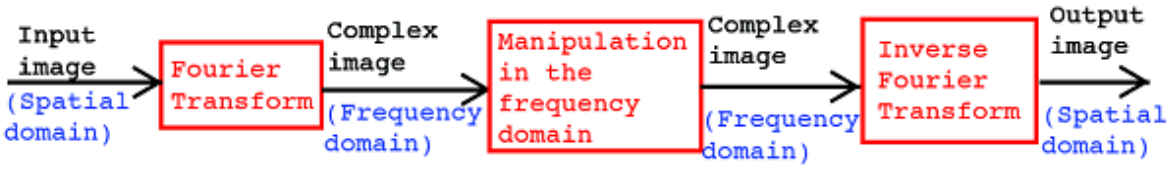
1. (a) and (c)
2. (d)
3. (c) and (d)
4. (c)
5. (b)
6. (a) and (b)
7. 

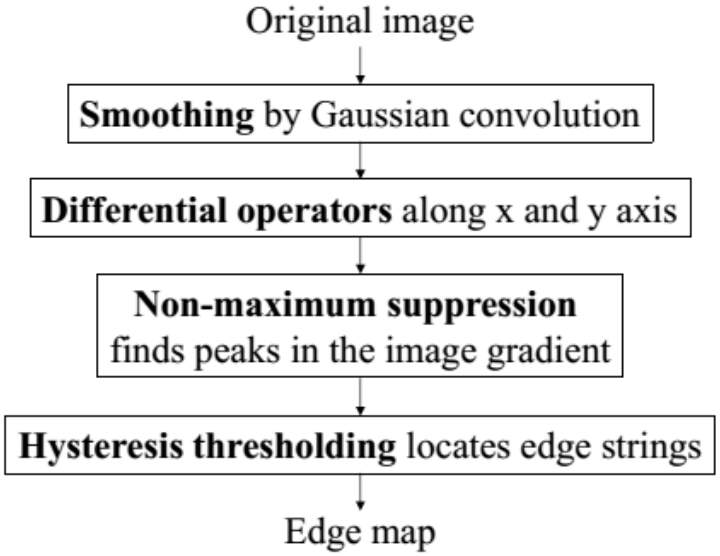
8. (d)
9. (a), (b), and (d)
10. (c)
11. (a), (b), (c), and (d)
12. $$G_\sigma(x,y) = \frac{1}{2\pi\sigma^2}\exp^{-\frac{x^2+y^2}{2\sigma^2}}$$
13. (b) and (c)
14. for $\frac{\partial I}{\partial x}$

