

CONTACT INFORMATION

NVIDIA Research
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 Santa Clara, CA 95050 USA

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RESEARCH INTERESTS

Dynamic scene analysis and visualization, scattered data approximation, multi-view geometry (structure from motion), real-time rendering, machine learning, augmented reality (visual SLAM), Sensor Fusion, object recognition, detection and tracking

EDUCATION

Georgia Institute of Technology Atlanta, Georgia
 Ph.D. in Computer Science, Dec. 2011 GPA: 3.87/4.0
 • Thesis: *Spatio-temporal Data Interpolation for Dynamic Scene Analysis*
 • Advisor: [Professor Irfan Essa](#)
 • Area of Study: Computer Vision and Graphics
 M.S. in Computer Science, Aug. 2010 GPA: 3.87/4.0
 • Advisor: [Professor Irfan Essa](#)
 • Area of Study: Computer Vision and Graphics
Yonsei University Seoul, South Korea
 B.S. in Electrical Engineering, Feb. 2001 GPA: 3.71/4.0 upper, 3.45/4.0 overall

EMPLOYMENT HISTORY

NVIDIA Research Santa Clara, California
 Senior Research Scientist Dec. 2014 – Present
NVIDIA Research Santa Clara, California
 Research Scientist Jan. 2012 – Dec. 2014
Georgia Institute of Technology, College of Computing Atlanta, Georgia
 Graduate Research Assistant Aug. 2005 – Dec. 2011
Disney Research Pittsburgh Pittsburgh, Pennsylvania
 Visiting Research Associate/Research Intern Jan. 2009 – Aug. 2009
Samsung IT R&D Center, SDS Seoul, South Korea
 Advisory Engineer Mar. 2001 – Aug. 2005
Samsung Electronics, Digital Solution Center Seoul, South Korea
 Ubiquitous Task Force Jun. 2003 – Jan. 2004
Republic of Korea Air Force Suwon, South Korea
 Engineer/Sergeant Mar. 1996 – Sep. 1998

THESIS

[BSTHESIS01] K. Kim, *Simple Enhanced Block-Matching Algorithm for Intermediate View Reconstruction*, Department of Electrical Engineering, Yonsei University
[PHDTHESIS11] K. Kim, *Spatio-temporal Data Interpolation for Dynamic Scene Analysis*, College of Computing, Georgia Institute of Technology

