Ryuji Hirayama

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Research Interests

3D Displays (particularly volumetric display), Computer Human Interaction, Media arts, Functional-materials application, Computational fabrication, Acceleration using FPGA

Education

Ph.D., Engineering   04/2014 – 03/2017
Graduate School of Engineering, Chiba University, Japan
Theme: Volumetric display containing multiple 2D images
Advisor: Professor Tomoyoshi Ito

M.S., Engineering   04/2012 – 03/2014
Graduate School of Engineering, Chiba University, Japan

B.S., Engineering   04/2008 – 03/2012
Faculty of Engineering, Chiba University, Japan

Experiences

Postdoctoral Researcher   04/2017 – present
Graduate School of Engineering, Chiba University, Japan
Advisor: Professor Tomoyoshi Ito

Research Fellow   04/2015 – present
Japan Society for the Promotion of Science
Theme: Volumetric display exhibiting multiple 2D information
Advisor: Professor Tomoyoshi Ito

Research Assistant of the ImPACT Program   11/2014 – 03/2015
Graduate School of Engineering, Chiba University, Japan
Theme: Acceleration of a cell searching algorithm for the Serendipiter
Project Leader: Professor Tomoyoshi Shimobaba

Teaching Assistant   10/2014 – 03/2015
Faculty of Engineering, Chiba University
Lecture: Experiment of electrical and electronics engineering III

Student Assistant   07/2013 – 10/2014
Academic Link Center, Chiba University
Job: Leaning support for undergraduate students

Research Grants

Grant-in-Aid for JSPS Fellows, No. 16J30007   04/2016 – present
Japan Society for the Promotion of Science
2,300,000 JPY / 2 years

Grant-in-Aid for JSPS Fellows, No. 15J07684   04/2015 – 03/2016
Japan Society for the Promotion of Science
1,200,000 JPY / 1 year

Honors and Awards

President Award for the Excellent Record Chiba University	**03/2017**
Dean Award for the Excellent Record Graduate School of Engineering, Chiba University	**03/2017**
Global Prominent Research Program to Support Sending Graduate Students Abroad Chiba University	**12/2016**
Program to Support Sending Graduate Students Abroad Chiba University	**10/2016**
JSPS Ikushi Prize Japan Society for the Promotion of Science	**03/2016**
KONICA MINOLTA Science and Technology Foundation Award The Optical Society of Japan	**06/2015**
Best Poster Award (FORUM 8 Award) Computer Graphic Arts Society	**03/2015**
Scholarship Loan Forgiveness for Academic Excellence (Full Amount) Japan Student Services Organization	**05/2015**
Outstanding Paper Award for Young C&C Researchers NEC C&C Foundation	**01/2015**
Program to Support Sending Graduate Students Abroad Chiba University	**05/2014**
Grants for Researchers Attending International Conferences NEC C&C Foundation	**05/2014**
Scholarship Loan Forgiveness for Academic Excellence (Full Amount) Japan Student Services Organization	**05/2014**
President Award for the Excellent Record Chiba University	**03/2014**
Dean Award for the Excellent Record Graduate School of Engineering, Chiba University	**03/2014**

Journal Papers

1. **R. Hirayama**, T. Suzuki, T. Shimobaba, A. Shiraki, M. Naruse, H. Nakayama, T. Kakue, T. Ito, "Inkjet printing-based volumetric display projecting multiple full-colour 2D patterns", Scientific Reports, 7, 46511 (2017).

2. T. Shimobaba, Y. Endo, **R. Hirayama**, Y. Nagahama, T. Takahashi, T. Nishitsuji, T. Kakue, A. Shiraki, N. Takada, N. Masuda, T. Ito, "Autoencoder-based holographic image restoration", Applied Optics, 56(13), F27-F30 (2017).

3. T. Shimobaba, Y. Endo, **R. Hirayama**, D. Hiyama, Y. Nagahama, S. Hasegawa, M. Sano, T. Takahashi, T. Kakue, M. O., T. Ito, "Holographic micro-information hiding", Applied Optics, 56(4), 833-837 (2017).

4. **R. Hirayama**, A. Shiraki, M. Naruse, S. Nakamura, H. Nakayama, T. Kakue, T. Shimobaba, T. Ito, "Optical Addressing of Multi-Colour Photochromic Material Mixture for Volumetric Display", Scientific Reports, 6, 31543 (2016).

5. T. Shimobaba, M. Makowski, Y. Nagahama, Y. Endo, **R. Hirayama**, D. Hiyama, S. Hasegawa, M. Sano, T. Kakue, M. Oikawa, T. Sugie, N. Takada, T. Ito, "Color computer-generated hologram generation using the random phase-free method and color space conversion", Applied Optics, 55(15), 4159-4165 (2016).