| | | |
|---|---|---|
| -1 | 0 | 1 |
| -2 | 0 | 2 |
| -1 | 0 | 1 |

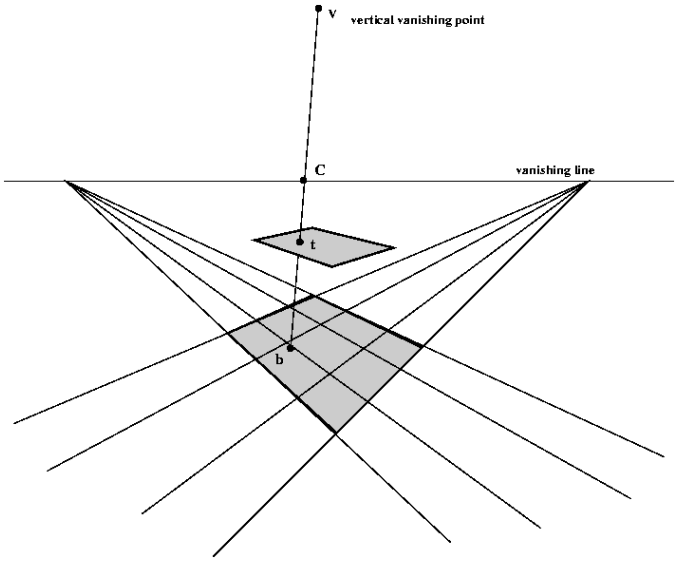
for $\frac{\partial I}{\partial y}$

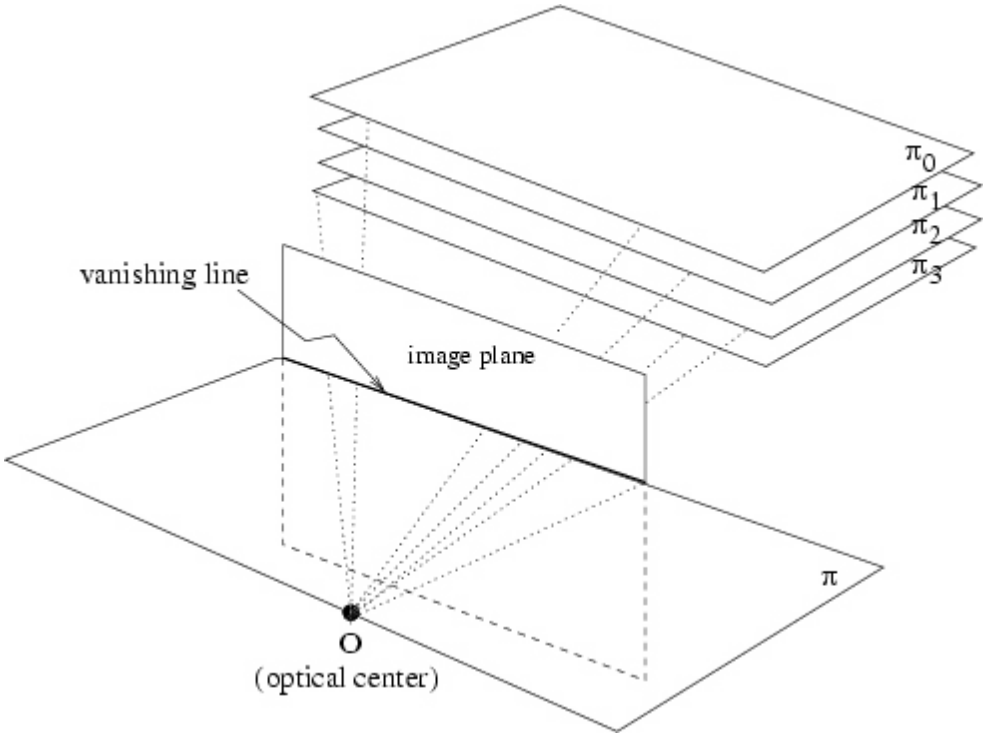
| | | |
|---|---|---|
| 1 | 2 | 1 |
| 0 | 0 | 0 |
| -1 | -2 | -1 |

where $I$ is the greyscale image

15. 

16. (a), (b), and (c)
17. (c)
18. (a)
19. (a) and (b)
20. (b) and (c)
21. (b)
22. (c)
23.
    a. Calculate gradient magnitude and orientation (direction) at each pixel
    b. Divide the orientations into a certain number of bins
    c. Vote the gradient magnitude of each pixel into the bin corresponding to its gradient magnitude
24. (d)
25. (b) and (c)
26. Laplacian filter finds rapid changes (edges) in images OR Laplacian finds the second order derivatives in images which are sensitive to noise. Thus images are first smoothed with a Gaussian filter.
27. A
    a. Compute the gradient magnitudes and orientations for each Gaussian convolved image (use the keypoint scale to select the corresponding smoothed image)
    b. Using a region around a keypoint, divide the orientations into 36 bins and vote the magnitudes into the corresponding bins (also weight them by a Gaussian window of $1.5\sigma$)
    c. Use the peak(s) as orientation(s) for the SIFT descriptor(s)
28. (a)
29. (b)
30. (d)
31. (b)
32. In a perspective image, all parallel lines meet at a single point. This point is called the vanishing point.
33.






34. (a) (c) and (d)
35. $R = (AC/AD)/(BC/BD)$ other 5 possible ones are also correct
36. (c)
37. $$h_{13} = h_{23} = 0, \quad h_{33} = 1$$
38. (c)
39. The *epipolar line* is the straight line of intersection of the epipolar plane with the image plane.

    OR

    It is the image in one camera of a ray through the optical centre and image point in the other camera.

40. (b) and (d)
41.
    a. Time coding
    b. Color coding
    c. Spatial pattern coding
42. The optical flow constraint equation is $I_x u + I_y v + I_t = 0$
43. (b)
44.
    a. Find nearest points between the two sets i.e. the corresponding points

b. Remove point correspondences that have a distance beyond a certain threshold
c. Find the transformation that minimizes the least square distance between the two sets of corresponding points and apply it to one of the point sets.