Sanjeev J. Koppal

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EXPERIENCE AND EDUCATION

Assistant Professor (IEEE Senior Member) 2014-present
University of Florida, Electrical and Computer Engineering
Director of the Florida Optics and Computational Sensor (FOCUS) Lab

Member of Technical Staff 2012-2014
Texas Instruments Imaging R&D Group

Post-doctoral Research Associate 2009-2012
Harvard University
Mentor: Prof. Todd Zickler

Graduate Research Assistant 2003-2009
Robotics Institute, Carnegie Mellon University
Ph.D. Robotics Aug 2009
Advisor: Prof. Srinivasa Narasimhan

Undergraduate Research Assistant 1999-2003
University of Southern California
B.S. Computer Science May 2003
Mentor: Prof. Gaurav Sukhatme

JOURNALS

J17 Adaptive Fovea for Scanning Depth Sensors
International Journal of Robotics Research, 2020
Z. Tasneem, C. Adhivarahan, D. Wang, H. Xie, K. Dantu and **S. J. Koppal**

J16 Design and Calibration of a Fast Flying-Dot Projector
for Dynamic Light Transport Acquisition
Transactions on Computational Imaging, 2020
K. Henderson, X. Liu, J. Folden, B. Tilmon, S. Jayasuriya and **S. J. Koppal**

J15 Proximity-based Sensor Fusion of Depth Cameras and Isotropic Rad-detectors
Transactions on Nuclear Science, 2020
K. Henderson, X. Liu, K. Stadnakia, A. Martin, A. Enqvist and **S. J. Koppal**

J14 The Security-Utility Trade-off for Iris Authentication and
Eye Animation for Social Virtual Avatars
IEEE VR 2020 (in the proceedings of TVCG 2020)
B. John, S. Joerg, **S. J. Koppal** and E. Jain

J13 A Silicon Optical Bench with Vertically-oriented Micromirrors
for Active Beam Steering
Sensors and Actuators A: Physical, 2019

D Wang, C Watkins, **S. J. Koppal** and H Xie

J12 Data Fusion for a Vision-Aided Radiological Detection System:
Calibration Algorithm Performance
Nuclear Instruments and Methods in Physics A, 2018
K. Stadnikia, K. Henderson, A. Martin, P. Riley, **S. J. Koppal** and Andreas Enqvist

J11 Focal Flow: Velocity and Depth from Differential Defocus through Motion
International Journal on Computer Vision (IJCV), 2017
E. Alexander, Q. Guo, **S. J. Koppal**, S.J. Gortler, and T. Zickler

J10 Leveraging gaze data for segmentation and effects on comics
Transactions on Multimedia Computing (TOMM), 2017
I. Thirunarayanan, K. Khetarpal, **S. J. Koppal**, O. LeMeur, J. Shea and E. Jain

J09 Pre–capture privacy for small vision sensors
Transactions on Pattern Analysis and Machine Intelligence (PAMI) 2016
F. Pittaluga and **S. J. Koppal**

J08 A survey on computational photography in the small
IEEE Signal Processing Magazine, 2016
S. J. Koppal

J07 Wide-angle structured light with a scanning MEMS mirror in liquid
Optics Express, 2016
X. Zhang, **S. J. Koppal**, R. Zhang, L. Zhou, E. Butler and H. Xie

J06 Beyond perspective dual photography with illumination masks
Transactions on Image Processing (TIP), 2015
S. J. Koppal and S. G. Narasimhan

J05 Generalized assorted camera arrays: robust cross-channel registration and applic.
Transactions on Image Processing (TIP), 2015
J. Holloway and K. Mitra and **S. J. Koppal** and A. Veeraraghavan

J04 Towards wide-angle micro vision sensors
Transactions on Pattern Analysis and Machine Intelligence (PAMI), 2013
S. J. Koppal, I. Gkioulekas, T. Young, H. Park, K. Crozier, G. Barrows and T. Zickler

