



# Department of Computer Science Distinguished Lecture Series 2016/17

Prof. Yasushi Yagi

Executive Vice President,  
Osaka University



4 May 2017 (Thursday)  
4:30 - 5:30pm

LT1 (SCT501),  
Cha Chi-ming Science Tower,  
Ho Sin Hang Campus



## Special Sensing System for Computer Vision

### Abstract

The studies in our laboratory focus on theory and applications related to computer vision and media processing. Some of the major research projects undertaken in the laboratory involve the creation of novel optical sensing systems including the omni-directional vision system, and the development of algorithms for human sensing, human behavior analysis, gait analysis, geometrical analysis and computational photography.

Especially, we have been studying creation of novel optical sensing systems for more than 25 years. Today, I will introduce several special sensing systems for computer vision.

It is desirable to engineer a small camera with a wide field of view (FOV) because of current developments in the field of wearable cameras and computing products, such as action cameras and Google Glass. However, typical approaches for achieving wide FOV, such as attaching a fisheye lens and convex mirrors, require a trade-off between optics size and the FOV. We have proposed camera optics that achieve a wide FOV, and are at the same time small and lightweight. The proposed optics are a completely lensless and catoptric design. They contain four mirrors, two for wide viewing, and two for focusing the image on the camera sensor. First, I will briefly introduce catadioptric camera system such as standard omnidirectional camera using hyperboloidal mirror, and show its characteristics. Then, I will talk about our prototype design of our lensless super wide view optics.

Measurement of transparent or translucent objects is an important technology with broad potential applications. In the computer vision field, computational photography approaches that combine optical design and computational algorithms to obtain informative images have been actively developed to enhance and restore images. However, it remains difficult to recover invisible information contained within transparent or translucent objects because light penetrates and scatters inside the object, heavily degrading observed images. Second my talk is about our special sensing system using either spatially or temporally modulated light. This optics, for example, can remove scattering lights from observation, by projecting high frequency patterns. I will show several recent research on the topics.

### Biography

Yasushi Yagi is the Executive Vice President of Osaka University in 2015. He received his Ph.D. degree from Osaka University in 1991. In 1985, he joined the Product Development Laboratory, Mitsubishi Electric Corporation, where he worked on robotics and inspections. He became a research associate at Osaka University in 1990, a lecturer in 1993, an associate professor in 1996, and a professor in 2003. He was the director of the Institute of Scientific and Industrial Research at Osaka University from 2012 to 2015.

The studies in his laboratory focus on computer vision and media processing including basic technologies such as sensor design, and applications such as an intelligent system with visual processing functions. Some of our major research projects are: the development of a novel vision sensors such as an omnidirectional catadioptric system; biomedical image processing such as endoscope and microscope images; person authentication, intention, and emotion estimation from human gait, and its applications to forensic and medical fields; photometry analysis and its application to computer graphics; an anticrime system using a wearable camera; and 3D shape and human measurement using infrared light.

He is a member of the Editorial Board of the International Journal of Computer Vision, the Editor-in-Chief of IPSJ Transactions on Computer Vision & Applications and the Vice-President of the Asian Federation of Computer Vision Societies. He is a fellow of IPSJ and a member of IEICE, RSJ, and IEEE.

### Enquiry

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