Harvard Medical School
Curriculum Vitae

Date Prepared: Oct. 8, 2018
Name: Jae-Hyun Jung (Instructor in Ophthalmology, Harvard Medical School)

Education

02/2007	B.Sc. *(Magna cum laude)*	Electrical Engineering	Pusan National University, Busan, Korea
08/2012	Ph.D.	Electrical Engineering *(Prof. Byoungho Lee, Ph. D.)*	Seoul National University, Seoul, Korea

Postdoctoral Training

09/2012-11/2012	Postdoctoral Fellow	Electrical/Optical Engineering 3D display and imaging *(Prof. Byoungho Lee, Ph. D.)*	Seoul National University, Seoul, Korea
12/2012-10/2015	Postdoctoral Fellow	Optical Engineering/ Vision Rehabilitation *(Prof. Eli Peli, M.Sc., O.D.)*	Schepens Eye Research Institute/Massachusetts Eye and Ear
12/2012-10/2015	Research Fellow	Ophthalmology *(Prof. Eli Peli, M.Sc., O.D.)*	Harvard Medical School

Faculty Academic Appointments

Spring 2007	Teaching Assistant	School of Electrical Engineering, Introduction to Electromagnetism with Practice (430.202B)	Seoul National University, Seoul, Korea
Fall 2007	Teaching Assistant	School of Electrical Engineering, Digital Logic Design and Lab (430.201A)	Seoul National University, Seoul, Korea
Fall 2007	Teaching Assistant	School of Electrical Engineering, Design Project for Electrical Devices & Systems (430.405)	Seoul National University, Seoul, Korea
Spring 2011	Teaching Assistant	School of Electrical Engineering, Optical Information Processing (430.830)	Seoul National University, Seoul, Korea
10/2015-present	Investigators	Schepens Eye Research Institute	Massachusetts Eye and Ear, Boston, MA
10/2015-present	Instructor (Tenure-track)	Department of Ophthalmology	Harvard Medical School, Boston, MA

Other Professional Positions

03-07/2001	Research Intern	Sejin Electronics Co. Ltd., Busan, Korea
07/2001-09/2003	Special Intelligence Officer (Rank: Sergeant)	Republic of Korea Armed Forces
10/2014-present	Korean Scientist and Engineers Network (KOSEN) Expert	Korean Institute of Science and Technology Information (KISTI), Seoul, Korea
11/2016-present	Expert in IEC Committee for Standardization (Eyewear display and 3D display devices)	International Electrotechnical Commission (IEC)

Professional Societies

2007-	Optical Society of Korea (OSK)	Member
2008-	Optical Society of America (OSA)	Member
2010-	Society for Information Display (SID)	Member
2010-	International Society of Photo-Optical Engineers (SPIE)	Member
2011-	Institute of Electrical and Electronics Engineers (IEEE)	Member
2013-	American Academy of Optometry (AAO)	Member
2014-	Association for Research in Vision and Ophthalmology (ARVO)	Member
2016-	Society for Imaging Science and Technology	Member

Editorial Activities

1. Ad Hoc Reviewer

Optics Express (OSA)
Biomedical Optics Express (OSA)
Optics Letters (OSA)
Applied Optics (OSA)
Journal of Optical Society of America (OSA) A
PLoS ONE
Optical Engineering (SPIE)
Journal of Electronic Imaging (SPIE)
Journal of Biomedical Optics (SPIE)
Journal of the Society for Information Display (SID)
Journal of Display Technology (IEEE)
Journal of the Optical Society of Korea
Chinese Optics Letters

Honors and Prizes

03/2000	**Academic Excellence Scholarship**, School of Electrical Engineering, Pusan National University, Busan, Korea
09/2000, 07/2004-02/2007	**Brain Korea 21 Scholarship**, School of Electrical Engineering, Pusan National University, Busan, Korea
02/2007	**Magna cum laude**, School of Electrical Engineering, Pusan National University, Busan,

	Korea
03/2007- 08/2012	**Brain Korea 21 Scholarship**, School of Electrical Engineering, Seoul National University, Seoul, Korea
09/2008	**Academic Excellence Scholarship**, School of Electrical Engineering, Seoul National University, Seoul, Korea
05/2008	Proceeding by Kang J, **Jung J-H**, Kim J, Park J-H, Lee B, "Object-based reconstruction of three-dimension spatial information using elemental images" was selected as a "**Best Paper**" of the Conference on Optoelectronics & Optical Communications (COOC) 2008, Optical Society of Korea (OSK)
09/2008	Paper by Kim Y, Kim J, Kim Y, Choi H, **Jung J-H**, Lee B, "Thin-type integral imaging method with an organic light emitting diode panel. Applied Optics 2008; 47: 4927-4934" was selected as a **cover image paper** in the issue
02/2009	**Electronics & Telecommunications Research Foundation Scholarship**, School of Electrical Engineering, Seoul National University, Seoul, Korea
04/2009	Paper by Kim Y, Park G, **Jung J-H**, Kim J, Lee B, "Color moiré pattern simulation and analysis in three-dimensional integral imaging for finding the moiré-reduced tilted angle of a lens array. Applied Optics 2009; 48: 2178-2187" was selected as a **cover image paper** in the issue
10/2009	Proceeding by **Jung** et al. "360-degree viewable cylindrical integral imaging system using electroluminescent films" was awarded the **Merck Young Scientist Award** for the best presentation at the International Meeting on Information Display (IMID) 2009, Society for Information Display (SID)
06/2009	**Student Travel Grant**, International Display Workshops (IDW) 2009, Society for Information Display (SID)
01/2010	Proceeding by Jung I, **Jung J-H**, Lee B, "Analysis of occlusion area reconstruction range in elemental image based on integral imaging" was selected as a "**Best Paper**" of the Winter Annual Meeting 2010, Optical Society of Korea (OSK)
03/2011	**Best Researcher of the Year by PhD Student Award**, School of Electrical Engineering, Brain Korea 21, Seoul National University, Seoul, Korea
05/2011	Proceeding by Yeom J, Chen N, **Jung J-H**, Lee B, "Depth resolution enhancement of phase-only hologram for multi-plane images generated from integral imaging" was selected as a "**Best Paper**" of the Conference on Optoelectronics & Optical Communications (COOC) 2011, Optical Society of Korea (OSK)
06/2011	Proceeding by Kim J, **Jung J-H**, Hong J, Yeom J, Lee B, "Elemental image generation with correlation of mismatching error between pixel and lens in integral imaging" was selected as a "**Best Paper**" of the International Conference on 3D Systems and Applications (3DSA), Assoc. Realistic Media Industry
10/2011	Paper by **Jung** et al, "Effect of fundamental depth resolution and cardboard effect to perceived depth resolution on multi-view display. Optics Express 2011; 19: 20468-20482" was selected as a **cover image paper** and **top downloaded paper** in the issue
06/2012	**Student Travel Grant**, Society for Information Display (SID) Display Week 2012, SID
08/2012	Paper by Kim Y, Hong K, Yeom J, Hong J, **Jung J-H**, Lee YW, Park J-H, Lee B, "Frontal projection-type three-dimensional display. Optics Express 2012; 20: 20130-20138" was

reported in CNN, NBC, BBC, and other media press releases.

