Scene Appearance Change As Framerate Approaches Infinity

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The Question

- Cameras use light to construct a model of scene appearance, not record light properties
- Model should change as the scene changes
  - How fast does the scene change?
  - Can we know (e.g., photon shot noise)?
- Increasing temporal resolution (framerate) should produce a sharply decreasing amount of additional data. Does it?

Why We Care

- If so, can use high framerate capture and
  - Pick still exposure interval after capture
  - HDR (High Dynamic Range)
  - Framerate-independent video
  - Negligible temporal gaps between frames
- In other words, can implement TDCI (Time Domain Continuous Imaging)

High-Framerate Cameras

- Consumer cameras with 240 to 1000 FPS
- Temporally-skewed multi-cameras...
  like ***FourSee*** :

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Experiments

- Consumer cameras @ 240-1000 FPS record a normal scene in *ordinary* lighting
- Synthesize lower FPS by **stacking**
- Measure information content by TDCI coding
  - Waveform per pixel
  - Noise model
  - Record each time a pixel value changes from expected by more than noise

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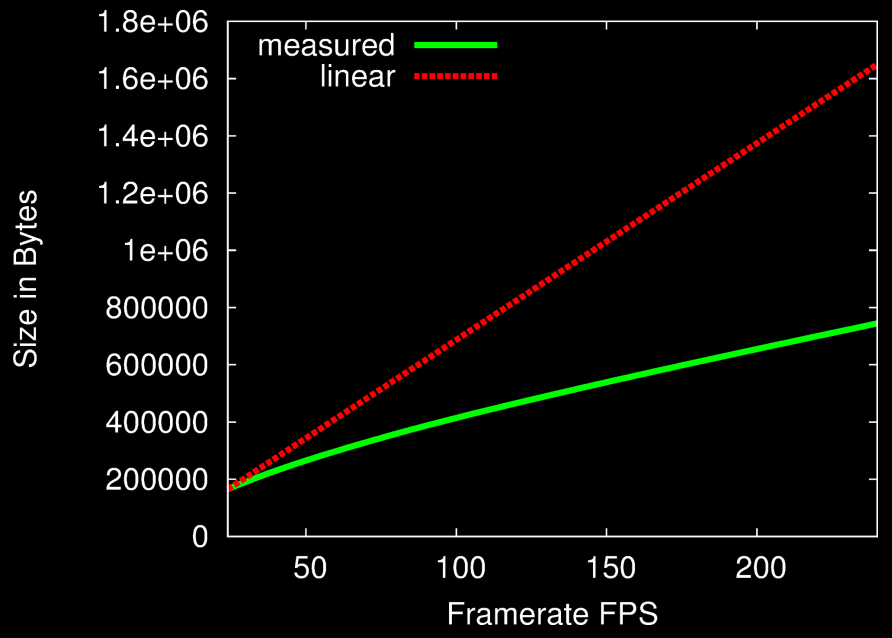
Canon PowerShot N @ 240 FPS

(original `.mov` was 66,252,172 Bytes)



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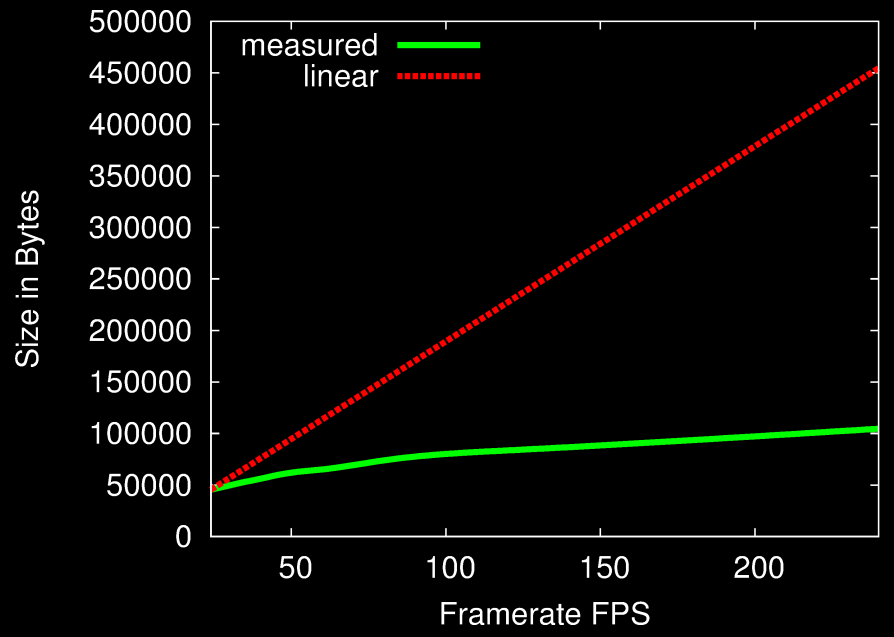
Canon PowerShot N @ 240 FPS

(original `.mov` was 71,434,052 Bytes)



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Conclusions

- Information content quickly approaches a **constant** as FPS is increased
- Noise model has a huge impact on compression obtained

Want details? See our paper & poster!

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