

# Curriculum Vitae

Oct, 2018

## Tadamasa Sawada

National Research University – Higher School of Economics

School of Psychology (Faculty of Social Sciences)

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### Education

2003-2006: Doctor of Science in Information Processing. Department of Information Processing, Tokyo Institute of Technology Graduate School, Ph.D. dissertation: “Human perception of shape from shading,” 2006. Supervisor: Dr. Hirohiko Kaneko<sup>1</sup> (Psychophysics). Committee: Dr. Keiji Uchikawa<sup>2</sup>, Dr. Hiroshi Nagahashi<sup>1</sup>, Dr. Itsuo Kumazawa<sup>1</sup>, Dr. Hiroshi Ando<sup>3,4</sup> and Dr. Masami Yamaguchi<sup>5</sup>.

2001-2003: Department of Information Processing, Tokyo Institute of Technology Graduate School, M.Sc. thesis: “The role of priors in shape perception from shading,” 2003. Supervisor: Dr. Hirohiko Kaneko<sup>1</sup> (Psychophysics). Committee: Dr. Keiji Uchikawa<sup>2</sup>, Dr. Hiroshi Nagahashi<sup>1</sup> and Dr. Masahiro Yamaguchi<sup>1</sup>.

1997-2001: Department of Electrical and Electronic Engineering, Faculty of Engineering, Tokyo Institute of Technology, Bachelor Degree of Engineering

<sup>1</sup> Imaging Science and Engineering Laboratory, Tokyo Institute of Technology, Japan.

<sup>2</sup> Department of Information Processing, Tokyo Institute of Technology, Japan.

<sup>3</sup> Universal Media Research Center, NICT, Japan

<sup>4</sup> Department of Perceptual and Cognitive Dynamics, Media Information Science Laboratories, ATR, Japan.

<sup>5</sup> Department of Psychology, Chuo University, Japan.

### Professional Affiliations

Vision Science Society

Society for Mathematical Psychology

### Professional Experience

Sep/01/2014-Current: Assistant Professor, School of Psychology, National Research University – Higher School of Economics, Moscow, Russia.

Apr/11/2014-Aug/31/2014: Postdoctoral Research Assistant (H1B), Graduate Center for Vision Research, SUNY College of Optometry, New York, NY.

Jan/19/2013-Apr/10/2014: Postdoctoral Research Assistant (H1B), Department of Psychology, the Ohio State University, Columbus, OH.

Oct/19/2011-Jan/18/2013: Postdoctoral Research Assistant (H1B), Department of Psychological Sciences, Purdue University, West Lafayette, IN.

Apr/04/2006-Mar/31/2011: Postdoctoral Research Fellow (J1), Department of Psychological Sciences, Purdue University, West Lafayette, IN.

## **Ad hoc reviewer for**

*Attention, Perception, & Psychophysics*

*Behavior Research Methods*

*Cognition*

*Cognitive Systems Research*

*IEEE Transactions on Industrial Informatics*

*Journal of Experimental Psychology: Human Perception and Performance*

*Journal of Imaging Science and Technology*

*Journal of Mathematical Psychology*

*Journal of Vision*

*MDPI Symmetry*

*MDPI Vision*

*NeuroImage*

*Pattern Recognition*

*Perception*

*Perceptual and Motor Skills*

*Quarterly Journal of Experimental Psychology*

*Vision Research*

*Journal of the Vision Society of Japan*

*The Conference on Behavior Representation in Modeling and Simulation (BRiMS)*

*The European Conference on Visual Perception (ECVP)*

*The Iberoamerican Congress on Pattern Recognition (ICPR)*

## **Awards**

Dr. A. Louis Medin award (third place poster paper) for The 13th NDIA Annual Science & Engineering Technology Conference/Defense Tech Exposition, 2012.

Fred Brown Research Award for Sawada & Petrov (2017, Journal of Neurophysiology) at Ohio State University.

## **Patents**

Pizlo, Z., Sawada, T., & Li, Y. (Granted). Reconstruction of shapes of near symmetric and asymmetric objects. US8406567 B2 (<https://www.google.us/patents/US8406567>).

Pizlo, Z., Sawada, T., & Li, Y. (Filed). Figure-ground organization of 3D scenes. US20140049613 A1 (<https://www.google.us/patents/US20140049613>), WO2012116350 A3 (<https://www.google.us/patents/WO2012116350A3>).