08/2012 Proceeding by **Jung J-H**, Kim J, Lee B, "A solution based on multi-view pickup for pseudoscopic problem in integral imaging" was selected as a "**Best Paper**" of the Optical Society of Korea Summer Annual Meeting 2012, Optical Society of Korea (OSK)

11/2012 **National Research Foundation (NRF) of Korea Postdoctoral Fellowship**, National Research Foundation of Korea

05/2014 Paper by Kim J, **Jung J-H**, Jeong Y, Hong K, Lee B, "Real-time integral imaging system for light field microscopy. Optics Express 2014;22:10210–10220" was selected as a **top downloaded paper** in the issue

02/2015 **Research Award**, Promobilia Foundation, Stockholm, Sweden

05/2015 Paper by **Jung** et al. "Active Confocal Imaging for Visual Prostheses. Vision Research 2015; 111:182-196" was selected "**Best Paper of the Year by a Trainee**" of Schepens Eye Research Institute, Massachusetts Eye and Ear, Harvard Medical School

10/2017 **Alice J. Adler Fellowship** for junior faculty, Schepens Eye Research Institute, Harvard Medical School

07/2018 **Fight for Sight Grant-in-Aid Award**, Fight for Sight Foundation, NY

Report of Funded and Unfunded Projects

Funding Information

Past

03-06/2007 Development of full-parallax 3D display
Research Grant from Samsung Advanced Institute of Technology
Graduate Student (PI: Byoungho Lee)
This project was to design and implement high resolution glasses-free 3D display for multiple viewers.

03/2007-02/2008 Research and development of glassless real-time, real dynamic three-dimensional display system using integral imaging
Global Frontier Program, Ministry of Trade, Industry & Energy, Korea (F0004190)
Graduate Student (PI: Byoungho Lee)
This project was to design and implement 2D/3D convertible, 60-inch large scale and 360-degree viewable integral imaging system with wide viewing angle and high resolution.

03/2007-02/2008 Development of glassless three-dimensional display system and three-dimensional image processing technology
Research Grant from Samsung SDI Co., Ltd.
Graduate Student (PI: Byoungho Lee)
The goal of this project was to develop a multi-view image synthesizing algorithm from 2D image using optical flow. From the motion difference in multiple frames of a 2D movie, the depth was extracted and a 3D image was reconstructed to generate multi-view images.

09/2007-11/2012 Center for active plasmonics application systems
National Creative Research Center Program, Ministry of Science and Technology/Korea Science and Engineering Foundation, Korea
Graduate Student (PI: Byoungho Lee)

	The goal of this study was development of novel active plasmonics-based three-dimensional integral-imaging display devices with high-resolution, wide viewing zone, and ultra-fast switching.
05-10/2010	A study on acquisition of 3D information and 3D contents format Research Grant from Electronics and Telecommunications Research Institute (ETRI), Korea Graduate Research Assistant (PI: Sung-Wook Min) This project was to research and develop multi-view synthesis software and novel 3D contents format for multi-view TV broadcasting.
05/2011- 06/2012	Feasibility investigation of the high density ray field display for real 3D Research Grant from Samsung Advanced Institute of Technology Graduate Student (PI: Byoungho Lee) This project was to investigate the impact of high density ray field 3D display to accommodation-convergence conflict. Super multi-view display based on high density ray field was developed and the characteristics were analyzed.
04-11/2012	Coded aperture design for depth extraction Research Grant from Samsung Electronics Co., Ltd. Postdoctoral Fellow (PI: Byoungho Lee) The goal of this project was to develop an image processing algorithm for 3D depth extraction from coded aperture using light-field technology. Based on the depth extraction algorithm using coded aperture, a 3D sensor application could be developed for TV and mobile phone.
12/2012- 11/2013	Study on effect of super multi-view condition in three-dimensional display to accommodation response and improvement of optical vision rehabilitation device Basic Research Fellowship, National Research Foundation of Korea, 2012R1A6A3A03038820 **PI** ($33,000) The goal of this project was to characterize human factors of super multi-view display and develop a vision rehabilitation device for a visually impaired person using optical engineering.
02/2015	Active confocal imaging for visual prostheses Grant from the Promobilia Foundation, Stockholm, Sweden #14222 **PI** ($30,000) This project was to develop a novel imaging system to focus on only one depth plane of an object of interest with removal of background for visual prostheses.
04-07/2017	Fabrication and evaluation of high power mirror-based prism for the treatment of patients with hemianopia (loss of half of visual field) The Massachusetts Technology Transfer Center, MA Acorn Innovation Fund 2017 **Co-Investigator** (PI: Eli Peli) A prism device we invented was successfully used to expand the visual field of patients with hemianopia (loss of half the field of vision in both eyes) by shifting the images of objects from the blind side. Limited optical power of conventional prisms currently restricts the magnitude of the effect. To increase the available power, we invented a mirror-based prism-like device which in addition to higher power offers better image quality. With MTTC funding we will fabricate a prototype to verify and evaluate its utility opening

the way to realization of commercialized practical treatment with better performance.

2017 Designing light-field camera using multiple camera array for visual prostheses
Grant from Margaret and Leo Meyer and Hans M. Hirsch Foundation
Co-Investigator (PI: Eli Peli)
This project was to develop a novel light-field camera using small web camera array for background de-cluttering so that visual prostheses users can easily recognize the object with a complex background.

Current

09/2013 – 03/2019 Visual field expansion through innovative multiplexing prism design
NIH/ R01- EY023385
Co-Investigator (PI: Eli Peli) (Direct: $1,263,360, Total: $2,460,830)
This project is to develop an innovative multiplexing prism lens (the Quadrafield lens) for patients with concentric peripheral field loss (tunnel vision), to conduct laboratory-based tests to determine the parameters for the prisms and prism placements within the lens, and then conduct a multicenter randomized controlled trial to evaluate device efficacy.

01/2016 – 01/2020 Active confocal Imaging for visual prostheses
US Department of Defense, W81XWH-16-1-0033
PI (PI: Jae-Hyun Jung & Eli Peli) (Direct: $1,548,295, Total: $2,999,953)
This project is to develop and evaluate a novel front-end optical and video processing system to be used with any visual prosthesis that will remove background clutter and therefore improve object detection and recognition despite the prostheses' limitations.

10/2017 – 09/2018 The best field expansion configuration for using multiplexing prism for homonymous hemianopia
Alice J. Adler Fellowship, Schepens Eye Research Institute, Harvard Medical School
PI ($30,000)
We propose to test novel field expansion configurations to determine which configuration provides better performance for detection hazards in homonymous hemianopia using multiplexing prisms that show the shifted and see-through views together.

07/2018 – 06/2019 Field Expansion for Acquired Monocular Vision using Multiplexing Prism
Fight for Sight Grant-in-aid
PI ($25,000)
We propose the development of novel field expansion glasses using a special prism (multiplexing prism) for acquired monocular vision patients to improve collision and hazard detection. Our proposed device shows up to ~90° into the blind side (almost complete recovery of normal binocular field) without loss of any seeing field. The performance of patients with and without the device will be compared in pedestrian collision task in simulated walking scenarios.