J03 Exploiting DLP illumination dithering for reconstruction and
photography of high-speed scenes
International Journal on Computer Vision (IJCV), 2011.
S. J. Koppal, S. Yamazaki and S. G. Narasimhan

J02 A viewer-centric editor for stereoscopic cinema
IEEE Computer Graphics and Applications (CG&A), 2011.
S. J. Koppal, L. Zitnick, M. Cohen, S. Kang, B. Ressler and A. Colburn

J01 Appearance derivatives for iso-normal clustering of scenes
Transactions on Pattern Analysis and Machine Intelligence (PAMI), 2008.
S. J. Koppal and S. G. Narasimhan

CONFERENCES

C27 FoveaCam: A MEMS Mirror-Enabled Foveating Camera
ICCP 2020
B. Tilmon, E. Jain, S. Ferrari, and **S. J. Koppal**

C26 Revealing Scenes by Inverting Structure from Motion Reconstructions
CVPR 2019 *Best Paper Finalist*
F. Pittaluga, **S. J. Koppal**, S. Kang and S. Sinha

C25 A Large Aperture 2-Axis Electrothermal MEMS Mirror for Compact 3-D LiDAR
2019 International Conference on Optical MEMS and Nanophotonics
D. Wang, C. Watkins, M. Aradhya, **S. J. Koppal** and H. Xie

C24 A Compact Omnidirectional Laser Scanner Based on an Electrothermal Tripod MEMS Mirror for LiDAR
Transducers 2019
D. Wang, C. Watkins, **S. J. Koppal**, M. Li, Y. Ding and H. Xie

C23 EyeVEIL: Degrading Iris Authentication in Eye-Tracking Headsets
ETRA 2019
B. John, **S. J. Koppal** and E. Jain

C22 Learning Privacy Preserving Encodings through Adversarial Training
IEEE Winter Conference on Applications in Vision (WACV), 2019
F. Pittaluga, **S. J. Koppal** and A. Chakrabarti

C21 Directionally Controlled Time-of-Flight Ranging for Mobile Sensing Platforms
Robotics Science and Systems (RSS), 2018
Z. Tasneem, D. Wang, H. Xie and **S. J. Koppal**

C20 An Integrated Forward-View 2-Axis MEMS Scanner for Compact 3D LIDAR
NEMS 2018 *Best Student Paper Award*
D. Wang, S. Rojas, A. Shuping, Z. Tasneem, **S. J. Koppal** and H. Xie

C19 A Compact 3D LIDAR Based on an Electrothermal Two-Axis MEMS Scanner for Small UAV
SPIE 2018
D. Wang, S. Strassle, A. Stainsby, Y. Bai, **S. J. Koppal** and H. Xie

C18 Designing Light Filters to Detect Skin Using a Low-powered Sensor
SoutheastCon 2018
M. Tariq, A. Ghosh, K. Badillo-Urquiola, A. Jha, **S. J. Koppal**, and P. J. Wisniewski

C17 Tracking Radioactive Sources through Sensor Fusion of Omnidirectional LIDAR and Isotropic Rad-detectors
3DV 2017
K. Henderson, K. Stadnikia, A. Enqvist and **S. J. Koppal**

C16 A Compact MEMS-Based Wide-Angle Optical Scanner
International Conference on Optical MEMS and Nanophotonics (OMN), 2017

B. Yang, L. Zhou, X. Zhang, D. Wang, **S. J. Koppal** and H. Xie

C15 Situational Information Guidance for Revised Detection Limits
Nuclear Science Symposium / Medical Imaging Conference 2017
K. Stadnikia, K. Henderson, **S. J. Koppal** and A. Enqvist

C14 A Wide-angle Immersed MEMS Mirror and Its Application in OCT
International Conference on Optical MEMS and Nanophotonics, 2016
X. Zhang, L. Zhou, C. Duan, D. Zheng, **S. J. Koppal**, and H. Xie

