EE702 Assignment 1

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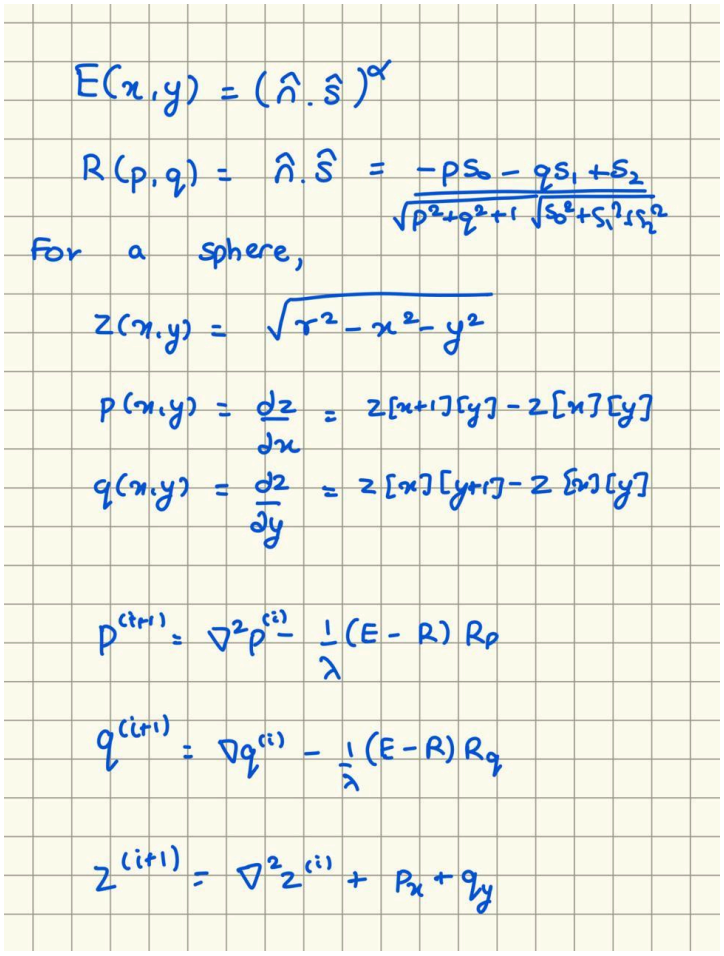
General Description

We have created 3 .ipynb files, 1 for parts a to e, and 2 for part f
For parts a to e, for variation of noise, alpha, epsilon1, epsilon2, and different regularization/smoothness constraints (we have done this by changing values of lambda and number of iterations).
For part f, we have taken 2 cases, 1 is via a 2D image of a spherical object, named kirby.jpg, that takes as input a jpg image and 1 case where we have used a .ply file for comparison with ground truth of 3D objects (for first case we have done it by visual comparison as we were only required to use an image and not a .ply file, hence the 2D image output .ipynb is (f)'s answer).
The following are the formulae that have been used in the assignment (implemented in the code)-



(g)

- The recovery of object like a sphere is fairly robust to noise and change in source given the perturbations are upto single digit values in the code, for the variable noise_radiance, (depth map changes starts showing noticeable error for values upward of 0.1, beyond 0.2 it ceases to be similar in shape to a sphere). Here, noise_radiance is scaled by the irradiance value of the image, so a 0.1. When changing the values of epsilon1 and epsilon2, the sphere is slightly shifted, however the shape remains the same.
- The usage of this algorithm depends on the type of image we have provided. It works well for spherical objects as expected, and depending on the value of lambda we obtain different results for non spherical objects. The lambda parameter is more prominent in changing results when the object has prominent edges and depth changes inside the region of interest, where the region of interest is the region in which the object lies, i.e. the object has parts which are significantly different from the center body of the object in depth.
    - Our first input is a spherical object with 5 oblong shapes attached to the image. The depth is accurate except for the 2 oblong shapes which are higher than the main sphere, as the sphere is given the highest height and the oblong shapes are less than the sphere.
    - Our second input is a rabbit, which is entirely oblong in shape. It also shows a tendency of having the highest point at the centre, although the highest point is near the bottom left of the image (leg of the rabbit in the image). The rest of the object is fairly accurate.