Motivation

Techniques for denoising are based on priors that assume noise characteristics are either purely Poissonian or Gaussian. Real world images are a mixture of both, with Gaussian read noise dominating at lower intensities and Poissonian shot noise dominating at higher intensities.

This study shows that we can achieve better SNR performance during denoising by using a mixed model.

Related Work

Practical Poissonian-Gaussian noise modeling and fitting for single-image raw-data - Alessandro Foi characterizes the Poissonian-Gaussian noise model for sensors.


New Technique

Repeat for N iterations or until coverage:

- Compute Poissonian priors
  \[ \frac{\lambda^k e^{-\lambda}}{k!} \]

- Compute Gaussian priors
  \[ \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}} \]

- Compute signal-based weights
- Mix Poissonian / Gaussian priors based on weights

Experimental Results

- Using a TV prior improves the Poissonian denoising by optimizing for sparse gradients
- Mixing Gaussian & Poissonian ADMM improves the performance of Poissonian ADMM

28.3656 PSNR 28.6575