Assignment - 4

Divyansh Agarwal (da2629)

November 20, 2014

1 Problem - Part b

The formula for the surface normal (p,q) at point (x, y) in the image, given the center of the sphere in image coordinates as $(\bar{x}, \bar{y})$ and radius R :

$$p = \frac{x - \bar{x}}{R^2 - (x - \bar{x})^2 - (y - \bar{y})^2}$$

$$q = \frac{y - \bar{y}}{R^2 - (x - \bar{x})^2 - (y - \bar{y})^2}$$

Assumption It is assumed that the lighting direction is same as the normal direction at the brightest spot in each image because the Image Intensity I at an image point is directly proportional to $n.s$, where n is the normal at the corresponding surface point and s is the light direction. Therefore, I will be brightest when $n.s$ attains it's maximum value i.e. when $n.s = 1$, i.e the angle between the vectors n and s is 0.

2 Problem - Part d

For Part d, I started with the three brightest intensities for each point. However, it gave a contoured normal estimation, i.e some artifacts were observed at the points where the light source combination changed. So, eventually, I used all 5 light sources to calculate the normals which solved the problem.