C13 Data Fusion for a Vision-Radiological System: Calibration Algorithm Response to Sensor Location
INMM 2016
K. Stadnikia, A. Martin, P. Riley, K. Henderson, **S. J. Koppal** and A. Enqvist

C12 Focal flow: Measuring distance and velocity with defocus and differential motion
ECCV 2016 *Best Student Paper*
E. Alexander, Q. Guo, **S.J. Koppal**, S.J. Gortler, and T. Zickler

C11 Sensor-level privacy for thermal cameras
International Conference on Computational Photography (ICCP), 2016
F. Pittaluga, A. Zivkovic and **S. J. Koppal**

C10 Low-cost depth and radiological sensor fusion to detect moving sources
3DV, 2015
P. Riley, A. Enqvist and **S. J. Koppal**

C09 Privacy preserving optics for miniature vision sensors
Conference on Computer Vision and Pattern Recognition (CVPR), 2015
F. Pittaluga and **S. J. Koppal**

C08 Data Fusion for a Vision-Radiological System for Source Tracking and Discovery
Advancements in Nuclear Instrumentation Measurement Methods and their Applic., 2015
A. Enqvist and **S. J. Koppal**

C07 MEMS mirrors submerged in liquid for wide-angle scanning
International Conference on Solid-State Sensors, Actuators and Microsystems, 2015
X. Zhang, R. Zhang, **S. J. Koppal**, E. Butler, X. Cheng and H. Xie

C06 Wide-angle micro sensors for vision on a tight budget
Conference on Computer Vision and Pattern Recognition (CVPR), 2011.
S. J. Koppal, I. Gkioulekas, T. Zickler and G. Barrows

C05 Shadow cameras: Reciprocal views from illumination masks
International Conference on Computer Vision (ICCV), 2009.
S. J. Koppal and S. G. Narasimhan

C04 Temporal dithering of illumination for fast active vision
European Conference on Computer Vision (ECCV), 2008.
S. G. Narasimhan, **S. J. Koppal** and S. Yamazaki

C03 Novel depth cues from uncalibrated near-field lighting
International Conference on Computer Vision (ICCV), 2007.
S. J. Koppal and S. G. Narasimhan

C02 Clustering appearance for scene analysis
Conference on Computer Vision and Pattern Recognition (CVPR), 2006.
S. J. Koppal and S. G. Narasimhan

C01 Structured light from scattering media
International Conference on Computer Vision (ICCV), 2005.
S. G. Narasimhan, S. K. Nayar, B. Sun and **S. J. Koppal**

Book chapters

BC02 Koppal S.J. (2014/2019) Lambertian Reflectance. In: Ikeuchi K. (eds) Computer Vision. Springer, Boston, MA

BC01 Koppal S.J. (2014/2019) Diffuse Reflectance. In: Ikeuchi K. (eds) Computer Vision. Springer, Boston, MA

Workshops and other publications

W04 A low-power structured light sensor for outdoor scene reconstruction and dominant material identification
International Workshop on Projector-Camera Systems, 2012
C. Mertz, **S. J. Koppal**, S. Sia and S. G. Narasimhan

W03 Illustrating motion through DLP Photography
PROCAMS, 2008
S. J. Koppal and S. G. Narasimhan

W02 Leveraging Gaze Data for Segmentation and Effects on Comics
ACM Symposium on Applied Perception Poster, 2016
I. Thirunarayanan, **S. J. Koppal**, J. Shea and E. Jain

W01 Taylor Series of Appearance Functions
CMU-Robotics Institute Technical report, 2006
S. J. Koppal, A. Datta, S. G. Narasimhan and K. Nishino

PATENTS

P08 S. J. Koppal and F. Pittaluga
Optical privatizing device US Patent
US10440348B2, 2019

P07 S. J. Koppal and Vikram Appia
Time-of-Flight (TOF) Assisted Structured Light Imaging
US Patent US10061028B2, 2018

P06 S. J. Koppal
Controlling Image Focus in Real-Time Using Gestures and Depth Sensor Data

