

## COMP27112 - Lab 4 Questions

**1. Canny has two thresholds that control the edge thresholding process. What is their purpose?**

We use the 2 thresholds to identify which edges are weak and which are strong, so we can discard the ones that fall below the threshold. The first threshold is the lower threshold and if an edge gradient magnitude is less than this lower threshold then we may want to discard this edge. The second threshold is the upper threshold and if the gradient magnitude is greater than this then this is a strong edge and can be selected.

**2. What is the purpose of the aperture parameter? What is the result of changing it from 3 to 5, 7, 9 or greater?**

The aperture parameter determines the size of the Sobel filter that is used to calculate the gradient magnitude and direction of the image. Its purpose is to control the level of detail considered when detecting edges. If we increase the aperture it can allow us to detect more detailed larger features. This is because the kernel is bigger and we can include more neighbouring pixels in the calculation of the gradient. However increasing it too much may make it sensitive to noise as it may detect edges that weren't there due to additional pixels being included. When I use an aperture value above 3 in my implementation the edge detection is very sensitive to noise and models lines that didn't exist beforehand.

**3. The Hough transform has two parameters that specify the resolution of the accumulator. Their default values are 1 and  $\pi/180$ . What is the effect of increasing the first and reducing the second?**

The first is the distance resolution from the origin to the line. If we increase this value the accumulator array becomes more finely spaced. This means that it can detect lines at smaller intervals of distance, so it is more detailed. However, increasing too much could lead to overfitting which we want to avoid. The second value is the angle resolution. This is the resolution of the angle between the line and the x-axis. Decreasing this will allow you to detect lines at smaller intervals of orientation. Increasing the distance resolution and reducing the angle resolution will increase the accuracy of the Hough transform

**4. The Hough transform has a pair of parameters that determine the minimum length of a line that can be accepted, and the maximum gap between two segments if they are to be considered part of the same line. What is the effect of changing these values?**

Changing the minimum length of a line will affect the number of points for it to form a line from. When we increase this parameter we will only consider lines that are longer than the specified threshold. As we increase this parameter the lines detected get longer. This filters out short lines as these are usually due to noise. The second parameter is the maximum gap between two segments and decreasing this means we shorter lines as only considers

segments that are closer together than the specified threshold as part of the same line. Increasing this means we get longer, more continuous lines.

**5. How close are the computed horizons to where you think the horizon should be?  
What might cause any discrepancy?**

When the parameters are modified the computed horizons are quite accurate. However, due to the large amount of noise in some images the horizon lines were plotted with deviations from what was expected. This is due to other points not on the horizon skewing the polynomial line.