JAE-HYUN JUNG, PHD, FAAO

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RESEARCH AREA AND SKILLS

Vision Science (Matlab-Psychtoolbox), VR/AR and 3D displays (Oculus, Vive Eye Pro), Computational photography (Matlab, OpenCV, C++), Vision aids design (LightTool, Zemax), Human subject studies (SPSS), VR mobility simulators (Unity), Human-computer Interaction

PROFESSIONAL EXPERIENCE

SCHEPENS EYE RESEARCH INSTITUTE, HARVARD MEDICAL SCHOOL 12/2012-Present

Assistant Professor (Present) – Instructor (tenure-track faculty, 2015) – Postdoc Fellow (Prof. Eli Peli, 2012)

- Experienced principal investigator of own lab (scholar.harvard.edu/Jaehyun_Jung) for applied visual perception projects that require multi-disciplinary backgrounds (computer science, optical engineering, vision science, and optometry). Lead and manage all development steps (Patent – Designing – Prototyping – Human subject study – Journal publication – Commercialization) in the projects (selected projects below).

Monocular Visual Confusion for Field Expansion, NIH R01, PI (2019 – Present)

- Study effect of AR display configurations (monocular and stereoscopic) and eye movements to bistability of visual/motion perception (monocular/binocular rivalry and suppression)
- Developing AR field expansion vision aids in the VR environment
- Developing realistic VR walking scenarios and modeling pedestrian collisions in VR
- Leading clinical human subject studies of walking and collision avoidance behavior in AR/VR environments with the field expansion aids

Active Confocal Imaging for Visual Prostheses, US DoD, Co-PI (2016 – 2021)

- Studied computational photography algorithms for multi-sensory visual perception in visual prostheses (retinal/cortical implant, tactile-visual sensory substitution)
- Developed light-field background removal systems based on light-field imaging and computational photography with motion parallax (2 US patents awarded)
- Led clinical human subject studies of object recognition with confocal imaging on VR prosthetic vision

Visual Field Expansion through Innovative Multiplexing Prism, NIH R01, (2013 – Present)

- Designed and developed an optical augmented vision element (Multiplexing prism), an optical module of cascaded optical elements for wide field expansion (Multi-periscopic prism), and 3D-printed field expansion glasses for field loss patients
- Developed a 3D-printed camera setup and image processing algorithm to photographically depict and simulate human visual perception with the developed vision aids
- Led clinical human subject studies of driving and walking performance with the developed devices in simulated VR environments

Scientific Consulting

- **SAMSUNG ELECTRONICS** - Human subject studies for UX and display development (2021)
- **LetinAR Inc** - Development and performance measure of AR displays (2020-2021)
- **International Electrotechnical Commission (IEC) -** Electronic Displays Committee (Eyewear display, 3D display, Automotive display) (2016 **–** Present)

SEOUL NATIONAL UNIVERSITY (SNU), SEOUL, KOREA 11/2012

Postdoc Fellow (08/2012) - PhD in Electrical Engineering & Computer Science (Prof. Byoungho Lee)

- Dissertation Topic: Three-dimensional displays and light-field imaging systems development
- Developed various light-field 3D displays (2D/3D switchable, 360° viewable 3D, frontal-projection 3D, multi-view tracking 3D, and real-time microscopy 3D displays) and computational photography algorithms for light-field imaging (real-time capturing and display, depth resolution enhancement, and source image rectification)
- Best Researcher Award by PhD Students, Seoul National University (2011), Merck Young Scientist Award, Society for Information Display (2009)

SELECTED HONORS AND PRIZES

Fellow of the American Academy of Optometry (FAAO) (2019)
Alice J. Adler Fellowship in Faculty Development Award, Harvard Medical School (2017)
Promobilia Research Fellowship Award, Promobilia Foundation (2015)

SELECTED RECENT JOURNAL PUBLICATIONS

Total 45 Journal and 75 conference papers in Vision Science, Optics, and Imaging societies and 6 patents (all publications are available at https://scholar.harvard.edu/jaehyun_jung/publications)

1. Duan H, Shen W, Min X, Tian Y, Jung J-H, Yang X, Zhai G. Develop then Rival: A Human Vision-Inspired Framework for Superimposed Image Decomposition. IEEE Trans. Multimedia. 2022. https://doi.org/10.1109/TMM.2022.3172882
2. Jung J-H, Kurukuti NM, Peli E. Photographic depiction of the field of view with spectacles-mounted low vision aids. Optom Vis Sci. 2021 Oct;98(10):1210-26, https://10.1097/OPX.0000000000001790
3. Avraham D, Jung J-H, Yitzhaky Y, Peli E. Epiretinal Prosthetic Vision Simulation: Temporal Aspects. J Neural Eng. 2021 Aug;18(4):0460d9, https://doi.org/10.1088/1741-2552/ac1b6c
4. Peli E, Vargas-Martin F, Kurukuti N, Jung J-H. Multi-periscopic prism device for field expansion. Biomed Opt Express. 2020 Sep;11(9):4872-89, https://doi.org/10.1364/boe.399028
5. Jung J-H, Castle R, Kurukuti N, Manda S, Peli E. Field expansion with multiplexing prism glasses improves pedestrian detection for acquired monocular vision. Transl Vis Sci Technol. 2020 Jul;9(8): Article 35, https://doi.org/tvst.9.8.35
6. Pamir Z, Canoluk MU, Jung J-H, Peli E. Poor resolution at the back of the tongue is the bottleneck for spatial pattern recognition. Sci Rep. 2020. Feb;10(1):Article 2435, https://doi.org/10.1038/s41598-020-59102-3
7. Choi HJ, Peli E, Park M, Jung J-H. Design of 45° periscopic visual field expansion device for patients with homonymous hemianopia. Opt Commun. 2020 Jan;454:Article 124364, https://doi.org/10.1016/j.optcom.2019.124364
8. Qiu C, Lee K, Jung J-H, Goldstein R, Peli E. Motion Parallax Improves Object Recognition in the Presence of Clutter in Simulated Prosthetic Vision. Transl Vis Sci Technol. 2018 Oct;7(5):Article 29, https://doi.org/10.1167/tvst.7.5.29
9. Qiu C, Jung J-H, 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, https://doi.org/10.1167/tvst.7.5.1
10. Peli E, Jung J-H. Multiplexing Prisms for Field Expansion. Optom Vis Sci. 2017 Aug;94(8):817-829. https://doi.org/10.1097/OPX.0000000000001102