REFEREED
CONFERENCE
PUBLICATIONS

- [CVPR16a]** B. Eckart, K. Kim, A. Troccoli, A. Kelly, J. Kautz, *Accelerated Generative Models for 3D Point Cloud Data*, In *Proceeding of 2016 IEEE Conference on Computer Vision and Pattern Recognition, CVPR 2016*
- [CVPR16b]** P. Molchanov, X. Yang, S. Gupta, K. Kim, S. Tyree, J. Kautz, *Online Detection and Classification of Dynamic Hand Gestures with Recurrent 3D Convolutional Neural Networks*, In *Proceeding of 2016 IEEE Conference on Computer Vision and Pattern Recognition, CVPR 2016*
- [IV16]** S. Gupta, P. Molchanov, X. Yang, K. Kim, S. Tyree, J. Kautz, *Towards Selecting Robust Hand Gestures for Automotive Interfaces*, In *Proceeding of 2016 IEEE Intelligent Vehicles Symposium, IV 2016*
- [3DV15]** B. Eckart, K. Kim, A. Troccoli, A. Kelly, J. Kautz, *MLMD: Maximum Likelihood Mixture Decoupling for Fast and Accurate Point Cloud Registration*, In *IEEE 3D Vision, 3DV2015*
- [EGSR15]** S. U. Mehta, K. Kim, D. Pajak, K. Pulli, J. Kautz, R. Ramamoorthi, *Filtering Environment Illumination for Interactive Physically-Based Rendering in Mixed Reality*, In *Eurographics Symposium on Rendering, EGSR 2015*
- [CVPRW15]** P. Molchanov, S. Gupta, K. Kim, J. Kautz, *Hand Gesture Recognition with 3D Convolutional Neural Networks*, In *IEEE CVPR 2015 Workshop on Hand Gesture Recognition*
- [FG15]** P. Molchanov, S. Gupta, K. Kim, K. Pulli, *Multi-sensor System for Drivers Hand-Gesture Recognition*, In *IEEE Automatic Face and Gesture recognition, FG2015*
- [RADAR15]** P. Molchanov, S. Gupta, K. Kim, K. Pulli, *Short-Range FMCW Monopulse Radar for Hand-Gesture Sensing*, In *IEEE International Radar Conference 2015*
- [3DV14]** D. Herrera, K. Kim, J. Kannala, K. Pulli, and J. Heikkila, *DT-SLAM: Deferred Triangulation for Robust SLAM*, In *IEEE 3D Vision, 3DV2015*
- [SIGGRAPH13]** J. Baek, D. Pajak, K. Kim, K. Pulli, and M. Levoy, *WYSIWYG Computational Photography via Viewfinder Editing*, In *ACM Transactions on Graphics, SIGGRAPH Asia 2013*
- [CVPR12]** K. Kim, D. Lee, and I. Essa, *Detecting Regions of Interest in Dynamic Scenes with Camera Motions*, In *Proceeding of 2012 IEEE Conference on Computer Vision and Pattern Recognition*
- [ICCV11]** K. Kim, D. Lee, and I. Essa, *Gaussian Process Regression Flow for Analysis of Motion Trajectories*, In *Proceeding of 2011 IEEE International Conference on Computer Vision*
- [CVPR10a]** K. Kim, M. Grundmann, A. Shamir, I. Matthews, J. Hodgins, and I. Essa, *Motion Fields to Predict Play Evolution in Dynamic Sports Scenes*, In *Proceeding of 2010 IEEE Conference on Computer Vision and Pattern Recognition*
- [CVPR10b]** R. Hamid, R. Kumar, M. Grundmann, K. Kim, I. Essa and J. Hodgins, *Player Localization Using Multiple Static Cameras for Sports Visualization*, In *Proceeding of 2010 IEEE Conference on Computer Vision and Pattern Recognition*
- [ISMAR09]** K. Kim, S. Oh, J. Lee and I. Essa, *Augmenting Aerial Earth Maps with Dynamic Information*, In *Proceeding of 2009 IEEE/ACM International Symposium on Mixed and Augmented Reality*

