CONTACT INFORMATION

Last (Family) Name	First	Middle	Prefix
Kim	Jaihie		

Organization's Name (If None, Please leave blank)	Organization's Affiliation (Education/Industry/Government/Other)
Yonsei University	Education

Preferred Mailing Address

School of Electrical & Electronic Engineering, College of Engineering, Yonsei University, Sudamoongoo

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Seoul		120-749	Republic of Korea

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(82)-2-2123-2869	(82)-2-312-4584	jhkim@yonsei.ac.kr	04415875

EDUCATION

Degrees	Year	Educational Institution	Location
PhD	1984	Case Western Reserve University	Cleveland, Ohio
Masters	1982	Case Western Reserve University	Cleveland, Ohio
Bachelors/First Degree	1979	Yonsei University	Seoul, Republic of Korea

PROFESSIONAL HISTORY

From (year) to (year)	Name of Company	Position Held
1984 - present	Yonsei University	Professor
2002 - 2011	Biometric Engineering Research Center (as a National Engineering Research Center)	Director
2000 – 2002	Yonsei University	Vice President (Information & Communications Division)
1998 – 1999	Yonsei University	Chairman, School of Electrical and Electronic Engineering
1978 – 1980	Gold Star (currently LG Electronics) Ltd.	Research Staff Member

INDIVIDUAL CONTRIBUTIONS

Professor Jaihie Kim has made a number of significant contributions to the field of biometric recognition. He served as the Director of the Biometric Engineering Research Center (BERC) at Yonsei University, South Korea. This Center was funded by the National Research Foundation of Korea during 2002-2011 with a total funding of more than US$10 million. This was the only center funded by the Korean government on the topic of biometrics in Korea, which advanced the state of art in biometrics not only in Korea but globally. During the period 2002-2011, BERC graduated 40 Ph.D. and 139 M.Sc. students, published 244 journal papers and 338 conference papers, and transferred several biometrics technology to leading companies in South Korea, including Samsung, Suprema, Digent and Mando.

Prof. Kim's novel contributions cover the topics of touchless fingerprint recognition, iris recognition at a distance and biometric system security. One of his outstanding achievements is that, in addition to his numerous publications, he has been granted a total of 47 patents, seven of which have been transferred to 3 different companies in South Korea. His specific contributions that qualify him for elevation to Fellow are described below.

Touchless fingerprint recognition Prof. Kim was an early researcher to propose a 'Touchless Fingerprint Recognition' system, where the fingerprint image is captured without making a contact with the sensor. He presented several new approaches to deal with the following problems: (i) finger pose variations which is the fundamental problem in touchless recognition ("A recognizable-Image Selection for Fingerprint Recognition with a Mobile-Device Camera", IEEE TSMC*[1]), (ii) how to extend a fingerprint image by using a simple two side-mirror structure ("Mosaicing Touchless and Mirror-reflected Fingerprint Images," IEEE TSMC), (iii) how to optimally match fingerprints by using ridge flows ("Fingerprint Matching Incorporating Ridge

Features with Minutiae", IEEE TIFS*[2]), and (iv) how to obtain all five fingerprint images of a hand simultaneously ("Touchless Sensor Capturing Five Fingerprint Images by One Rotating Camera", OE*[3]). The technology related to touchless fingerprint recognition developed by his group was transferred to Samsung Electronics, Suprema and Digent; it will appear in the market as a mobile application as well as a standalone biometric recognition unit.

Iris Recognition at distance Prof. Kim presented various methods for iris recognition at a distance with a standoff of 1-3 meters. He proposed (i) a fast focusing algorithm for capturing high quality iris images based on the ratio of high and low-frequency sub-band averages ("New Focus Assessment Method for Iris Recognition Systems", PRL*[4]), (ii) an extension of the capture volume of iris images ("Quantitative evaluation of depth of capture volume extension by constrained least-square-based image restoration", OE), and (iii) the use of a light stripe to quickly detect the incoming user at a distance in a PTZ camera environment ("Nonintrusive Iris Image Acquisition System Based on a Pan-Tilt-Zoom Camera and Light Stripe Projection," OE). This last paper won the best paper award at the International Conference on Biometrics 2007. He also proposed a coaxial optical structure to capture iris images with a fast and easy control ("Coaxial optical structure for iris recognition from a distance", OE) and novel methods to recognize poor quality iris images for which he won the 5th place among the 97 world-wide participants in NICE.I (Noisy Iris Challenge Evaluation 2008) contest and 4th place among the 67 participants in NICE.II (2010).