Pending

04/2019- 03/2024 Visual field expansion through innovative multiplexing prism design
NIH/ R01 Renewal
Co-Investigator (PI: Eli Peli)
This project is a competing renewal for the same project described above. We will develop an innovative multi-periscopic prism lens for patients with concentric peripheral field loss (tunnel vision) and for patients with homonymous hemianopia, to conduct laboratory-based tests to determine the parameters for the prisms and prism placements within the

lens, and then we will conduct a multicenter randomized controlled trial to evaluate device efficacy.

09/2019-08/2022 Novel Field Expansion Glasses for Monocular Vision
US Department of Defense, W81XWH-18-VRP-IIRA
PI
We propose the development of novel field expansion glasses using 3D-printed clip-on and hang-on holders of special prism (multiplexing prism) for acquired monocular vision. Our proposed device shows up to ~90° into the blind side (almost complete recovery of normal binocular field) without loss of any seeing field. The feasibility test of the device will be performed in virtual reality walking scenarios.

04/2019-03/2024 High Power and Wide Visual Field Expansion for TBI Field Loss
US Department of Defense, W81XWH-18-VRP-FTTSA
Co-Investigator (PI: Eli Peli)
We invented a novel optical device which provides more than 45° image shift to be used as field expansion visual aid for TBI field loss. Following feasibility tests in virtual reality simulators, we expect to bring to the market an effective device that will afford greater independence and improved quality of life to patients with visual field loss.

07/2019-06/2024 Measuring the impact of optic flow distortion on visually induced motion sickness in virtual reality environment
NIH/ R01
Co-Investigator (PI: Alex Hwang)
The proposed project aims to address the visually induced motion sickness (VIMS) symptoms that commonly occur in virtual reality (VR) condition by testing our novel hypothesis based on intra-sensory conflict (i.e. optic flow distortion) theory. The subjects' VIMS experience will be quantitatively measured with and without various optic flow distortions commonly introduced by VR configurations to estimate the impact of distorted optic flow on VIMS. The results of the proposed studies will increase the underlying knowledge of VIMS invocation in VR and assist future VR environment design to reduce VIMS invocation.

Report of Local Teaching and Training

Teaching of Students in Courses:

Fall 2016	Conduct of Science (MED-SCI 300QC) 2nd year graduate school students	Harvard Medical School
Fall 2017	Conduct of Science (MED-SCI 300QC) 2nd year graduate school students	Harvard Medical School

Formal Teaching of Residents, Clinical Fellows and Research Fellows (post-docs)

03/2016-08/2017	Schepens Eye Research Institute, Harvard Medical School	Cheng Qiu, PhD, Postdoctoral Research Fellow, Currently Postdoctoral Fellow at the University of Pennsylvania
08/2016-07/2017	Schepens Eye Research Institute, Harvard Medical School	Navid Mostofi, PhD, Postdoctoral Research Fellow, Currently Engineer at Trilion Quality Systems, LLC

08/2016-06/2018	Schepens Eye Research Institute, Harvard Medical School	Cyril Nyankerh, OD Research Fellow, Currently PhD student in the University of Alabama
11/2017-present	Schepens Eye Research Institute, Harvard Medical School	Zahide Pamir, PhD Postdoctoral Research Fellow
01/2018-present	Schepens Eye Research Institute, Harvard Medical School	Mahalakshmi Ramamurthy, PhD Postdoctoral Research Fellow

Laboratory and Other Research Supervisory and Training Responsibilities

2013	University of Rochester, NY	Michael Dupuis, BS Summer Intern, Currently Optical Engineer for Northrop Grumman Corporation
2015-2018	Schepens Eye Research Institute, Harvard Medical School	Merve Tuccar, MS Research Assistant
2016, 2017-2018	Schepens Eye Research Institute, Harvard Medical School	Satchi Davis, BS Research Programmer, Currently Programmer for Northrop Grumman Corporation
08-11/2017	Ben-Gurion University of the Negev	David Avraham, BS Visiting MS student, Currently PhD student in Ben-Gurion University of the Negev
05/2016-06/2018	Schepens Eye Research Institute, Harvard Medical School	Kassandra Lee, MS Research Assistant, Currently PhD student in University of Nevada, Reno
01-07/2018	Schepens Eye Research Institute, Harvard Medical School	Christopher Trantas Research Programmer
05-08/2018	Columbia University, NY	Katarina Stephan, Summer Intern
04/2017-present	Schepens Eye Research Institute, Harvard Medical School	Sailaja Manda, MS, MPhil Optometry Research Assistant
2017-present	Schepens Eye Research Institute, Harvard Medical School	Nish Mohith Kurukuti, BS Research Engineer
2017 – present	Schepens Eye Research Institute, Harvard Medical School	Rachel Castle, BA Research Assistant
05/2018 - present	Schepens Eye Research Institute, Harvard Medical School	Mehmet Umut Canoluk, MS Research Assistant

Local Invited Presentations

11/11/2013	Impact of high power and incidence angles on prism corrections for visual field loss Trainee's Work-in-Progress seminar, Schepens Eye Research Institute, Massachusetts Eye and Ear, Harvard Medical School
04/01/2016	Active confocal imaging for visual prostheses 2016 Faculty Retreat, Department of Ophthalmology, Harvard Medical School
09/12/2017	Multiplexing prisms for field expansion

SERIes Seminar, Schepens Eye Research Institute, Massachusetts Eye and Ear, Harvard Medical School

09/12/2017 Prismatic devices for visually impaired
Global Health Leadership Program at New England College of Optometry, Schepens Eye Research Institute, Massachusetts Eye and Ear, Harvard Medical School

09/11/2018 Background de-cluttering for visual prostheses
SERIes Seminar, Schepens Eye Research Institute, Massachusetts Eye and Ear, Harvard Medical School

Report of Regional, National and International Invited Teaching and Presentations

Invited Presentations and Courses

National

07/2012 Review of 3D Displays
SID Korea Chapter Review Workshop, Konkuk University, Seoul, Korea

03/20/2014 Active confocal imaging for visual prostheses
United States Army Medical Research & Materiel Command (USAMRMC) to the Workshop on Technology Applications/"Art of the Possible" in Vision Restoration, Frederick, MD

10/07/2014 Multiplexing prism glasses for field expansion in bitemporal hemianopia, monocular vision, and normally sighted
Research Lecture Series, New England College of Optometry (NECO), Boston, MA

02/28/2015 Light-field imaging system for visual prostheses
2015 Korean-American Scientists and Engineers Association Annual Symposium, MIT, Cambridge, MA

04/17/2015 Light-field technology: 3D display and imaging
Rowland Institute for Science, Harvard University, Cambridge, MA

07/12/2017 Multiplexing prism glasses for field expansion
Research Lecture Series (T35 students), New England College of Optometry (NECO), Boston, MA

05/01/2018 Profound Low Vision and Low-vision Clinical Trials
Session moderator, ARVO 2018, Honolulu, HI