6. **R. Hirayama**, H. Nakayama, A. Shiraki, T. Kakue, T. Shimobaba, T. Ito, "Image quality improvement for a 3D structure exhibiting multiple 2D patterns and its implementation", Optics Express, 24(7), 7319-7327 (2016).

7. T. Sanpei, T. Shimobaba, T. Kakue, Y. Endo, **R. Hirayama**, D. Hiyama, S. Hasegawa, Y. Nagahama, M. Sano, M. Oikawa, T. Sugie, T. Ito, "Optical encryption for large-sized images", Optics Communications, 361, 138-142 (2016).

8. T. Shimobaba, T. Kakue, Y. Endo, **R. Hirayama**, D. Hiyama, S. Hasegawa, Y. Nagahama, M. Sano, M. Oikawa, T. Sugie, T. Ito, "Improvement of the image quality of random phase-free holography using an iterative method", Optics Communications, 355, 596-601 (2015).

9. T. Shimobaba, T. Kakue, Y. Endo, **R. Hirayama**, D. Hiyama, S. Hasegawa, Y. Nagahama, M. Sano, M. Oikawa, T. Sugie, T. Ito, "Random phase-free kinoform for large objects", Optics Express, 23, 17269-17274 (2015).

10. **R. Hirayama**, M. Naruse, H. Nakayama, N. Tate, A. Shiraki, T. Kakue, T. Shimobaba, M. Ohtsu, T. Ito, "Design, implementation and characterization of a quantum-dot-based volumetric display", Scientific Reports, 5, 8472 (2015), *highlighted in Nature Japan*

11. D. Arai, T. Shimobaba, K. Murano, Y. Endo, **R. Hirayama**, D. Hiyama, T. Kakue, T. Ito, "Acceleration of computer-generated hologram using tilted wavefront recording plane method", Optics Express, 23, 1740-1747 (2015).

12. T. Shimobaba, M. Makowski, T. Kakue, N. Okada, Y. Endo, **R. Hirayama**, D. Hiyama, S. Hasegawa, Y. Nagahama, T. Ito, "Numerical investigation of lensless zoomable holographic projection to multiple tilted planes", Optics Communications, 333, 274-280 (2014).

13. T. Shimobaba, T. Kakue, N. Okada, Y. Endo, **R. Hirayama**, D. Hiyama, T. Ito, "Ptychography by changing the area of probe light and scaled ptychography", Optics Communications, 331, 189-193 (2014).

14. T. Shimobaba, T. Kakue, M. Oikawa, N. Takada, N. Okada, Y. Endo, **R. Hirayama**, T. Ito, "Calculation reduction method for color computer-generated hologram using color space conversion", Optical Engineering, 53(2), 024108 (2014).

15. T. Shimobaba, T. Kakue, M. Oikawa, N. Okada, Y. Endo, **R. Hirayama**, N. Masuda, T. Ito, "Non-uniform sampled scalar diffraction calculation using non-uniform fast Fourier transform", Optics Letters, 38, 5130-5133 (2013).

16. T. Shimobaba, M. Makowski, T. Kakue, M. Oikawa, N. Okada, Y. Endo, **R. Hirayama**, N. Masuda, T. Ito, "Lensless zoomable holographic projection using scaled Fresnel diffraction", Optics Express, 21, 25285-25290 (2013).

17. T. Shimobaba, H. Yamanashi, T. Kakue, M. Oikawa, N. Okada, Y. Endo, **R. Hirayama**, T. Ito, "Inline digital holographic microscopy using a consumer scanner", Scientific Reports, 3, 2664 (2013).

18. H. Nakayama, A. Shiraki, **R. Hirayama**, N. Masuda, T. Shimobaba, T. Ito, "Three-dimensional volume containing multiple two-dimensional information patterns", Scientific Reports, 3, 1931 (2013).

Presentations

1. **R. Hirayama**, T. Suzuki, T. Shimobaba, A. Shiraki, M. Naruse, H. Nakayama, T. Kakue, T. Ito, "Inkjet-printed 3D structure projecting multiple full-color images", OPIC IP2017, Yokohama, Japan (2017).

2. F. Kawashima, **R. Hirayama**, A. Shiraki, H. Nakayama, T. Kakue, T. Shimobaba, T. Ito "Gradation expression by overlap of voxels in volumetric display composed of photochromic materials", 3DSA 2016, Fukuoka, Japan (2016).