- [ISWC08]** K. Kim, J. Summet, T. Starner, D. Ashbrook, M. Kapade and I. Essa, *Localization and 3D Reconstruction of Urban Scenes Using GPS*, In *Proceeding of 2008 IEEE International Conference on Wearable Computers*
- [ACMMM06]** K. Kim, I. Essa and G. D. Abowd, *Interactive Mosaic Generation for Video Navigation*, In *Proceeding of 2006 ACM International Conference on Multimedia*
- REFEREED
JOURNAL
PUBLICATIONS
- [TOG13]** J. Baek, D. Pajak, K. Kim, K. Pulli, and M. Levoy, *WYSIWYG Computational Photography via Viewfinder Editing*, In *ACM Transactions on Graphics, Volume 32*.
- [VR11]** K. Kim, S. Oh, J. Lee and I. Essa, *Augmenting Aerial Earthmaps with Dynamic Information from Videos*, In *Virtual Reality Journal* [Special issue on Augmented Reality], Springer London, 2011 (VR)
- [JGT08]** B. Kim, K. Kim and G. Turk, *A Shadow Volume Algorithm for Opaque and Transparent Non-Manifold Casters*, In *Journal of Graphics Tools*, A.K. Peters, 2008
- OTHER
PUBLICATIONS
POSTERS,
TECH' REPORTS
- [STS11][ISMICS 2011]** E. Sarin, K. Kim, I. Essa, and W. Cooper, *3-Dimensional Visualization of the Operating Room Using Advanced Motion Capture: A Novel Paradigm to Expand Simulation-Based Surgical Education*
- [4GS09]** K. Kim, M. Grundmann, I. Essa, *Collaborative Crowd-casting using Mobile devices*, In *4G Symposium*, Las Vegas 2009
- [TECH07]** B. Kim, K. Kim, G. Turk, *Real-time Shadow of Transparent Casters Using Shadow Volume*, In *Georgia Institute of Technology Technical Report GT-IC-07-04*
- [TECH06]** K.Kim, J.Summet, T.Starner, D.Ashbrook, M.Kapade and I.Essa, *Localization and 3D Reconstruction of Urban Scenes Using GPS*, 2008 In *Georgia Institute of Technology Technical Report GT-IC-08-06*
- [GT-CMU06A]** K.Kim, I.Essa and F. Dellaert *Augmenting Earth Maps with Dynamic Information Using Vanishing Point Clustering*, In 2006 GT-CMU Retreat for Graphics
- [GT-CMU06B]** B. Kim and K. Kim, *Transparent Shadow Casters and Softened Self-Shadow Using Shadow Volume*, In 2006 GT-CMU Retreat for Graphics
- [GT-CMU05]** K. Kim and I. Essa, *Multi-scale Photomosaic*, In 2005 GT-CMU Retreat for Graphics
- INVITED
TALK
- [SNU11]** K. Kim, *Spatio-temporal Analysis of Videos for Visualization*, Department of Computer Science and Engineering, Seoul National University January.2011
- [Google13]** K. Kim, *Sparse-to-dense approaches for video analysis*, **Google Tech-talk**, Google Research. 2013.
- PATENTS
ISF
- [P16a]** B. Eckart, K. Kim, A. Troccoli, J. Kautz *Modeling Point Cloud Data - Hierarchies of Gaussian Mixture Models* US Patent.
- [P16b]** P. Molchanov, S. Gupta, K. Kim, *Multi-Sensor Based User Interface* US Patent.
- [P16c]** P. Molchanov, S. Gupta, K. Kim, *In-Vehcle Short-range RADAR system for Intelligent UIs* US Patent App.
- [P14]** K. Kim, D. Pajak, K. Pulli,. *System, Method, and computer program product for performing one-dimensional searches in two-dimensional images*, US Patent.
- [P13]** K. Kim, A. Shamir, IA Matthews, M. Grundmann, JK. Hodgins, and Irfan Essa. *System and Method for Utilizing Motion Fields to Predict Evolution in Dynamic Scenes*, US Patent App. 13/075,947

REVIEWER TC,EDITOR	Reviewer in CVPR, ICCV, Eurographics, SIGGRAPH, SIGGRAPH ASIA, tPAMI, tIP, HPG, EVC (TC), EVW(TC), IWMV(TC), IEICE (Assc.Editor).
MEDIA COVERAGE	<p>[CNN09] H. Collins, J. Levs, <i>New technology tracks movement on ground</i>, CNN News-room, aired on October 2009</p> <p>[NS09] V. Venkatraman, <i>Live video makes Google Earth cities bustle</i>, NewScientist, September 2009, Magazine Issue 2728</p> <p>[PS09] S.F. Locke, <i>Augmented Google Earth Gets Real-Time People, Cars, Clouds</i>, PopularScience, September 2009</p>

RESEARCH AND
PROFESSIONAL
PROJECTS
INVOLVED

NVIDIA Research

Santa Clara, CA USA

Mobile Visual Computing Group

- Leading **VirtualEye (DARPA)** project: 3D mapping and free view-point video.
- Leading **NVIDIA SLAM** (Simultaneous Localization and Mapping) project (NVS-LAM): for next generation augmented reality **[3DV14][3DV15][EGSR15][CVPR16a]**.
- Collaboration with Google/ATAP for **Tango** project.
- Conducting a project for **Driver's gesture recognition system** for Advanced Driver Assistant System (ADAS) using multi-modal sensors and Deep Neural Network (CNN) **[FG15][RADAR15][P15-a,b][IV16][CVPRW15][CVPR16b]**
- Conducting tracking and scene reconstruction research for ADAS and autonomous driving project (Sensor fusion: depth-camera, vision, IMU, etc.)
- Conducted an Real-time viewfinder editing project: **[SIGGRAPH13]**.
- Co-author of a tutorial on OpenCV for native Android: SIGGRAPH13 (mobile)
- Fast Image registration and tracking for mobile vision **[P14]**
- Stochastic Motion field analysis using Gaussian Process **[CVPR12]**