06/26/2018 Light-field background de-cluttering for visual prostheses
OSA Imaging and Applied Optics Congress
3D Image Acquisition and Display: Technology, Perception and Applications, Orlando, FL

06/29/2018 Prism spectacles to increase field of vision
NEI 50th Anniversary Symposium: Low Vision and Vision Rehabilitation, Bethesda, MD

International

11/16/2014 Multiplexing prism glasses for field expansion in bitemporal hemianopia, monocular vision, and normally sighted
Korean Nuero-Ophthalmology Society (KNOS), Seoul National University Hospital, Seoul, Korea

11/17/2014	Active confocal imaging for visual prostheses and multiplexing prisms for visually impaired persons National Creative Research Center for Active Plasmonics Application Systems (NCRCAPAS), Seoul National University, Seoul, Korea
11/18/2014	Active confocal imaging for visual prostheses and multiplexing prisms for visually impaired persons BK21+ Creative Education Center for Advanced Display, Kyung Hee University, Seoul, Korea
11/18/2014	Active confocal imaging for visual prostheses and multiplexing prisms for visually impaired persons Department of Physics, Sejong University, Seoul, Korea
11/19/2014	Active confocal imaging for visual prostheses and multiplexing prisms for visually impaired persons School of Information and Communication Engineering, Inha University, Incheon, Korea
11/20/2014	Active confocal imaging for visual prostheses and multiplexing prisms for visually impaired persons Samsung Advanced Institute of Technology, Samsung Electronics, Suwon, Korea
07/10/2018	Light-field confocal imaging for visual prostheses Department of Physics and Astronomy, Sejong University, Seoul, Korea
07/13/2018	Active confocal imaging for visual prostheses International Cooperation & Exchange Program, Information Science and Technology College, Dalian Maritime University, Dalian, China
07/16/2018	Novel field expansion devices for visual field loss International Cooperation & Exchange Program, Information Science and Technology College, Dalian Maritime University, Dalian, China
07/20/2018	New Era in Low Vision Aids Fourth Industrial Revolution Symposium, Kim's Eye Hospital, Department of Ophthalmology, Konyang University Hospital, Seoul, Korea
07/23/2018	Background De-Cluttering for Visual Prostheses Department of Electrical and Computer Engineering, Seoul National University, Seoul, Korea

Report of Technological and Other Scientific Innovations

Peli E, **Jung J-H**, Qiu C Motion parallax in object recognition	US Patent Application, PCT/US2018/022916, Mar. 16, 2018 The proposed systems and methods for visual prostheses apply image processing techniques and/or depth camera systems to suggest and select image information corresponding to in-plane objects (e.g., objects at selected distances or within particular focal planes relative to the user's position) from out-of-plane objects to effectively stabilize the object at the center of view and actively move background clutter in the other planes.
Peli E, **Jung J-H** Active confocal imaging	US Patent Granted, Jul. 17, 2018 Recent advances in prosthetic vision for the blind including retinal

systems and methods for visual prostheses	implants and other "sensory substitution devices" that use tactile or electrical stimulation are encouraging. However, they all have low resolution, limited field of view, and can display only very few gray levels, severely restricting their utility. We proposed a novel front-end optical and video processing system to be used with any visual prosthesis that will remove background clutter and therefore improve object detection and recognition despite the prostheses' limitations.
Hong J, **Jung J-H**, Hong K, Kim Y, Lee B Method and system for imaging display	Korean Patent, 10-1118745, Mar. 14, 2012 A 2D/3D convertible projection type display was proposed. Pinhole array, rear screen and projector, and front screen and projector can display 2D/3D images separately.
Lee B, Kim Y, Kim J, **Jung J-H**, Kang J, Choi H Three-dimensional display system and method for using electrically moving pinhole array	Korean Patent, 10-0928332, Nov. 26, 2009 A resolution and viewing angle-enhanced integral imaging system using electrically movable pinhole array was proposed. A pinhole array on liquid crystal was adopted as a dynamic pinhole array in integral imaging.
Lee B, Kim Y, **Jung J-H** Two-dimensional/three-dimensional convertible display device using surface light source array	Korean Patent, 10-0918670, Sep 22, 2009 A thin and compact integral imaging system using electroluminescent films or organic emitting diode was proposed. An array of pinholes on electroluminescent film or organic emitting diode was proposed to form a point light-source array for reconstructing three-dimensional images based on integral imaging.

Report of Scholarship

Publications

Peer reviewed publications in print or other media (Journal)

1. Kim Y, Kim J, Kang JM, **Jung J-H**, Choi H, Lee B. Point light source integral imaging with improved resolution and viewing angle by the use of electrically movable pinhole array. Opt Express. 2007 Dec 24;15(26):18253-67. PubMed PMID: 19551123.
2. Kim Y, Kim J, Kim Y, Choi H, **Jung J-H**, Lee B. Thin-type integral imaging method with an organic light emitting diode panel. Appl Opt. 2008 Sep 20;47(27):4927-34. PubMed PMID: 18806853. (Featured cover article)
3. **Jung J-H**, Park G, Kim J, Kang J, Lee B. Three-dimensional conversion of two-dimensional movie using optical flow and normalized cut. Korean Journal of Optics and Photonics. 2009 January; 20(1):16-22.
4. Kang J, **Jung J-H**, Lee B, Park J-H. Object-Based Integral Imaging Depth Extraction Using Segmentation. Korean Journal of Optics and Photonics. 2009 February; 20(2):94-101.
5. **Jung J-H**, Kim Y, Kim Y, Kim J, Hong K, Lee B. Integral imaging system using an electroluminescent film backlight for three-dimensional-two-dimensional convertibility and a curved structure. Appl Opt. 2009 Feb 10;48(5):998-1007. PubMed PMID: 19209217.
6. Kim Y, Park G, **Jung J-H**, Kim J, Lee B. Color moiré pattern simulation and analysis in three-dimensional integral imaging for finding the moiré-reduced tilted angle of a lens array. Appl Opt. 2009 Apr 10;48(11):2178-87. PubMed PMID: 19363558. (Featured cover article)
7. Park G, **Jung J-H**, Hong K, Kim Y, Kim YH, Min SW, Lee B. Multi-viewer tracking integral imaging system and its viewing zone analysis. Opt Express. 2009 Sep 28;17(20):17895-908. doi: 10.1364/OE.17.017895. PubMed PMID: 19907578.
8. Hong K, Hong J, **Jung J-H**, Park J-H, Lee B. Rectification of elemental image set and extraction of lens lattice by

projective image transformation in integral imaging. Opt Express. 2010 May 24;18(11):12002-16. doi: 10.1364/OE.18.012002. PubMed PMID: 20589062.

