
Discussion Fluttered Shutter

Computational Photography

Hendrik Lensch, Summer 2007

Projects

List available now

Project proposal (2 pages): 1st of June

- LaTeX Template will be made available

Project idea presentation: 8th of June

Final Project presentation: 20th of July

Project report

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Questions

- What problem addresses the paper?
- Why is the problem relevant?
- Why is it a hard problem?
- Who might be interested?
- Who are the authors?
- What do the authors claim as their contribution?
- Did they reach their goals?
- What are other existing solutions?
- Are there missing references?
- What is the novel idea?

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Questions

- Summarize the individual steps of the approach.
- Is each step well presented?
- Do the authors present enough detail so that the work could be reproduced?
- How could the presentation be improved?
- Comment on the results.
- How good are they?
- How complicated is it to achieve them?
- How much interaction is required?
- What are the limits?

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Questions

- Are the limitations clearly stated?
- How could the technique be improved?
- Could it be used in some other context?
- Summarize the main points.
- Is the paper length adequate?
- How would you judge the paper?

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Deconvolution

$$\hat{O}(u, v) = \frac{\hat{P}^*(u, v)\hat{I}(u, v)}{|\hat{P}(u, v)|^2}$$

$$\hat{O}(u, v) = \frac{\hat{I}(u, v)}{\hat{P}(u, v)} = \hat{O}(u, v) + \frac{\hat{N}(u, v)}{\hat{P}(u, v)}$$

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Deconvolution

- Tikhonov regularization
- H is highpass filter

$$J_1(O) = \| I(x, y) - (P * O)(x, y) \|^2 + \lambda \| H * O \|^2$$

$$\hat{O}(u, v) = \frac{\hat{P}^*(u, v)\hat{I}(u, v)}{|\hat{P}(u, v)|^2 + \lambda |\hat{H}(u, v)|^2}$$

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Bayesian Approach

$$p(O | I) = \frac{p(I | O)p(O)}{p(I)},$$

$$\text{ML}(O) = \max_O p(I | O).$$

$$\text{MAP}(O) = \max_O p(I | O)p(O).$$

- assuming Gaussian noise

$$p(I | O) = \frac{1}{\sqrt{2\pi}\sigma_N} \exp - \frac{(I - P * O)^2}{2\sigma_N^2},$$

$$O^{n+1} = O^n + \gamma P^* * (I - P * O^n),$$

$P^*(x, y) = P(-x, -y)$, P^* is the transpose of the PSF,

Lucy-Richardson

- with Poisson noise

$$p(I | O) = \prod_{x,y} \frac{[(P * O)(x, y)]^{I(x,y)} \exp \{- (P * O)(x, y)\}}{I(x, y)!}.$$

- maximum at

$$\frac{\partial \ln p(I | O)(x, y)}{\partial O(x, y)} = 0.$$

- iterative scheme

$$O^{n+1}(x, y) = \left[\frac{I(x, y)}{(P * O^n)(x, y)} * P^*(x, y) O^n(x, y) \right]$$

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