DM Assignment 10

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Overview

This document summarises the technique used to apply DBSCAN to images for image clustering.

Questions & Answers

1. What criterion did you use to decide whether a pixel is a core object?

Ans: If the pixel had at least 30 points (**minPts**) in its neighbourhood, it is considered a core object. Its neighbourhood is defined as other pixels that satisfy:
i. Pixel Space: The spatial separation between the two pixels must be such that the Euclidian distance between their normalised co-ordinates must be lesser than or equal to 0.1 (**physEps**).

ii. Color Space: The euclidian distance between the Red, Green and Blue components (normalised) of the two pixels must be lesser than or equal to 0.3 (**colorEps**).

2. What values of epsilon in color and pixel space, and minPts, were used and why?

Ans:

Color Space Epsilon: 0.3

Pixel Space Epsilon: 0.1

minPts: 30

Reasons: These values were arrived at by trial and error, and were found to give the expected clustering at the right places (5 clusters in total - left eye, right eye, mouth, general face region, background).

minPts was approximated by visually examining the image to guess at the smallest cluster required - the eye - which looked not smaller than 30 pixels, validated by empirical testing.

Higher pixel space epsilon would cause both eyes of the face to be in same cluster as physical separation begins to matter less.

Lower pixel space epsilon would cause the spatial radius of the neighbourhood to reduce, eventually giving no clusters and increasing noise. Also, lower the number of neighbours chosen in each run, greater the depth of recursion in the expandClusters phase of the algorithm.

Higher color space epsilon would cause more dissimilar colors to become clustered, thereby reducing number of clusters and their accuracy.

Lower color space epsilon would prevent smoothing of the aberrant pixels present in the picture, leading to higher number of clusters, or noise.

3. What logic was used to determine if a pixel was in the neighbourhood of another pixel?

The euclidian distance between the normalised pixel coordinates of the two pixels must be lesser than or equal to the pixel space epsilon.

The euclidian distance between the normalised RGB values of the two pixels must be lesser than or equal to the color space epsilon.