Analysis of Feature Visibility in Non-Line-of-Sight Measurements

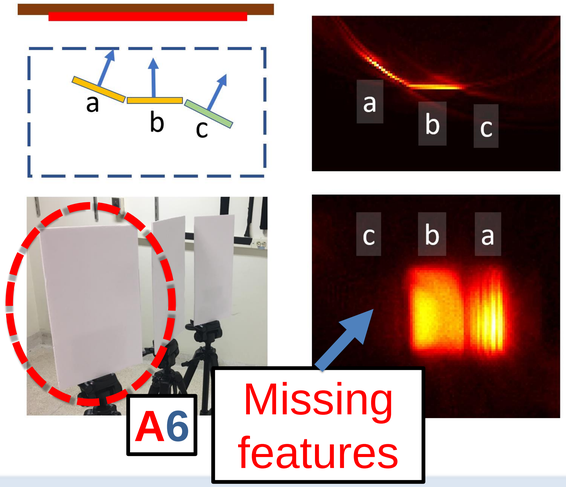
Xiaochun Liu, Sebastian Bauer, Andreas Velten*
Computational Optics Group, University of Wisconsin - Madison

WISCONSIN UNIVERSITY OF WISCONSIN-MADISON
CVPR LONG BEACH CALIFORNIA June 16-20, 2019

"Why are certain features invisible in NLOS measurements?"

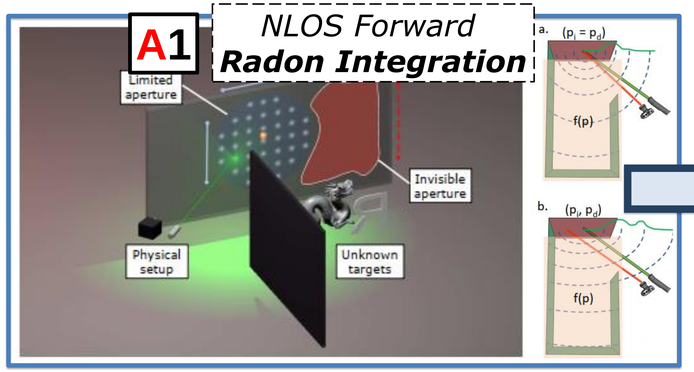
We

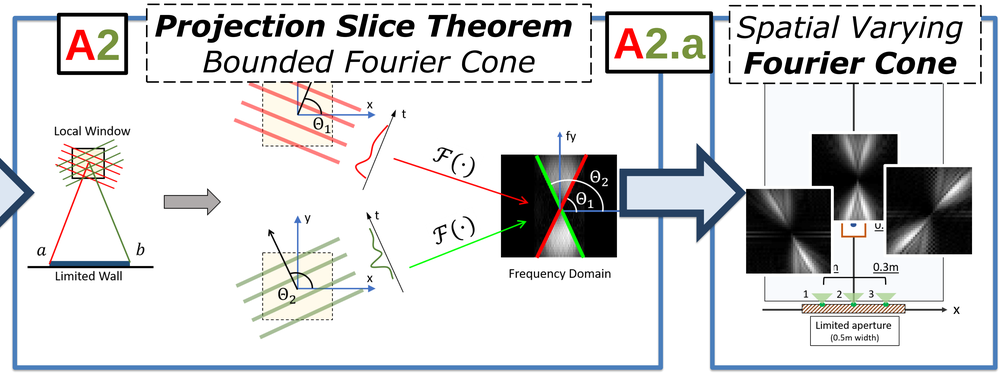
- ✓ Link NLOS problem to **Radon** Type **Integration**
- ✓ Consider **Limited measurements** scenarios
- ✓ Apply **spatial-frequency** analysis
- ✓ Show **fundamental limits** (missing features)
- ✓ Stimulate **future** methodology

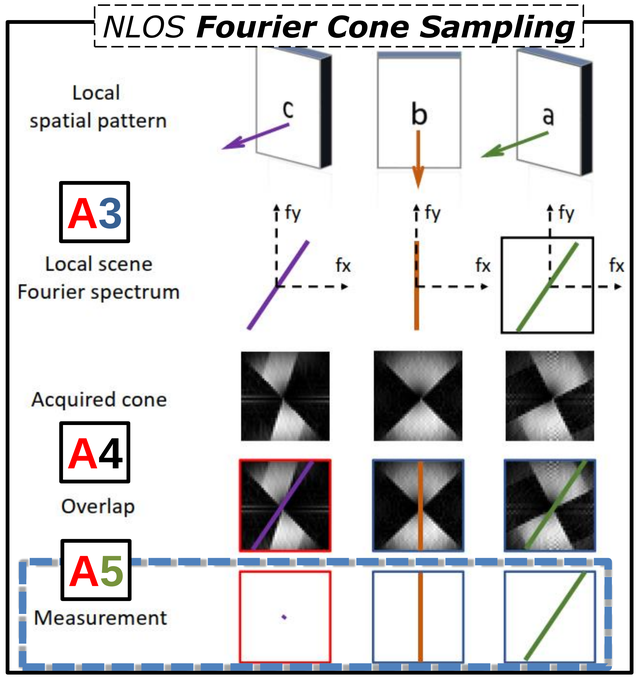


Brief Intro for NLOS Imaging

Non-Line-of-Sight (NLOS) builds camera that can image around a corner. It uses transient illumination devices and computational inverse methods to decode 3D images from measurements. Most previous work in this area only focuses on showing *good* recovery image.







Analytical Steps

- A1. Generalize NLOS measurements as Elliptical Radon Integral
- A2. Use projection slice theorem to calculate Fourier Transform of measurement functions
  - a) Fourier Cones describing the measurements
- A3. Compute Fourier Transform of Scene Features
- A4. Local Fourier Cone "sample" Scene Features in Fourier domain
- A5. Scene Features outside Fourier Cone are in a Null space (missing features)
- A6. Fourier Cone and Scene Features vary spatially (missing features)

More?

Easy Video Description

Let's stay connected :)

Supplementary YouTube Video

Computational Optics Group

Xiaochun Liu: https://xiaochunliu.github.io
Andreas Velten: velten@gmail.com
Lab: https://biostat.wisc.edu/~compoptics/

Poster for: Xiaochun Liu, Sebastian Bauer, Andreas Velten*, Analysis of Feature Visibility in Non-Line-of-Sight Measurements. *IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**)*, **2019**