Alankar Kotwal

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Research Summary

I work in computational imaging, where we combine illumination, cameras and computation in innovative ways to sense the environment in a way that traditional cameras can't. I build optical imaging systems to realize these capabilities. My current work applies the principles of computational imaging to improve visual feedback in neurosurgery.

My previous work involved using wave nature of light to achieve exciting capabilities like seeing through scattering media and micron-scale shape acquisition, with applications in biomedical imaging and fabrication. Some of these were possible only in the lab now: We brought them out in the open!

Education

Carnegie Mellon University — Aug 2017 - Dec 2022
PhD in Robotics
Advisor: Prof. Ioannis Gkioulekas

Indian Institute of Technology Bombay — Jul 2016 - Jun 2017
Master of Technology in Electrical Engineering
Thesis advisor: Prof. Ajit Rajwade

Indian Institute of Technology Bombay — Jul 2012 - Jun 2016
Bachelor of Technology in Electrical Engineering
Research advisors: Prof. Ajit Rajwade and Prof. Suyash Awate

Professional Positions

Postdoctoral Researcher — May 2023 - present
Department of Neurosurgery, University of Texas Medical Branch
Advisor: Dr. Pablo Valdes

Visiting Researcher — June 2023 - present
Department of Electrical and Computer Engineering, Rice University
Advisor: Prof. Ashok Veeraraghavan

Postdoctoral Researcher — Feb 2023 - Apr 2023
Robotics Institute, Carnegie Mellon University
Advisor: Prof. Ioannis Gkioulekas

Graduate Research Assistant — Aug 2017 - Jan 2023
Robotics Institute, Carnegie Mellon University
Advisor: Prof. Ioannis Gkioulekas

Visiting PhD Student in Radiology — May 2019 - Aug 2019
Neuroradiology, Massachusetts General Hospital
Advisor: Dr. Rajiv Gupta

Research Assistant — Aug 2016 - Aug 2017
Department of Electrical Engineering, Indian Institute of Technology Bombay
Advisor: Prof. Ajit Rajwade

Publications

Passive micron-scale time-of-flight with sunlight interferometry
Computer Vision and Pattern Recognition (2023), highlight paper [paper]
A. Kotwal, A. Levin and I. Gkioulekas

Swept-angle synthetic wavelength interferometry
Computer Vision and Pattern Recognition, 2023 [paper]
Computational Cameras and Displays Spotlight, 2023
A. Kotwal, A. Levin and I. Gkioulekas

Interferometric transmission probing with coded mutual intensity
ACM Transactions on Graphics, 2020 [paper, video]
A. Kotwal, A. Levin and I. Gkioulekas

Joint desmoking, specularity removal, and denoising of laparoscopy images via graphical models and Bayesian inference
International Symposium on Biomedical Imaging, 2017 [paper]
A. Baid, **A. Kotwal**, R. Bhalodia, S. Merchant and S. Awate

Joint desmoking and denoising of laparoscopy images
International Symposium on Biomedical Imaging, 2016 [paper]
A. Kotwal, R. Bhalodia and S. Awate

Designing constrained projections for compressed sensing: mean errors and anomalies with coherence
GlobalSIP, 2018 [paper]
D. Shah, **A. Kotwal** and A. V. Rajwade

Signal sensing and reconstruction for a novel multi-source static computed tomography system
ICASSP, 2020 [paper]
A. Kotwal, A. Cramer, D. Wu, K. Yang, W. Krull, I. Gkioulekas and R. Gupta

Invited Talks and Courses

"**Computational Interferometric Imaging**" | ACM SIGGRAPH course | Jul 2023

"**Swept-Angle Synthetic Wavelength Interferometry**" | Computational Cameras and Displays Workshop at the IEEE/CVF Conference on Computer Vision and Pattern Recognition | Jun 2023

"**Computational Interferometric Imaging**" | University of California at San Diego – Pixel Cafe | May 2023

"**Computational Interferometric Imaging**" | Camera Culture | Massachusetts Institute of Technology Media Lab | Jan 2023

"**Computational Interferometric Imaging**" | Wellman Center for Photomedicine, Massachusetts General Hospital | Jan 2023

"**Computational Interferometric Imaging**" | Photonics Center, Boston University | Jan 2023

"**Computational Interferometric Imaging**" | Robotics Institute seminar, Carnegie Mellon University | Dec 2022

"**Computational Interferometry**" | Samsung AI Center in Toronto | Oct 2022

"**Computational Interferometry**" | University of California at Los Angeles Grundfest Lectures in Computational Imaging | Jul 2022

"**Interferometric Transmission Probing with Coded Mutual Intensity**" | ACM SIGGRAPH | Aug 2020

"**Interferometric Transmission Probing with Coded Mutual Intensity**" | CVPR CCD | Jun 2020

Theses

Computational interferometric imaging
Doctoral Dissertation, Robotics Institute, Carnegie Mellon University, 2023 [link]

Optimizing sensing matrices for compressed sensing recovery

Master's Thesis, Electrical Engineering, Indian Institute of Technology Bombay, 2017 [link]

Academic Service

Reviewer, ACM SIGGRAPH Asia, 2023

Reviewer, IEEE/CVF Conference on Computer Vision and Pattern Recognition, 2023

Reviewer, IEEE/CVF Conference on Computer Vision, 2023

Reviewer, International Conference on Computational Photography, 2022-2023

Reviewer, International Journal of Computer Assisted Radiology and Surgery, 2018

Awards

Undergraduate Research Award for Master's thesis, Indian Institute of Technology Bombay, 2017

Gold medal at the 6^{th} International Olympiad on Astronomy and Astrophysics, representing India

Bronze medal at the 5^{th} International Earth Sciences Olympiad, representing India

KVPY Scholarship 2011 by the Government of India for students interested in basic sciences

Other information

Citizenship: Indian

Languages: English (fluent), Marathi (native), Hindi (fluent)