

Studies on Interactive Humanoids

Hiroshi Ishiguro

Department of Systems Innovation, Osaka University (Distinguished Professor)
ATR Hiroshi Ishiguro Laboratories (Visiting Director)

Keynote Abstract

We, humans, have innate brain function to recognize humans. Therefore, very humanlike robots, androids, can be ideal information media for human-robot/computer interaction. The speaker has developed various types of interactive robots and androids.

Geminoid that is a teleoperated android of an existing person can transmit the presence of the operator to the distant place. The operator recognizes the android body as his/her own body after talking with someone through the geminoid and has virtual feeling to be touched when someone touches to the geminoid.

However, the geminoid is not the ideal medium for everybody. For example, elderly people often hesitate to talk with adult humans and the adult androids. A question is what the ideal medium for everybody is. In order to investigate it, the speaker proposes the minimum design of interactive humanoids. It is called Telenoid. The geminoid is the perfect copy of an existing person and it is the maximum design of interactive humanoids. On the other hand, the minimum design looks like a human but we cannot judge the age and gender. Elderly people like to talk with the Telenoid very much. In this talk, the speaker discusses the design principles for the robots and their effects to conversations with humans.

Biograph

Hiroshi Ishiguro (M[']) received a D.Eng. in systems engineering from Osaka University, Japan in 1991. He is currently Professor of Department of Systems Innovation in the Graduate School of Engineering Science at Osaka University (2009-), Distinguished Professor of Osaka University (2013-) and visiting Director (2014-) of Hiroshi Ishiguro Laboratories at the Advanced Telecommunications Research Institute and an ATR fellow.

His research interests include distributed sensor systems, interactive robotics, and android science. He has published more than 300 papers in major journals and conferences, such as *Robotics Research* and *IEEE PAMI*. On the other hand, he has developed many humanoids and androids, called Robovie, Repliee, Geminoid, Telenoid, and Elfoid. These robots have been reported many times by major media, such as Discovery channel, NHK, and BBC. He has also received the best humanoid award four times in RoboCup. In 2011, he won the Osaka Cultural Award presented by the Osaka Prefectural Government and the Osaka City Government for his great contribution to the advancement of culture in Osaka. In 2015, he received the Prize for Science and Technology (Research Category) by the Minister of Education, Culture, Sports, Science and Technology (MEXT).

He was also awarded the Sheikh Mohammed Bin Rashid Al Maktoum Knowledge Award in Dubai in 2015.

H. Ishiguro, F. Dalla Libera (Eds), *Geminoid Studies*, Springer, 2018.

T. Arimoto, Y. Yoshikawa, H. Ishiguro, Multiple-Robot Conversational Patterns for Concealing Incoherent Responses, *International Journal of Social Robotics*, Vol. 1, No. 11, 2018.

C. Ishi, T. Minato, H. Ishiguro, Motion Analysis in Vocalized Surprise Expressions and Motion Generation in Android Robots, *IEEE Robotics and Automation Letters*, Vol. 2, Issue 3, pp. 1748-1754, 2017.

H. Takahashi, M. Ban, H. Osawa, J. Nakanishi, H. Sumioka, H. Ishiguro, Huggable Communication Medium Maintains Level of Trust during Conversation Game, *Frontiers in Psychology*, Vol. 8, Article 1862, pp. 1-8, 2017.

K. Sakai, F. Dalla Libera, Y. Yoshikawa, H. Ishiguro, Generation of Bystander Robot Actions Based on Analysis of Relative Probability of Human Actions, *Journal of Advanced Computational Intelligence and Intelligent Informatics*, Vol. 21, No. 4, pp. 686-696, 2017.

M. Kasaki, H. Ishiguro, M. Asada, M. Osaka and T. Fujikado (Eds), *Cognitive Neuroscience Robotics A*, Springer, 2016.

M. Kasaki, H. Ishiguro, M. Asada, M. Osaka and T. Fujikado (Eds), *Cognitive Neuroscience Robotics B*, Springer, 2016.

M. Alimardani, S. Nishio, H. Ishiguro, Removal of proprioception by BCI raises a stronger body ownership illusion in control of a humanlike robot, *Scientific Reports*, Vol. 6, No. 33514, 2016.

G. Matsuda, H. Ishiguro, K. Hiraki, Infant discrimination of humanoid robots, *Frontiers in Psychology*, Vol. 6, Article 1397, pp. 1-7, 2015.

M. Alimardani, S. Nishio, H. Ishiguro, Humanlike robot hands controlled by brain activity arouse illusion of ownership in operators, *Scientific Reports*, Vol. 3, No. 2396, 2013.

T. Kanda and H. Ishiguro, *Human-robot interaction in social robotics*, CRC Press, 2012.

H. Ishiguro, T. Minato, Y. Yoshikawa, M. Asada, Humanoid platform for cognitive developmental robotics. *International Journal of Humanoid Robotics*, Vol. 8, No. 3, pp. 391-418, 2011.

H. Ishiguro, S. Nishio, Building artificial humans to understand humans. *Journal of Artificial Organs*. Vol. 10, No. 3, pp. 133-142, 2007.

H. Ishiguro, Scientific issues concerning androids. *International Journal of Robotics Research*, Vol. 26, No. 1, pp. 105-117, 2007.