

Q1

Let a model (may be a line, a circle, an ellipse, an affine transformation etc) can be uniquely identified by k points (for a line $k = 2$, for a circle $k = 3$, for an ellipse $k = 5$ and for a 2d affine transformation $k = 3$ correspondences).

Then choose k points randomly from the given points and compute the parameters of the model (for line, parameters are m and c). Define a distance measure (euclidean distance for example) and a threshold to establish consistency. Now compute the consistency score of all the points and save that score. Now choose k points again randomly and repeat the process several times. At the end select the winner based on maximum consistency score. Write a MATLAB code for RANSAC based circle detection. Test and dry run your code on synthetic data (generate several points of a circle and add noise to them).

Q2

Given a template image I , and the total number of bins k , write down the steps to compute the R-table R for generalized hough transformation. How to compute the R-table for an image which is 30° degree rotated version of I from the R-table R ? How to compute the R-table for an image which is the scaled up (zoomed in) version of I with the factor 1.5 ? Let say R is built based on gradient directions. Can we modify R so that it is based on edge directions?

Q3

Implement multi-scale corner detector in matlab. Test your code on several images. Compare your results with built-in matlab function corner.

Q4

Implement multi-scale person detector in matlab. Test your code on inria person dataset. You can use built-in matlab function computeHOGFeatures.

Q5

What is the curse of dimensionality. If X is the matrix of data with n samples each having d dimensions, what is the new dimensions p if we need 100% percent representation using PCA.

Q6

In which case the orthogonal projection is simply the dot product onto the basis?

Q7

What is camera matrix? What is 3D reconstruction? Why we need at least 2 cameras for 3D reconstruction in general? What are the types of cameras? What is camera calibration? Why camera calibration is help full?