High-fidelity Event-Radiance Recovery via Transient Event Frequency

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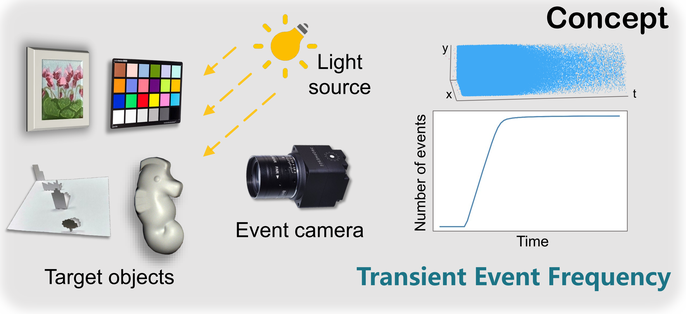
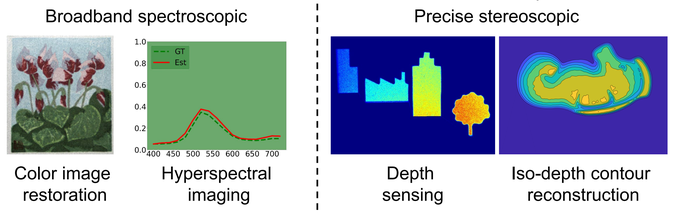
Key Idea



- We propose to use event cameras that are sensitive to radiance changes, to recover precise radiance values. We reveal that, under active lighting conditions, the transient frequency of event signals triggering linearly reflects the radiance value.
- We design an innovative method to convert the high temporal resolution of event signals into precise radiance values, which yields several capabilities in image analysis.

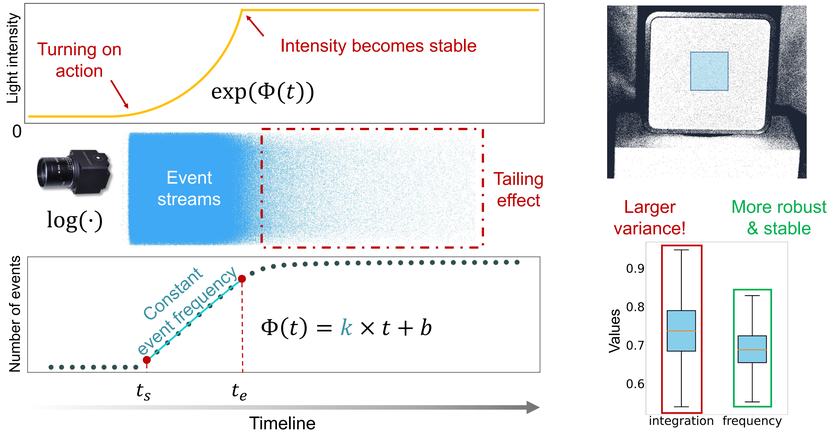
Capabilities



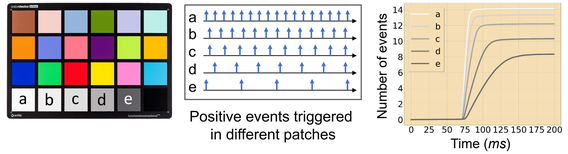
- The feasibility of recovering radiance values solely from the transient event frequency (**TEF**) is demonstrated through multiple experiments. Furthermore, we can directly apply computer vision algorithms developed for 2D images to event-radiance, expanding the potential applications of event cameras.

Project page

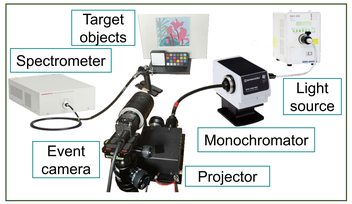
Proposed Method

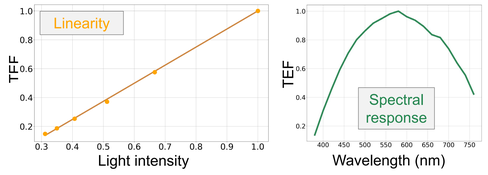


We reveal the **linear** relationship between TEF and radiance values at the split second of turning light on. The variance of values computed from demonstrate our frequency-based method is much more stable and robust.



Patches with higher radiance values trigger events in a higher frequency. The larger slope factor represents a higher radiance value.

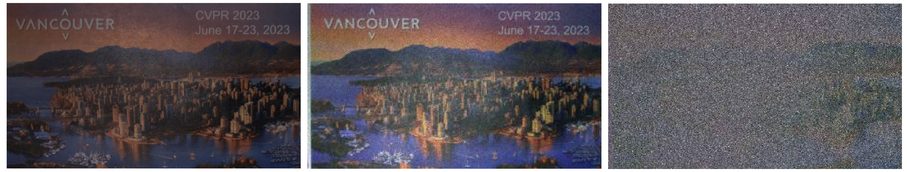




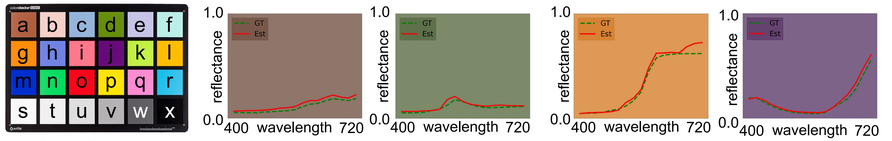
We calibrate the linearity of TEF and measure the spectral response function of the event camera.

Experimental Results

Color image restoration



Hyperspectral imaging



Depth sensing

Iso-depth contour reconstruction