3. **R. Hirayama**, A. Shiraki, H. Nakayama, T. Kakue, T. Shimobaba, T. Ito, "3-D crystal with a curved surface projecting multiple 2-D images", ACM SIGGRAPH Asia 2016 Posters, Macao, China (2016).

4. **R. Hirayama**, A. Shiraki, H. Nakayama, T. Kakue, T. Shimobaba, T. Ito, "Refraction-compensating algorithm for a 3D glass structure exhibiting multiple 2D images", Frontiers in Optics / Laser Science 2016, Rochester, USA (2016).

5. M. Oikawa, D. Hiyama, **R. Hirayama**, S. Hasegawa, Y. Endo, T. Sugie, N. Tsumura, M. Kuroshima, M. Maki, G. Okada, C. Lei, Y. Ozeki, K. Goda, T. Shimobaba, "A computational approach to real-time image processing for serial time-encoded amplified microscopy", SPIE Photonics West BIOS 2016, San Francisco USA (2016).

6. (invited) A. Shiraki, H. Nakayama, **R. Hirayama**, T. Kakue, T. Shimobaba, T. Ito, "Volumetric display containing multiple two dimensional information patterns", IDW 2015, Otsu, Japan (2015).

7. **(invited) R. Hirayama**, A. Shiraki, H. Nakayama, T. Kakue, T. Shimobaba, T. Ito, "3-D crystal exhibiting multiple 2-D images with directivity", VRCAI 2015, Kobe, Japan (2015).

8. **R. Hirayama**, A. Shiraki, H. Nakayama, T. Kakue, T. Shimobaba, T. Ito, "3-D crystal exhibiting multiple 2-D images with directivity", ACM SIGGRAPH Asia 2015 Posters, Kobe, Japan (2015).

9. **R. Hirayama**, A. Shiraki, M. Naruse, H. Nakayama, N. Tate, T. Kakue, T. Shimobaba, T. Ito, "Optically controlled quantum-dot-based volumetric display exhibiting multiple patterns", JSAP-OSA Joint Symposia 2015, Nagoya, Japan (2015).

10. **(invited) R. Hirayama**, M. Naruse, H. Nakayama, A. Shiraki, T. Kakue, T. Shimobaba, T. Ito, "Optically controlled volumetric display exhibiting multiple two-dimensional patterns", CC3DMR 2015, Busan, South Korea (2015).

11. **R. Hirayama**, H. Nakayama, A. Shiraki, T. Kakue, T. Shimobaba, T. Ito, "Development of volumetric display based on multi-bit color LED", APCCAS 2014, Okinawa, Japan (2014).

12. **R. Hirayama**, H. Nakayama, A. Shiraki, T. Kakue, T. Shimobaba, T. Ito, "Volumetric display containing multiple two-dimensional color motion pictures", SPIE DSS 2014, Baltimore, USA (2014).

13. (invited) T. Kakue, N. Masuda, Y. Endo, **R. Hirayama**, N. Okada, T. Shimobaba, T. Ito, "Special-purpose computer for real-time reconstruction of holographic motion picture, OIT 2013, Beijing, China (2013).

14. **R. Hirayama**, R. Omura, Y. Kobayashi, A. Shiraki, H. Nakayama, T. Kakue, N. Masuda, T. Shimobaba, T. Ito, "Development of a digitized volumetric display containing multiple two-dimensional patterns", 3DSA 2013, Osaka, Japan (2013).

15. **R. Hirayama**, H. Ando, A. Shiraki, H. Nakayama, T. Kakue, N. Masuda, T. Shimobaba, T. Ito, "Image-quality improvement of multiple two-dimensional patterns contained in three-dimensional volume", 3DSA 2013, Osaka, Japan (2013).

16. **R. Hirayama**, T. Shimobaba, H. Nakayama, A. Shiraki, T. Kakue, N. Masuda, T. Ito, "Optical encryption using three-dimensional volume containing multiple two-dimensional information patterns", DHIP 2012, Tokushima, Japan (2012).

Media

1. **R. Hirayama**, A. Shiraki, T. Kakue, T. Shimobaba, T. Ito, "Optical addressing method for full-color 3D display", SPIE Newsroom (2016).

Membership

Association for Computing Machinery (ACM)	**10/2016 – present**
The Optical Society (OSA)	**08/2016 – present**
The Japan Society of Applied Physics (JSAP)	**01/2014 – present**

Skills

Programming
C, C++, Matlab, VHDL, Verilog, HTML/CSS

Others
Illustrator, LaTeX, Maya, Unity, Excel, Word, PowerPoint