9. **Jung J-H**, Hong K, Park G, Chung I, Lee B. 360°-viewable cylindrical integral imaging system using a 3-D/2-D switchable and flexible backlight. Journal of the Society for Information Display. 2010 July; 18(7):527-534.
10. Pham DQ, Kim N, Kwon KC, **Jung J-H**, Hong K, Lee B, Park J-H. Depth enhancement of integral imaging by using polymer-dispersed liquid-crystal films and a dual-depth configuration. Opt Lett. 2010 Sep 15;35(18):3135-7. doi: 10.1364/OL.35.003135. PubMed PMID: 20847803.
11. Choi HJ, **Jung J-H**, Kim H, Lee B. Analysis of the motion picture quality of stereoscopic three-dimensional images. Journal of the Optical Society of Korea. 2010 December; 14(4):383-387.
12. **Jung J-H**, Hong K, Park G, Chung I, Park J-H, Lee B. Reconstruction of three-dimensional occluded object using optical flow and triangular mesh reconstruction in integral imaging. Opt Express. 2010 Dec 6;18(25):26373-87. doi: 10.1364/OE.18.026373. PubMed PMID: 21164988.
13. **Jung J-H**, Yeom J, Hong J, Hong K, Min SW, Lee B. Effect of fundamental depth resolution and cardboard effect to perceived depth resolution on multi-view display. Opt Express. 2011 Oct 10;19(21):20468-82. doi: 10.1364/OE.19.020468. PubMed PMID: 21997055. (Featured cover article)
14. Yeom J, Hong J, **Jung J-H**, Hong K, Park J-H, et al. Phase-only hologram generation based on integral imaging and its enhancement in depth resolution. Chinese optics letters : COL. 2011 December; 9(12):120009.
15. Chen N, Yeom J, **Jung J-H**, Park J-H, Lee B. Resolution comparison between integral-imaging-based hologram synthesis methods using rectangular and hexagonal lens arrays. Opt Express. 2011 Dec 19;19(27):26917-27. doi: 10.1364/OE.19.026917. PubMed PMID: 22274275.
16. Kim Y, Kim J, Hong K, Yang HK, **Jung J-H**, et al. Accommodative response of integral imaging in near distance. Journal of Display Technology. 2012 January; 8(2):70-78.
17. Kim J, **Jung J-H**, Hong J, Yeom J, Lee B. Elemental image generation method with the correction of mismatch error by sub-pixel sampling between lens and pixel in integral imaging. Journal of the Optical Society of Korea. 2012 March; 16(1):29-35.
18. **Jung J-H**, Park SG, Kim Y, Lee B. Integral imaging using a color filter pinhole array on a display panel. Opt Express. 2012 Aug 13;20(17):18744-56. doi: 10.1364/OE.20.018744. PubMed PMID: 23038515.
19. Kim Y, Hong K, Yeom J, Hong J, **Jung J-H**, Lee YW, Park J-H, Lee B. A frontal projection-type three-dimensional display. Opt Express. 2012 Aug 27;20(18):20130-8. doi: 10.1364/OE.20.020130. PubMed PMID: 23037066. (CNN, NBC, BBC, etc. press releases)
20. **Jung J-H**, Kim J, Lee B. Solution of pseudoscopic problem in integral imaging for real-time processing. Opt Lett. 2013 Jan 1;38(1):76-8. doi: 10.1364/OL.38.000076. PubMed PMID: 23282843.
21. Wooh S, Yoon H, **Jung J-H**, Lee YG, Koh J-H, Lee B, Kang YS, Char K. Efficient light harvesting with micropatterned 3D pyramidal photoanodes in dye-sensitized solar cells. Adv Mater. 2013 Jun 11;25(22):3111-6. doi: 10.1002/adma.201300085. Epub 2013 May 2. PubMed PMID: 23636901.
22. Kim J, **Jung J-H**, Jang C, Lee B. Real-time capturing and 3D visualization method based on integral imaging. Opt Express. 2013 Aug 12;21(16):18742-53. doi: 10.1364/OE.21.018742. PubMed PMID: 23938790.
23. Park SG, **Jung J-H**, Jeong Y, Lee B. Depth-fused display with improved viewing characteristics. Opt Express. 2013 Nov 18;21(23):28758-70. doi: 10.1364/OE.21.028758. PubMed PMID: 24514388.
24. **Jung J-H**, Peli E. Impact of high power and angle of incidence on prism corrections for visual field loss. Opt Eng. 2014 Jan 17;53(6). doi: 10.1117/1.OE.53.6.061707. PubMed PMID: 24497649; PubMed Central PMCID: PMC3909527.
25. Kim J, **Jung J-H**, Jeong Y, Hong K, Lee B. Real-time integral imaging system for light field microscopy. Opt Express. 2014 May 5;22(9):10210-20. doi: 10.1364/OE.22.010210. PubMed PMID: 24921724.
26. **Jung J-H**, Aloni D, Yitzhaky Y, Peli E. Active confocal imaging for visual prostheses. Vision Res. 2015 Jun;111(Pt B):182-96. doi: 10.1016/j.visres.2014.10.023. Epub 2014 Nov 3. PubMed PMID: 25448710; PubMed Central PMCID: PMC4417666. (Best paper of the year by a trainee in SERI, Harvard Medical School)
27. Peli E, Bowers AR, Keeney K, **Jung J-H**. High-Power Prismatic Devices for Oblique Peripheral Prisms. Optom Vis Sci. 2016 May;93(5):521-33. doi: 10.1097/OPX.0000000000000820. PubMed PMID: 26866438; PubMed Central PMCID: PMC4840069. (Press releases)

28. **Jung J-H**, Pu T, Peli E. Comparing object recognition from binary and bipolar edge images for visual prostheses. J Electron Imaging. 2016 Nov;25(6). pii: 061619. doi: 10.1117/1.JEI.25.6.061619. PubMed PMID: 28458481; PubMed Central PMCID: PMC5407304.
29. Peli E, **Jung J-H**. Multiplexing Prisms for Field Expansion. Optom Vis Sci. 2017 Aug;94(8):817-829. doi: 10.1097/OPX.0000000000001102. PubMed PMID: 28727615; PubMed Central PMCID: PMC5542858.
30. Han S. Qiu C, Lee K, **Jung JH**, Peli E. Word recognition: Re-thinking prosthetic vision evaluation. J Neural Eng. 2018 May;15(5):055003. doi: 10.1088/1741-2552/aac663. PubMed PMID: 29781807.
31. **Jung JH**, Peli E. No useful field expansion with full-field prisms. Optom Vis Sci. 2018 Sep;95(9):805-12, DOI: 10.1097/OPX.0000000000001271. PubMed PMID: 30169356.
32. **Jung JH**, Peli E. Field expansion for acquired monocular vision using a multiplexing prism. Optom Vis Sci. 2018 Sep;95(9):814-28, DOI: 10.1097/OPX.0000000000001277. PubMed PMID: 30169357.
33. Qiu C, **Jung JH**, Tuccar-Burak M, Spano LP, Goldstein RB, Peli E. Measuring the Effects of Prisms on Pedestrian Collision Detection with Peripheral Field Loss. Transl Vis Sci Technol. 2018 Sep;7(5):Article 1, DOI:10.1167/tvst.7.5.1. PubMed PMID: 30197833; PubMed Central PMCID: PMC6126965. (Featured cover article)
34. Qiu C, Lee K, **Jung JH**, Goldstein R, Peli E. De-cluttering using motion parallax improves recognition of new objects in simulated prosthetic vision. Transl Vis Sci Technol. 2018;In press.

