EE 702: Assignment 1

Shape from Shading

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I've taken 5 different values lambda,source noise, radiance noise (total 125 combinations)

For each combination of these values depth is esimated using ‘pq’ as well as ‘fg’ parameters (total 250 images)

"allSphere(2d)" and "allSphere"(3d) contain 250 images each having all the combinations

"demoLambda" : images for varying lambda keeping rest of the parameters constants for 'pq' and 'fg'

"demoSrc" : images for varying noiseSrc keeping rest of the parameters constants for 'pq' and 'fg'

"demoRad" : images for varying noiseRad keeping rest of the parameters constants for 'pq' and 'fg'

Later, depth is also estimated for a custom input.

Observations

1. Effect of lambda:

    Lambda determines regularization of the estimated function (sphere in our case). We don't observe much difference in reconstruction for 'fg' parameter by varying lambda. But in case of 'pq' parameters, the reconstructions start deteriorating as we reduce lambda. This happens because 'fg' parameters are bounded while 'pq' parameters are not bounded at the boundary of the sphere.

2. Effect of source noise (additive gaussian noise):

    Noise was added to S0, then radiance was computed. But while reconstruction I used S0 itself. This caused error in reconstructions. The sphere was observed to be shifted more and more in the direction of noise as amount of noise was increased. This shift is observed to be more in case of 'pq' than 'fg', because 'pq' parameter itself is very large. When it is multiplied by noise, overall noise increases.

3. Effect of Radiance Noise (additive gaussian noise):

Radiance was calculated normally. Then noise was added to the radiance. Estimation was carried out using this erroneous radiance. Increasing the amount of radiance noise increased the error in reconstruction. This error was less in case of 'fg' parameters than 'pq' parameters. The reason being the same due to more amplification of noise in case of 'pq' than 'fg'.