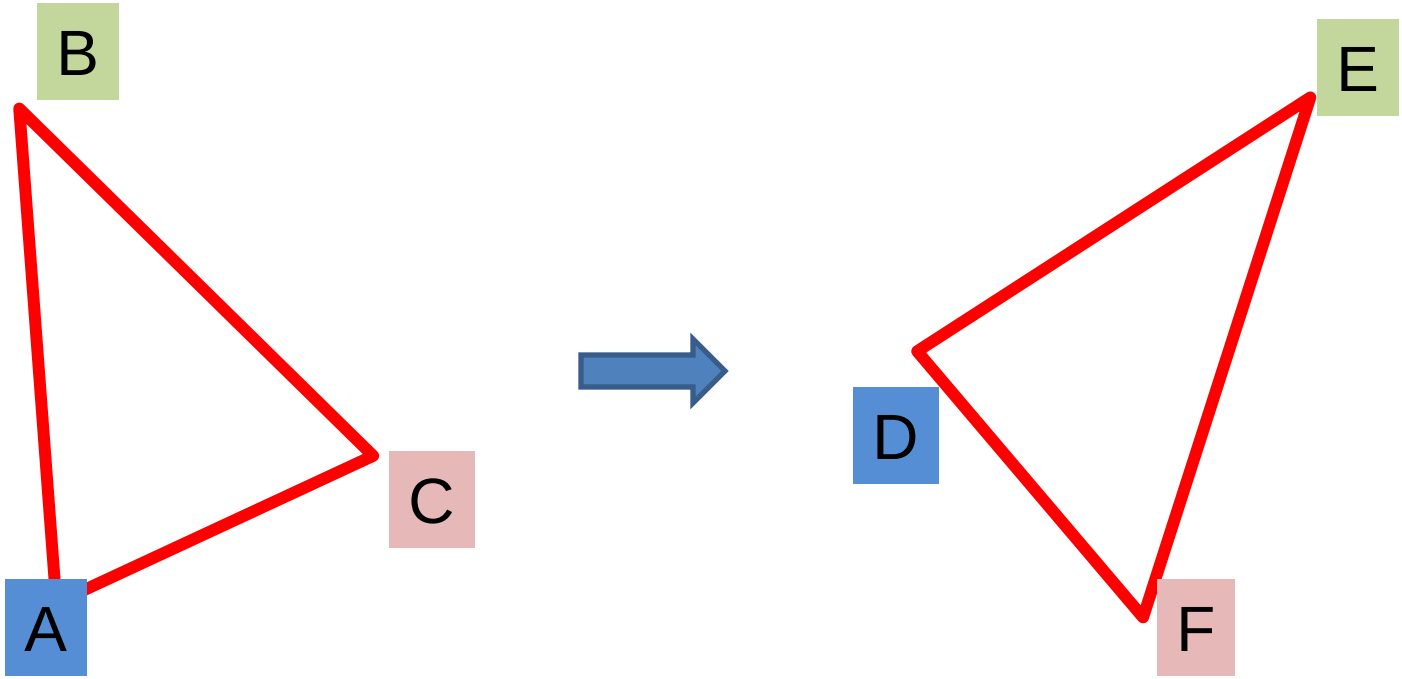
1) I am trying to blend this bear into this pool. What problems will I have if I use:
   a) Alpha compositing with feathering
   b) Laplacian pyramid blending
   c) Poisson editing?

Take-home questions

2) How would you make a sharpening filter using gradient domain processing? What are the constraints on the gradients and the intensities?