Peer reviewed publications in print or other media (Proceedings of Meetings)

1. Kim Y, Kim J, Kang J-M, **Jung J-H**, Lee B. Improved viewing resolution of three-dimensional integral imaging using pinhole array on LC panel. Three-Dimensional TV, Video, and Display VI, SPIE Optics East, Boston, MA, USA, Proc. SPIE, vol. 6778, paper 6778-29, pp. 67780U-1 - 67780U-8, Sep. 2007.
2. Kim Y, **Jung J-H**, Kang J-M, Kim Y, Lee B, Javidi B. Resolution-enhanced three-dimensional integral imaging using double display devices. IEEE Lasers and Electro-Optics Society Annual Meeting (LEOS 2007), Orlando, Florida, USA, paper TuW3, pp. 356-357, Oct. 2007.
3. Kim Y, Park G, Cho S-W, **Jung J-H**, Lee B, Choi Y, Lee MG. Integral imaging with reduced color moire pattern by using a slanted lens array. Stereoscopic Displays and Applications XIX, Electronic Imaging, Proc. SPIE, vol. 6803, paper 6803-59, San Jose, CA, USA, Jan. 2008.
4. Park G, **Jung J-H**, Kim J, Lee B. Computer-generation method for elemental image of integral floating display using virtual integral imaging system. Digital Holography and Three-Dimensional Imaging (OSA Optics and Photonics Spring Congress), St. Petersburg, Florida, USA, paper JMA16, Mar. 2008.
5. Kim Y, Kim J, Kim Y, **Jung J-H**, Lee B. Depth-enhanced integral floating imaging system with variable image planes using polymer-dispersed liquid-crystal films. Digital Holography and Three-Dimensional Imaging (OSA Optics and Photonics Spring Congress), St. Petersburg, Florida, USA, paper JMA2, Mar. 2008.
6. **Jung J-H**, Kim Y, Kim J, Lee B. A thin 3D-2D convertible integral imaging system using a pinhole array on an electroluminescent (EL) sheet. Digital Holography and Three-Dimensional Imaging (OSA Optics and Photonics Spring Congress), St. Petersburg, Florida, USA, paper DTuA2, Mar. 2008.
7. Kim J, Park G, **Jung J-H**, Kim Y, Min S-W, Lee B. Implementation of integral floating display system using concave mirror. The 6th International Conference on Optics-Photonics Design and Fabrication (ODF'08), Taipei, Taiwan, pp. 557-558, June 2008.
8. Kim Y, Kim Y-T, **Jung J-H**, Lee S-D, Lee B. Three-dimensional integral imaging using an elastic PDMS lens array. International Meeting on Information Display / International Display Manufacturing Conference / Asia Display (IMID/IDMC/ASIA DISPLAY 2008), Ilsan, Korea, paper P-146, pp. 714-717, Oct. 2008.
9. Kim Y, Hong K, **Jung J-H**, Seo J-M, Lee B. Measurement of the accommodation response in viewing stereoscopic images. OSA's 92nd Annual Meeting - Frontiers in Optics 2008, Rochester, NY, USA, paper FThM10, Oct. 2008.
10. **Jung J-H**, Park J-H, Lee B. Reconstruction of occluded regions in integral imaging using arbitrary view generation and optical flow. Technical Digest of International Topical Meeting on Information Photonics 2008, Hyogo, Japan, paper P1-20, pp. 78-79, Nov. 2008.
11. Kim J, Hong K, **Jung J-H**, Park G, Lim J, Kim Y, Hahn J, Min S-W, Lee B. High definition integral floating display

with multiple spatial light modulators. Stereoscopic Displays and Applications XX, Electronic Imaging, Proc. SPIE, vol. 7237, paper 7237OT-1-7237OT-8, San Jose, CA, USA, Jan. 2009.

12. Hong K, Hong J, Kang J-M, **Jung J-H**, Park J-H, Lee B. Improved three-dimensional depth extraction using super resolved elemental image set. Digital Holography and Three-Dimensional Imaging, Advances in Imaging, 2009 OSA Optics & Photonics Congress, Vancouver, Canada, paper DWB1, Apr. 2009.
13. **Jung J-H**, Park G, Kim Y, Lee B. 360-degree Viewable Cylindrical Integral Imaging System Using Electroluminescent Films. 9th International Meeting on Information Display (IMID 2009), Ilsan, Korea, paper 66-2, pp. 1254-1257, Oct. 2009. (Merck Young Scientist Awards)
14. **Jung J-H**, Kim Y, Kim S, Lee B. Stereoscopic View Image Generation Based on the Horopter. The 16th International Display Workshops (IDW'09), Miyazaki, Japan, paper 3Dp-3, pp1139-1142, Dec. 2009.
15. **Jung J-H**, Kim Y, Lee Y, Lee B. Enhancement of pinhole type integral imaging system using color filters of liquid crystal display panel. Biomedical Optics and 3-D Imaging: OSA Optics and Photonics Congress - Digital Holography and Three-Dimensional Imaging (DH), Miami, Florida, USA, paper DTuB3, Apr. 2010.
16. Kim Y, Hong K, **Jung J-H**, Hong J, Lee Y, Min S-W, Lee B. Enhanced optical depth converter based on integral imaging. Biomedical Optics and 3-D Imaging: OSA Optics and Photonics Congress - Digital Holography and Three-Dimensional Imaging (DH), Miami, Florida, USA, paper DMC1, Apr. 2010.
17. Chung I, **Jung J-H**, Hong J, Hong K, Lee B. Depth extraction with sub-pixel resolution in integral imaging based on genetic algorithm. Biomedical Optics and 3-D Imaging: OSA Optics and Photonics Congress - Digital Holography and Three-Dimensional Imaging (DH), Miami, Florida, USA, paper JMA3, Apr. 2010.
18. Hong K, **Jung J-H**, Park J-H, Lee B. Accurate lens lattice extraction in distorted elemental image set. Biomedical Optics and 3-D Imaging: OSA Optics and Photonics Congress - Digital Holography and Three-Dimensional Imaging (DH), Miami, Florida, USA, paper JMA20, Apr. 2010.
19. Kim Y, **Jung J-H**, Hong K, Park G, Lee B. Accommodation response in viewing integral imaging. Society for Information Display 2010 International Symposium (SID 2010) Digest of Technical Papers, Seattle, WA, USA, paper 37.4, May 2010.
20. **Jung J-H**, Hong K, Park J-H, Chung I, Lee B. Disparity estimation based on integral imaging in sub-pixel resolution using maximum a priori (MAP) registration. Optics and photonics for information processing IV, SPIE Optics and Photonics, San Diego, CA, USA, Proc. SPIE, vol. 7797, paper 779711, pp. 779711-1 - 779711-6, Aug. 2010.
21. Chung I, **Jung J-H**, Hong J, Hong K, Lee B. Reduction of quantization error in depth extraction based on integral imaging using genetic algorithm. 10th International Meeting on Information Display (IMID 2010), Ilsan, Korea, paper 29-3, pp. 204-205, Oct. 2010.
22. Kim Y, Yeom J, **Jung J-H**, Hong J, Lee B. View image error analysis based on focal mode and virtual mode in three-dimensional display using lenses. Advances in Display Technologies, SPIE Photonics West, San Francisco, CA, USA, paper 7956B-28, Jan. 2011.
23. Chen N, Yeom J, Hong K, Hong J, **Jung J-H**, Park J-H, Lee B. Phase-only hologram generation from multiple defocused images of three-dimensional object. OSA Topical Meeting on Digital Holography and Three-Dimensional Imaging, Tokyo, Japan, paper DMB3, May 2011.
24. **Jung J-H**, Hong J, Park G, Hong K, Min S-W, Lee B. Evaluation of perceived depth resolution in multi-view three-dimensional display using depth image-based rendering. 3DTV Conference ’11 - The True Vision, Capture, Transmission and Display of 3D Video, Antalya, Turkey, paper QOE-3, May 2011.
25. Yeom J, **Jung J-H**, Lee B. Viewing window expansion in integral floating display using tilted side mirrors. 3DTV Conference ’11 - The True Vision, Capture, Transmission and Display of 3D Video, Antalya, Turkey, paper IHI-1, May 2011.
26. Kim J, **Jung J-H**, Hong J, Yeom J, Lee B. Elemental image generation with correlation of mismatching error between pixel and lens in integral imaging. 3rd International Conference on 3D Systems and Applications (3DSA 2011), Seoul, Korea, pp. 141-143, June 2011. (Best Paper Award)
27. **Jung J-H**, Hong J, Park G, Hong K, Lee B. Computational reacquisition of a real three-dimensional object for integral imaging without matching of pickup and display lens array. Optics and Photonics for Information Processing V, SPIE Optics + Photonics, SPIE Proceedings, vol. 8134, San Diego, CA, USA, paper 8134-10, Aug. 2011.
28. **Jung J-H**, Kim J, Hong K, Lee B. Quality improvement of multi-view display and one-dimensional integral imaging in