US Patent US10079970B2, 2018

P05 S. J. Koppal
Depth sensor data with real-time processing of scene sensor data
US Patent US9767545B2, 2017

P04 T. Zickler, **S. J. Koppal**, G. L. Barrows and I. Gkioulekas
Optical micro-sensor
US Patent US9176263B2, 2015

P03 S. J. Koppal, S.B. Kang, C.L. Zitnick, M.F. Cohen, and B.K. Ressler
Stereo movie editing
US Patent US8330802B2, 2012

P02 Huikai Xie, **S. J. Koppal**, X. Zhang, L. Zhou and C. Duan
Endoscopic oct probes with immersed mems mirrors, WO2018023010A1 (Pending)

P01 Patrick J. Tighe, Nikolaus Gravenstein, Andre Pierre Boezaart, Sean A. Frith, Alina Zare Glenn and **S. J. Koppal**
Methods and systems for using near infrared spectroscopy to detect compartment syndrome, WO2019055341A1 (Pending)

FUNDING AWARDS (TOTAL $\sim \$2.5M$, PI SHARE $\sim \$1.25M$)

F06 Dynamic Light Transport Acquisition and Applications to Computational Illumination (2019-2022)
National Science Foundation (NSF) 1909729
Total $\sim \$500,000$ PI share $\sim \$250,000$

F05 Directionally Controlled Time-of-Flight Sensors: Algorthims, Optical and Imaging (2018-2021)
Office of Naval Research (ONR) N00014-18-1-2663
Total $\sim \$780,000$ PI share $\sim \$390,000$

F04 Novel Micro-LIDAR design and sensing algorithms for flapping-wing Micro-aerial Vehicle (2015-2019)
National Science Foundation (NSF) 1514154
Total $\sim \$400,000$ PI share $\sim \$200,000$

F03 Radiological Source Detection and Tracking Based on Multi-Sensor Data Fusion (2014-18)
Department of Homeland Security (DHS) 2014-DN-077-ARL083-03
Total $\sim \$890,000$, co-PI share $\sim \$460,000$

F02 Wide-angle optics for micro-LIDAR sensor (2018-2020)
MIST Center Award, Total $\sim \$100000$, PI share $\sim \$50000$

F01 Texas Instruments Embedded Processing University Funding Award (2013)

TEACHING

T02 Computational Photography, Fall 2014-present
Latest rating 4.3 for undergraduates and 4.5 for graduate students
I developed this Computational Photography course from scratch at UF, and which received its official course numbers recently (EEL 4403/5406). This course contains hands-on lab activity, where simple but powerful computational photography techniques were implemented in-lab, using just cellphone cameras and a few support structures (such as optical masks or a tripod). To inspire students further, the support structures were also designed and built by the students using 3D printers.

T01 Signals and Systems, Spring 2015-present
Latest rating 3.8 for undergraduates
EEL 3135 (Signals and Systems) is a core course for an undergraduate degree in Electrical and Computer Engineering at UF. The goal of the course is to garner a practice-based understanding of time-varying information (signals) and the software/circuits needed to process these (systems). I exploit the flipped nature of the class to help students develop abstract complex number processing skills, so that future courses that delve into the theory of signals and systems are accessible.

STUDENTS

Ph.D. Students

D07 Xiaoyang Zhang, graduated 2016 (co-advised)
Thesis: Robust Electrothermally Actuated Scanner for Fiberoptic Endoscopic Imaging and Wide-angle Optics: Magic Leap (first appointment)

D06 Francesco Pittaluga, graduated May 2019
Thesis proposed: Privacy Preserving Computational Cameras
2018 Microsoft Research Dissertation Awardee
NEC Labs (first appointment)

D05 Kristofer Henderson, expected May 2020
Thesis proposed: Lightweight Sensor Fusion using Radial Trajectories

D04 Dingkang Wang, expected 2020 (co-advised)
Thesis proposed: Quasi-static forward scanning electrothermal MEMS mirrors for LIDAR