## Press Releases

Standardizing the divisive-normalization model of V1 neurons. (2017). *Journal of Neurophysiology Podcast* (<https://www.youtube.com/watch?v=n5276Nlp16Q>)

Зарубежные учёные - о Российской науке и жизни в Москве (Foreign scientists – science in Russia and life in Moscow). (2015). *The Village* (<http://www.the-village.ru/village/people/people/227157-scientists>)

Robot Vision Goes 3-D. (2013). *NSF Highlight* (<http://go.usa.gov/bm5F>)

Purdue researcher helps robots 'see' in 3-D like humans. (May 2, 2012). *Purdue News Room* ([http://www.purdue.edu/newsroom/research\\_park\\_foundation/2012/120502PizloRobotVision.html](http://www.purdue.edu/newsroom/research_park_foundation/2012/120502PizloRobotVision.html)) followed by: e.g. *Reuters, Chicago Daily Herald, Wall Street Select, Los Angeles Daily News, Genetic Engineering News, IT News, Yahoo Finance, Marketwatch, BusinessInsider.com, CBS Money Watch.*

## Publications

### Book

Pizlo, Z., Li, Y., Sawada, T. & Steinman, R.M. (2014) *Making a Machine That Sees Like Us*. New York, NY: Oxford University Press.

### Journals

Koshmanova, E. & Sawada, T. (under revision after the 1st review) Perceiving Perpendicular and Parallel Contours in the Frontoparallel Plane. *Vision Research*.

Sawada, T. & Zaidi, Q. (accepted) Rotational-symmetry in a 3D scene and its 2D image. *Journal of Mathematical Psychology*.

Jayadevan, V. T., Sawada, T., Delp, E., & Pizlo, Z. (2018) Perception of 3D symmetrical and nearly symmetrical shapes. *Symmetry*, 10, 8:344, 1-24.

Sawada, T., & Petrov, A.A. (2017) The Divisive-Normalization Model of V1 Neurons: A Comprehensive Comparison of Physiological Data and Model Predictions. *Journal of Neurophysiology*, 118, 3051-3091.

Kwon, T., Li, Y., Sawada, T., & Pizlo, Z. (2016) Gestalt-like constraints produce veridical (Euclidean) percepts of 3D indoor scenes. *Vision Research*, 126, 264-277.

Sawada, T., Li, Y., & Pizlo, Z. (2014) Detecting 3D Mirror-Symmetry in a 2D Camera Image. *Proceedings of IEEE*, 102(10), 1588-1606.

Li, Y., Sawada, T., Latecki, L.M., Steinman, R.M., & Pizlo, Z. (2012) Visual recovery of the shapes and sizes of objects, as well as distances among them, in a natural 3D scene. *Journal of Mathematical Psychology*, 56(4), 217-231.

- Li, Y., Sawada, T., Shi, Y., Kwon, T., & Pizlo, Z. (2011) A Bayesian model of binocular perception of 3D mirror symmetric polyhedra. *Journal of Vision*, 11(4):11, 1-20.
- Sawada, T., Li, Y., & Pizlo, Z. (2011) Any pair of 2D curves is consistent with a 3D symmetric interpretation. *Symmetry*, 3(2), 365-388.
- Pizlo, Z., Sawada, T., Li, Y., Kropatsch, W., & Steinman, R.M. (2010) New Approach to the Perception of 3D Shape Based on Veridicality, Complexity, Symmetry and Volume. *Vision Research*. 50(1), 1-11.
- Sawada, T. (2010) Visual detection of symmetry of 3D shapes. *Journal of Vision*, 10(6):4, 1-22.
- Tsuruhara, A., Sawada, T., Kanazawa, S., Yamaguchi, M., Corrow, S., & Yonas, A. (2010) The development of the ability of infants to utilize static cues to create and access representations of object shape. *Journal of Vision*, 10(12):2, 1-11.
- Tsuruhara, A., Sawada, T., Kanazawa, S., Yamaguchi, M., & Yonas, A. (2009) Infant's sensitivity to pictorial depth cues: a transfer-across-cues study. *Infant Behavior and Development*. 32(4), 468-475.
- Sawada, T., & Pizlo, Z. (2008) Detection of skewed symmetry. *Journal of Vision*, 8(5):14, 1-18.
- Sawada, T., & Kaneko, H. (2007) Smooth-shape assumption for perceiving shapes from shading. *Perception*, 36(3), 403-415.
- Sawada, T., & Kaneko, H. (2006) Extracting illuminant direction from visual information for perceiving shape from shading. *The Journal of the Vision Society of Japan*, 18(4), 161-172 (in Japanese).
- Sawada, T., & Kaneko, H. (2003) Spatial properties of multiple cues for perceiving shape from shading. *The Journal of the Institute of Image Information and Television Engineers*, 57(5), 597-602 (in Japanese).

