

# Reaction Report V: Quanta Burst Photography

Minh Tran  
[minht@cs.cmu.edu](mailto:minht@cs.cmu.edu)

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**Identify one idea in the paper that you feel is a major contribution or a major limitation, explain it, and discuss why it is important**

The impressive results of the quanta burst photography on low-light high-speed motion environment were built upon different aspects including image denoising, burst denoising, quanta sensors, wide-dynamic-range sensors and image reconstruction from single-photon sensor data. Beside using SPADs to maximize the captured information in high noise condition, I think the main contribution in this research is the single-photon imaging model under motion where they identified the motion blur as the merging of photons in different timeframes and proposed to fix that by aligning frames before merging. This computationally efficient method divided the image sequence into temporal blocks to get a better SNR to use optical flow for aligning these blocks. This approach is important since it could be applied to and takes advantages of both SPAD and jots, two common single-photon sensing technologies, one is better in high-motion settings while other is more suitable for spatial resolution in slow motion scenes.

**Describe one idea of yours that builds on the paper and expand on that idea as much as possible**

I think one direction to extend this approach is to apply it to Non-Line-of-Sight problems such as shape reconstruction since it is very good in denoising. However, since the characteristics of noise in this research is from motion while the noise from NLOS problems could come from both motion and light scattering over the surface, we need to improve this method a little bit. First 100kfps may be is not comparable with transient cameras that are commonly used in NLOS, so we need to increase the frame rate. Second is the denoising could be better if we have some prior on the BRDF of the surface, perhaps it could be extracted using different wavelengths, but it is just the idea, not sure it is possible. Solving these two problems may help applying quanta burst photography into NLOS.