D03 Xiaomeng Liu, expected May 2021

D02 Justin Folden, expected May 2023

D01 Brevin Tilmon, expected May 2024

Thesis committees

Richard Al-Bayaty Electrical and Computer Engineering
Manu Chandran Electrical and Computer Engineering
Pratik Brahma Electrical and Computer Engineering
Chiranjib Sur Computer Engineering

Kelsey Stadniki Nuclear Engineering Sciences
Xiaohui Huang Computer Science
Inchul Choi Computer Science
Xianjin Dai Biomedical Engineering
Paul Johns Nuclear Engineering Science

AWARDS

ONR Summer Faculty Fellow (2020)
Best Paper Award Finalist (CVPR 2019)
Best Student Paper Award (NEMS 2018)
Best Student Paper Award (ECCV 2016)
Outstanding Reviewer Award (ECCV 2016)
USC Computer Science Award for Outstanding Achievement (2003)
USC Trustee Scholarship (full tuition) (1999-2003)
USC Undergraduate Engineering Research Award (1999-2003)

SERVICE

S04 Area chair for Computer Vision and Pattern Recognition (CVPR) 2019/2020

S03 Co-chair for Cameras and Computational Displays (CCD) 2018 workshop held in conjunction with CVPR 2018/2019

S02 Posters/Demos co-chair for International Conference on Computational Photography (ICCP) 2018 and 2020

S01 Reviewer for Scholarly Journals/Conferences
IEEE Pattern Analysis and Machine Intelligence (PAMI), IEEE Transactions on Image Processing (TIP), International Journal on Computer Vision (IJCV), Computer Vision and Pattern Recognition (CVPR), European Conference on Computer Vision (ECCV), International Conference on Computer Vision (ICCV), International Conference on Computational Photography (ICCP)

INVITED TALKS

IT 11 Optics and Sensing for Small Vision Platforms
FAU I-SENSE
Boca Raton, FL (Oct 2019)

IT 10 Toward Miniature Computer Vision Sensors
OSA Imaging Systems and Applications
Orlando, FL (June 2018)

IT 09 Small Vision Sensors for Phenomics
Phenome
Tucson, AZ (February 2018)

IT 08 Towards Privacy Preserving Cameras
ASU SENSIP

Phoenix, AZ (2018)

IT 07 Wide-FOV Sensing & Optical Processing for Small Vision Applications
OSA Incubator on Small Eyes and Smart Minds
Washington, DC (October 2017)

IT 06 Towards Privacy Preserving Cameras
IRISA-Rennes
Rennes, France (2017)

IT 05 Towards Privacy Preserving Cameras
Technicolor R&D Labs
Rennes, France (2017)

IT 04 Towards Privacy Preserving Cameras
INRIA-Bordeaux/LPN2
Bordeaux, France (2017)

IT 03 Towards Privacy Preserving Cameras
UCF CRCV
Orlando, FL (2017)

IT 02 Towards Micro Vision Sensors
UCF CREOL
Orlando, FL (2017)

IT 01 Privacy Preserving Sensors
University of Miami CSD
Miami, FL (2015)

MEDIA COVERAGE

MC 06 "Revealing Scenes by Inverting SFM Reconstructions"
Computer Vision News 2020

MC 05 "Best of ECCV: Focal Flow"
Computer Vision News 2016

MC 04 "RoboBees Can Fly and Swim. What's Next? Laser Vision"
Smithsonian Magazine 2015

MC 03 "RoboBee Lidar Useful for Robocars?"
IEEE Spectrum 2015

MC 02 "'RoboBees' with Laser Eyes Could Locate Disaster Victims"
NBC News 2015

MC 01 "Scientists Are Using Lasers to Teach RoboBees to See"
Smithsonian Magazine 2015

OTHER INFORMATION

Languages: English, Hindi, Kannada
Citizenship: U.S.A
Lab Website: focus.ece.ufl.edu