### **Book Chapters**

- Sawada, T., Li, Y., & Pizlo, Z. (in press) Organizing a 2D image for 3D shape recovery. *The Oxford Handbook of Computational Perceptual Organization*.
- Sawada, T., Li, Y., & Pizlo, Z. (2015) Shape Perception. In J. R. Busemeyer, Z. Wang, J. T. Townsend, & A. Eidels (Eds.), *The Oxford Handbook of Computational and Mathematical Psychology* (pp. 255-276). New York, NY: Oxford University Press.
- Li, Y., Sawada, T., Shi, Y., Steinman, R.M., & Pizlo, Z. (2013) Symmetry is the sine qua non of shape. In S. Dickinson & Z. Pizlo (Eds.), *Shape perception in Human & Computer Vision*. New York, NY: Springer.
- Sawada, T., Li, Y., & Pizlo, Z. (2011) Symmetry, shapes and surfaces. In C. W. Tyler (Ed.), *Computational Vision: From Surfaces to Objects* (pp. 113-124). Boca Raton, FL: Chapman Hall/CRC.

### **Book Review**

- Sawada, T. & Pizlo, Z. (2008) There is no royal road to vision science. Review of *Seeing Spatial Form*, by Jenkin, M.R.M. & Harris, L.R. eds. *Perception*, 37(10), 1612-1616.

### **Conference Proceedings (Refereed)**

Sawada, T., & Petrov, A.A. (2015) A Study of the Role of the Maintained-Discharge Parameter in the Divisive Normalization Model of V1 Neurons. *BICT'15 Proceedings of the 9th EAI International Conference on Bio-inspired Information and Communications Technologies (BIONETICS)*, 570-573.

Li, Y., Sawada, T., & Pizlo, Z. (2012) Building a seeing machine. *The 21th Behavior Representation in Modeling & Simulation (BRiMS) Conference*, 161-168.

Pizlo, Z., Li, Y., & Sawada, T. (2012) Making a machine that sees like us. *The 13th NDIA Annual Science & Engineering Technology Conference/Defense Tech Exposition*.

Sawada, T., & Pizlo, Z. (2008) Detecting mirror-symmetry of a volumetric shape from its single 2D image. *The Sixth IEEE Computer Society Workshop on Perceptual Organization in Computer Vision in Conjunction with IEEE CVPR 2008*.

Sawada, T., & Pizlo, Z. (2007) Symmetry detection in 3D scenes. *Proceedings of SPIE*, 6498, 64980Y/1-12.

### **Preprint/Technical-report**

Koshmanova, E. & Sawada, T. (2018) Perceiving Perpendicular and Parallel Contours in the Frontoparallel Plane. *NRU Higher School of Economics. Series PSY "Psychology"*. No. WP BRP 90/PSY/2018.

Minkov V., Sawada T. (2018) Seeing a Triangle in a 3D Scene Monocularly and Binocularly. *NRU Higher School of Economics. Series PSY "Psychology"*. No. WP BRP 91/PSY/2018.

### **Invited Colloquia**

Comparing human vision with machine vision. Yamagata University, Yonezawa, Yamagata, Japan, 2016

Modeling in vision science. Yamagata University, Yonezawa, Yamagata, Japan, 2016

Veridical visual perception and a computer that emulates it. HSE Tikhonov Moscow Institute of Electronics and Mathematics (MIEM HSE), Moscow, Russia, 2016

Visual perception as an inverse ill-posed problem. Tokyo Institute of Technology, Yokohama, Kanagawa, Japan, 2015

Visual perception of 3D-mirror and 3D-rotational symmetry. Meiji University, Tokyo, Japan, 2015

Mathematical and computational approaches to study human 3D scene perception. Faculty of Psychology, National Research University – Higher School of Economics, Moscow, Russia, 2014

Detecting symmetry of a 3D shape from its single 2D image. Department of Psychology, Tsinghua University, Beijing, China, 2012

Detecting symmetry of a 3D shape from its single 2D image. Department of Psychology, Tsinghua University, Beijing, China, 2012

2D invariants of 3D symmetry. Department of Psychology, Ohio State University, Columbus, Ohio, 2012

Detection of 3D symmetry from a single 2D image. Department of Psychology, Chuo University, Tokyo, Japan, 2011

Detection of 3D symmetry from a single 2D image. Department of Information Processing, Tokyo Institute of Technology, Yokohama, Japan, 2011

Detection of 3D symmetry from a single 2D image. Graduate Institute of Brain and Mind Sciences, National Taiwan University, Taipei, Taiwan, 2011

Visual detection of symmetry of 3D shapes. Department of Vision Science, SUNY Optometry, New York, NY, 2010

Recovering a 3D shape from a single 2D image: computational model and psychophysics. Department of Computer and Information Sciences, Temple University, Philadelphia, PA, 2009

Effects of experience on shape perception from shading. Department of Psychology, Chuo University, Tokyo, Japan, 2005

## **Teaching**

### **Graduate (Master)**

Visual Perception and Attention (2015, 2016, 2017, 2018)

Research Seminar “Cognitive science” (2014, 2015, 2016, 2017, 2018)

### **Undergraduate**

Research Seminar “Visual illusions as probes for studying the visual system” (2014, 2015)

### **Summer school**

Theoretical approach to visual perception (August 2015, Chuo university, Tokyo, Japan)