Georgia Institute of Technology

Atlanta, Georgia

Dynamic Scene Analysis

- Recognizing traffic patterns and detecting anomalous events using Gaussian Process Regression Flow, and 4th-order moment. Persistent Stare Exploitation and Analysis System (*PerSEAs*) with *Kitware/DARPA*. Published in **[ICCV11]**
- Analysis and prediction of multi-agent motions in dynamic sports scene. (*Microcasting at Disney Research*) Spatio-temporal radial basis network for dense flow generation. Tracking ground positions using geometric constraint optimization. Published in **[CVPR10A]** and **[CVPR10B]**
- Video retargeting for automated sports broadcasting. Auto-directed crop region, and its paths are calculated from motion saliency. Submitted to **[S11]**

Dynamic Scene Visualization and Augmented Reality

- City-level visualization of dynamic scenes from distributed videos using spatio-temporal interpolation and analysis. Published in **[ISMAR09]**, **[VR11]**, **[4GS09]** and **[GT-CMU06A]** Media coverage and articles in **[CNN09]**, **[NS09]** and **[PS09]**
- 3D Reconstruction and localization of nearby buildings from the analysis of GPS signals having low signal-to-noise ratio. Published in **[ISWC08]** and **[TECH06]**

Video-based Rendering

- Video-based spatio-temporal view interpolation for Simulating Cardiac Surgery (Emory/Inova Heart Vascular Insitute) Presented in **[STS11]** and **[ISMICS11]**
- Generation of painterly and water-colored videos using fore-ground segmentation and gradient field (Samsung STAR/SAIT) Fed into mobile NPR project.

Interactive Video and Multimedia System

- Automatic generation of the annotated collection of mosaics for interactive video navigation. (AwareHome/Tunner Studio) **[ACMMM06]** and **[GT-CMU05]**

Real-time Rendering Algorithm

- Generalized Shadow Volume algorithm for the real-time rendering of non-manifold transparent casters. Published in **[JGT08]**, **[TECH07]** and **[GT-CMU06B]**

Disney Research, Pittsburgh

Pittsburgh, PA USA

Scene Analysis and Micro-casting

- Conducted a project for detecting important location in the game. Designed and implemented proto-type system for micro-casting. **[CVPR10A]**
- Implemented player tracking algorithm using particle filter and mean-shift , and team classification algorithm for sports visualization. **[CVPR10B]**

Samsung IT R&D Center, SDS, and Samsung Electronics

Seoul, South Korea

Face Recognition, Real-time Collaboration System

- Responsible for face detection part. Fisher-face, and statistical skin segmentation were used for ViaFaceTM. Appeared in COMDEX 2001 Las Vegas.
- Designed and developed Real-time Collaboration System: SyncbizTM (2002 Samsung Best solution award)
- Developed embedded framework for IP-Set top box: LivingWiseTM (fed into Korea Telecommunication's IP-STB services)
- Ubiquitous Home network framework: NEX (framework fed into U-City projects at Samsung SDS): Remote Management system in the home server for U-City.

SOFTWARE AND
HARDWARE SKILLS

Languages, Scripts, and Wrappers:

- C, C++, Embedded C, Android Native C/C++, Java, JavaScript, MFC, ATL, COM, SQL, MySQL, MATLAB, under various IDE environments
- Libraries for Vision/Graphics/Math : OpenCV, OpenGL, GLSL, DirectX, Lapack, Intel Math Kernel Library

Digital Logic Circuit:

- FPGA and Computer-Aided Design Tools: VHDL, MAX+PLUS, SPICE

Video and Image Editing tools, and Renderer:

- 3D Studio Max, Autodesk Maya, Adobe Photoshop, Premiere, and others
- POV-Ray, Indigo, Blender

LANGUAGES

Fluent in Korean, English and Japanese

REFERENCES

Available in:

<http://www.kihwan23.com/jobsearch/docs/reference-list.pdf>

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