ray sampling using time-multiplexing method. The 11th International Meeting on Information Display (IMID 2011), Seoul, Korea, paper 70-2, pp. 522-523, Oct. 2011.

29. Yeom J, Kim Y, **Jung J-H**, Lee B. Optimum gap for reducing color separation in focal mode integral imaging. The 11th International Meeting on Information Display (IMID 2011), Seoul, Korea, paper 64-4, pp. 478-479, Oct. 2011.
30. Kim J, **Jung J-H**, Park S-g, Yeom J, Hahn J, Min S-W, Lee B. Floating curvature-effect large-depth integral imaging system. The 11th International Meeting on Information Display (IMID 2011), Seoul, Korea, paper 58-2, pp. 430-431, Oct. 2011.
31. Choi H, Kwon H, **Jung J-H**, Lee B. Analysis on the distortion of 3D image with depth axis movement in stereoscopic liquid crystal displays. The 11th International Meeting on Information Display (IMID 2011), Seoul, Korea, paper 52-4, pp. 387-388, Oct. 2011.
32. Kim J, Hong J, **Jung J-H**, Lee B. Frontal projection-type 3D display using micro convex mirror array and relay optic. International Conference on 3D Imaging (IC3D 2011), Liege, paper 54, Belgium, Dec. 2011.
33. Park S-g, **Jung J-H**, Kim Y, Lee B. Depth-fused Display with Enhanced Viewing Region. Holography and 3-D Imaging (DH), Biomedical optics and Three-Dimensional Imaging, 2012 OSA Optics and Photonics Congress, Miami, Florida, USA, paper DSu1C.5, Apr.-May 2012.
34. **Jung J-H**, Hong K, Lee B. Effect of viewing region satisfying super multi-view condition in integral imaging. Display Week 2012, Society for Information Display (SID) International Symposium, Seminar, and Exhibition, Boston, MA, USA, paper 65.2, pp. 883-886, June 2012.
35. Kim J, Hong J, **Jung J-H**, Hong J-Y, Moon J, Lee B. Analysis of depth resolution in multi-view display. Proceedings of the 12th International Meeting on Information Display (IMID 2012), Daegu, Korea, paper P2-9, pp. 671-672, Aug. 2012.
36. Park S-g, **Jung J-H**, Lee B. Depth expansion of depth-fused display based on integral imaging method. Proceedings of the 12th International Meeting on Information Display (IMID 2012), Daegu, Korea, paper 62-3, pp. 473-474, Aug. 2012.
37. Chen N, Yeom J, Hong K, **Jung J-H**, Lee B. Experimental verification of hologram generation using intensity images. Information Optics and Optical Data Storage II, 2012 SPIE Photonics Asia, Beijing, China, paper 8559-15, Nov. 2012.
38. Park S-g, **Jung J-H**, Kim J, Park J-H, Lee B. Analysis and improvement of the depth resolution in depth-fused display. The Second Japan-Korea Workshop on Digital Holography and Information Photonics, Tokushima, Japan, paper C028, Nov. 2012.
39. **Jung J-H**, Kim J, Park S-g, Choi SY, Nam D, Lee B. Accommodation response of super multi-view display using directional light in monocular condition, 19th The International Display Workshop, Kyoto, Japan, paper VHF5/3D5-4, Dec. 2012.
40. Kim J, **Jung J-H**, Lee B. Real-time pickup and display integral imaging system without pseudoscopic problem, Proc. SPIE. 8643, Advances in Display Technologies III, pp. 864303-864303-7, Feb. 2013.
41. **Jung J-H**, Pu T, Peli E. Comparing object recognition from binary and bipolar edge features. IS&T Int Symp Electron Imaging. 2016;2016. pii: HVEI-111. doi: 10.2352/ISSN.2470-1173.2016.16.HVEI-111. Epub 2016 Feb 14. PubMed PMID: 28409188; PubMed Central PMCID: PMC5388452.
42. **Jung J-H**, Qiu C, Peli E. Background de-cluttering for object recognition in video-based visual prostheses. 10th The Eye and The Chip World Research Congress, Detroit, MI, pp. 100 – 101, Sep. 2017.
43. Aloni D, **Jung J-H**, Yitzhaky Y. 3D noise-resistant segmentation and tracking of unknown and occluded objects using integral imaging. Proc. SPIE 10441, Counterterrorism, Crime Fighting, Forensics, and Surveillance Technologies, 104410D, Oct. 2017.
44. **Jung J-H**, Peli E. Light-field background de-cluttering for visual prostheses. Imaging and Applied Optics 2018, OSA Technical Digest (Optical Society of America, 2018), paper 3Tu3E.3, Jun. 2018. (Invited talk)

Non-peer reviewed scientific or medical publications/materials in print or other media

Thesis

Jung J-H. Study on improvement of three-dimensional displays based on multi-view display and pinhole-type integral imaging [Ph. D. dissertation]. 2012.

Educational Materials

1. **Jung J-H**. Distortions to visual field expansion with high-power Fresnel prisms. SPIE Newsroom 2014 DOI: 10.1117/2.1201402.005350.