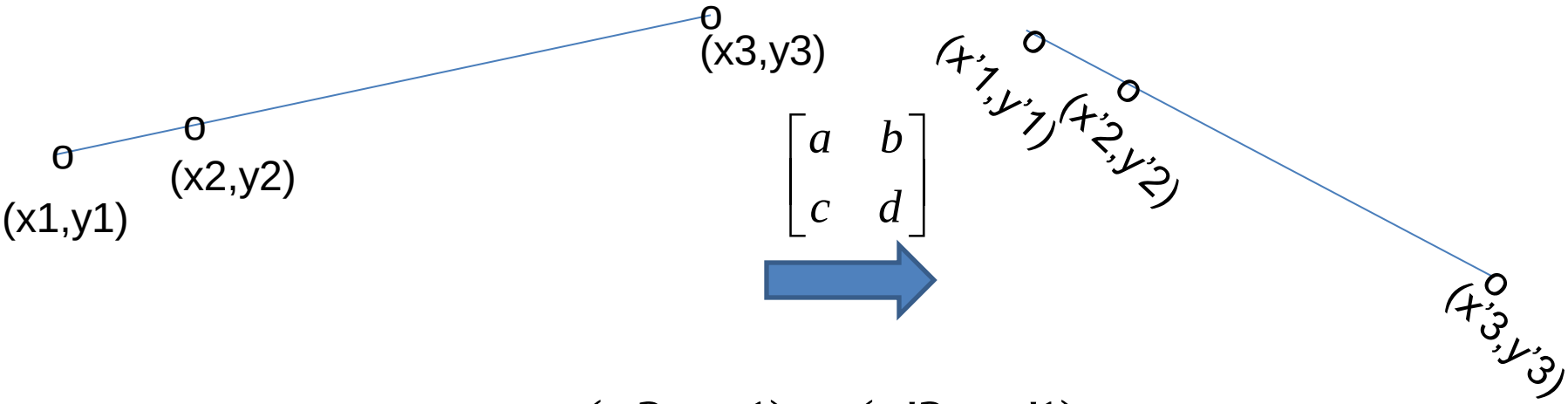
Take-home Question

1) Suppose we have two triangles: ABC and DEF. What transformation will map A to D, B to E, and C to F? How can we get the parameters?



Take-home Question

2) Show that ratios along a line are preserved under 2d linear transformations.



$$\frac{(x2 - x1)}{(x3 - x1)} = \frac{(x'2 - x'1)}{(x'3 - x'1)}$$

Hint: Because x2 is on the line through x1 and x3, x2 = k*(x3-x1)+x1 where k is between 0 and 1 if x2 is between x1 and x3

Take-home question

Suppose a 3D cube is facing the camera at a distance.

1. Draw the cube in perspective projection
2. Now draw the cube in weak perspective projection

Take-home question

Suppose you have estimated three vanishing points corresponding to orthogonal directions. How can you recover the rotation matrix that is aligned with the 3D axes defined by these points?

- Assume that intrinsic matrix K has three parameters
- Remember, in homogeneous coordinates, we can write a 3d point at infinity as (X, Y, Z, 0)

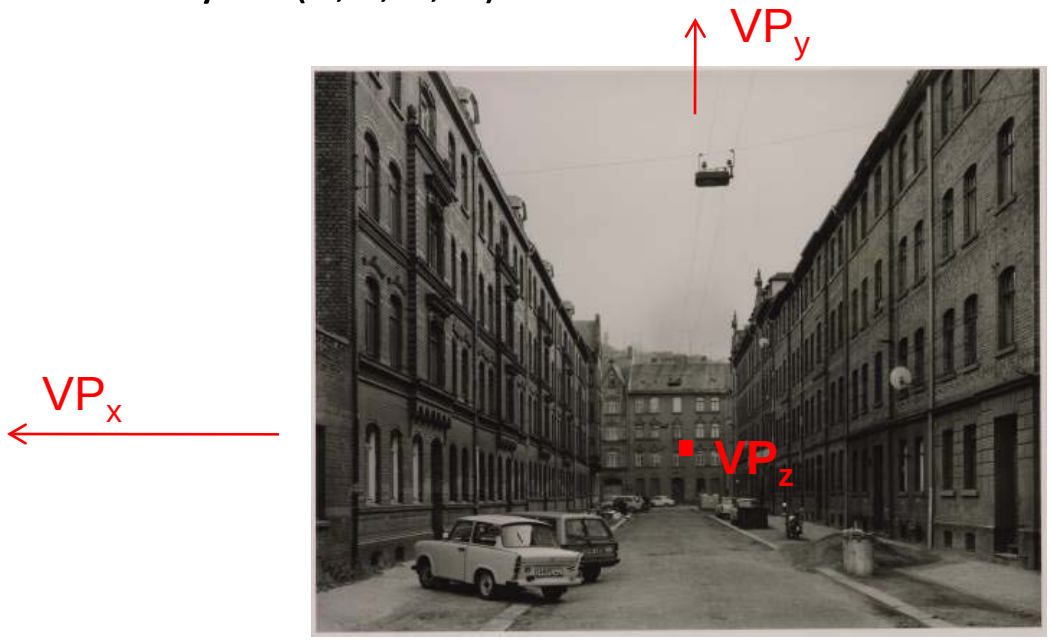


Photo from online Tate collection

Take-home question

Assume that the camera height is 5 ft.

- What is the height of the man?
- What is the height of the building?
- How long is the right side of the building compared to the small window on the right side of the building?