Abstracts, Poster Presentations and Exhibits Presented at Professional Meetings

1. Dupuis M, **Jung J-H**, Peli E. Calculating Field Expansion and Apical Scotoma Size in Optical Correction for Homonymous Hemianopia, Biomedical Engineering Society 2013 Annual Meeting, P-Sat-B-24, Sep. 2013.
2. **Jung J-H**, Peli E. Spurious reflection effects in Fresnel prisms used for visual field expansion, Academy 2013 of American Academy of Optometry, 135000, Oct. 2013.
3. **Jung J-H**, Peli E. Impact of high power and high incidence angles on peripheral prisms for homonymous hemianopia. Vision 2014 (11th International Conference on Low Vision). Melbourne, Australia, Mar. 2014
4. **Jung J-H**, Peli E. Configuring multiplexing prism for field expansion of acquired monocular vision and normally sighted. Vision 2014 (11th International Conference on Low Vision). Melbourne, Australia, Mar. 2014.
5. **Jung J-H**, Peli E. Multiplexing prism glasses for field expansion in bitemporal hemianopia. Invest. Ophthalmol. Vis. Sci. 2014;55(13):4129.
6. **Jung J-H**, Peli E. Novel field expansion for acquired monocular vision or bitemporal hemianopia. Academy 2014 of American Academy of Optometry, 145070, Nov. 2014.
7. Peli E, **Jung J-H**. Impact of background clutter removal using confocal imaging on object recognition with simulated visual prosthesis. Academy 2014 of American Academy of Optometry, 145070, Nov. 2014.
8. **Jung J-H**, Pu T, Aloni D, Yitzhaky Y, Peli E. Active confocal imaging for visual prostheses. 2015 Annual Meeting & Alumni Reunion, Department of Ophthalmology, Harvard Medical School, May. 2015.
9. **Jung J-H**, Peli E. Multiplexing prism prescription glasses for field expansion of monocular vision. Academy 2015 of American Academy of Optometry, 155261, Oct. 2015.
10. Qiu C, Spano L, Tuccar M, Goldstein R, **Jung J-H**, Peli E. Judging pedestrian collisions in open-space walking simulations. Academy 2016 of American Academy of Optometry, Nov. 2016.
11. **Jung J-H**, Peli E. Analysis of Light-field imaging for background de-cluttering in visual prostheses. 6th Military Vision Symposium on Ocular and Vision Injury, Mar. 2017.
12. Mostofi N, Peli E, **Jung J-H**. Confocal image generation from light-field using GPU for background de-cluttering in visual prostheses. 6th Military Vision Symposium on Ocular and Vision Injury, Mar. 2017.
13. Qiu C, **Jung J-H**, Peli E. **Motion** Parallax in Prosthetic Vision. 6th Military Vision Symposium on Ocular and Vision Injury, Mar. 2017.
14. **Jung J-H**, Kurukuti NM, Peli E. **3D**-printed clip-on multiplexing prism holder for field expansion in acquired monocular vision. Academy 2017 of American Academy of Optometry, Oct. 2017.
15. Lee K, Qiu C, **Jung J-H**, Peli E. Motion parallax improves recognition of fixated object with cluttered background in simulated prosthetic vision. ARVO 2018, Apr. 2018.
16. **Jung J-H**, Peli E. No useful field expansion for hemianopia or acquire monocular vision with full-field prisms. ARVO 2018, Apr. 2018.
17. Peli E, **Jung J-H,** Kurukuti NM, Vargas Martin F. High power multi-periscopic device for field expansion. ARVO 2018, Apr. 2018.
18. Lee K, Qiu C, **Jung J-H**, Goldstein G, Peli E. Motion parallax improves recognition of new objects presented in clutter in simulated prosthetic vision. OSA Fall Vision Meeting 2018, Sep. 2018.
19. **Jung J-H**, Kurukuti NM, Peli E. Photographic Depiction of the Effects of Visual Aids on Field of View. Academy 2018 of American Academy of Optometry, Nov. 2018. (accepted)
20. Peli E, **Jung J-H,** Kurukuti NM, Vargas Martin F. High power multi-periscopic device for field expansion. Academy 2018 of American Academy of Optometry, Nov. 2018. (accepted)

Narrative Report

My research focuses on the interface between optical/electrical systems and human vision. I propose to uncover the principles underlying human visual perception, and apply them to improve low vision aids, from prism glasses to visual prostheses. I am studying three-dimensional (3D) imaging and display systems and image processing methods to restore vision and rehabilitate people with visual impairments. I am also studying realistic and effective representation methods to interact with people.

Since 2007, I have proposed several light-field 3D imaging and display systems that use a micro lens array to capture and represent whole 3D rays within a single shot of elemental image. These systems permit real-time capturing and reconstruction of 3D volume data, as well as confocal image generation. I have applied this novel imaging system to improve visual prostheses for people with visual impairments, such as retinal/cortical implants and sensory substitution devices (SSDs). The proposed active confocal imaging system will remove background clutter from images, and improve detection of possible objects of interest. It will be applicable to any type of visual prosthesis including cortical/retinal implants, SSDs, and optogenetics. For a pilot study of this work, I was awarded a research grant from the Swedish Promobilia Foundation, and received the award for best paper of the year by a trainee at SERI. Moreover, I was recently awarded a DoD grant to develop the system. For this latter grant I will focus on a more elaborate study involving object recognition, visual search, and mobility testing to find better representations for visual prostheses to aid people with visual impairments.

In addition to the imaging system for visual prostheses, I have designed a virtual reality (VR) training program for visual prostheses users, and applied for a DoD grant to implement and evaluate it. Using a 3D VR world generated by a computer game engine, the proposed training system can provide purely visual stimuli that are fully controllable (location, contrast, background, and visual properties: perspective, parallax and size). Such a system would also be completely safe, as opposed to real-world training. With the VR training system, the patients can practice over many hours at home and receive instantaneous feedback as progress is automatically monitored. The series of studies for visual prostheses continue to drive development and improvement of visual prostheses to help blind people.

I have developed several 3D displays including novel light-field displays that show multiple views of 3D scenes without requiring special glasses to view the scenes. My research focus has shifted from technology development to human factors, particularly the comfort of 3D display users. I have investigated the impact of light-field displays in accommodation and convergence responses, and recently focused on motion sickness in VR head-mounted displays induced by spatial distortions.

I have also developed real-time light-field microscopy that captures and simultaneously represents entire 3D volumetric information of live specimens. This novel microscopy system can capture the 3D live movements of specimens and display it with a multi-view 3D display, without the need for special glasses, to share with multiple observers.

I have been working to characterize and improve conventional low vision rehabilitation devices using my expertise in optical engineering and display technologies. I have developed visual field expansion devices for patients with homonymous and bitemporal hemianopia and for patients with acquired monocular vision using various prism devices, including a novel multiplexing prism that permits both see-through and shifted views. The visual fields of patients using the proposed devices are expanded by about 40°, achieving one of the best performances in field expansion devices with a cosmetically acceptable design. It can also expand the far peripheral visual field of a person with normal vision, which can be useful to a motorcyclist, bike rider, or soldier. I also investigated the impact of using a high angle of incidence with prisms, and how this affects prism power, thereby providing accurate information about the effective fitting of prism devices for field expansion. I am pursuing the development of other types of optical devices for field expansion of patients with visual field loss to increase fidelity and contrast.