Biometric system security Prof. Kim proposed many innovative algorithms for securing biometric systems and data which include a new cancelable fingerprint algorithm that does not require fingerprint alignment ("Alignment-Free Cancelable Fingerprint Templates Based on Local Minutiae Information", IEEE TSMC), a fuzzy vault scheme to keep secrete data with iris biometrics ("A New Method for Generating an Invariant Iris Private Key Based on the Fuzzy Vault System", IEEE TSMC), a fake iris detection using the reflectance ratio of iris to sclera ("Multi-feature Based Fake Iris Detection Method", OE), and a fake fingerprint detection by analyzing the image signals ("Fake Fingerprint Detection Using Multiple Static Features," OE). His intellectual property related to fake fingerprint detection was transferred to Digent for use in their commercial products. Due to Prof. Kim's significant achievements in integrated biometric security, his biometric lab has been designated as the leading national lab for approving fake biometric detection in commercial products in South Korea.

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*1. IEEE Transactions on System, Man and Cybernetics
*2. IEEE Transactions on Information Forensics and Security
*3. Optical Engineering
*4. Pattern Recognition Letters

EVIDENCE OF TECHNICAL ACCOMPLISHMENT

Touchless Fingerprint Recognition

Dongjae Lee, Kyoungtaek Choi, Heeseung Choi, Jaihie Kim, "*A Recognizable-Image Selection for Fingerprint Recognition with a Mobile-Device Camera*", IEEE Transactions on System, Man and Cybernetics -Part B, pp. 233-243, Vol. 38, No. 1, February 2008.
This was the first paper that addressed preprocessing issues and algorithms for touchless fingerprint recognition using the built-in camera in a mobile phone. The previous touch-based fingerprint recognition systems did not address the issue of focusing, quality check and pose estimation for incoming fingerprint image. This mobile touchless fingerprint technology was transferred to the Samsung (2007) and resulted in two patents: Korea 0891324 "Fingerprint Recognition System using Personal Mobile Device" and US 8,165,356 "Apparatus and Method for Determining the Acceptability of a Fingerprint Image to be Analyzed". Prof. Kim was the leader with his students (including D. Lee) being co-authors of the paper.

Heeseung Choi, Kyoungtaek Choi, Jaihie Kim, "*Mosaicing Touchless and Mirror-reflected Fingerprint Images"*, IEEE Transactions on Information Forensics and Security, pp.52-61, March 2010. In this paper, a new touchless fingerprint sensor composed of a single camera and two side mirrors capturing the center view and two side view images of a fingerprint is proposed. A mosaicking algorithm to combine these three images into a more complete fingerprint image is proposed. The technology is patented in US 8,243,131, Japan 4738532 and Korea 1054312 and transferred to Suprema (2009). Prof. Kim was the leader of this work with his students being co-authors. It is an improved version of their early touchless sensor model, Korea patent 0604267, which was transferred to Digent (2010).

The following three papers proposed methods to achieve high quality images for both touchless and touch-based fingerprint recognition. Prof. Kim was the leader and the corresponding authors of all papers

- Kyoungtaek Choi, Heeseung Choi, Sangyoun Lee, Jaihie Kim, "*Fingerprint Image Mosaicking by Recursive Ridge Mapping*", IEEE Transactions SMC-Part B, Special Issue on Recent Advances in Biometrics Systems, pp. 1191-1203, October 2007.
- Heeseung Choi, Kyoungtaek Choi, Jaihie Kim, "*Fingerprint Matching Incorporating Ridge Features with Minutiae*", IEEE TIFS, pp. 338-345, June 2011.
- Sanghoon Lee, Heeseung Choi, Jaihie Kim, "*Fingerprint Quality Index using Gradient Components*", IEEE TIFS, pp. 792-800, December 2008.

Iris Recognition

Soweon Yoon, Ho Gi Jung, Kang Ryoung Park and Jaihie Kim, "*Nonintrusive Iris Image Acquisition System Based on a Pan-Tilt-Zoom Camera and Light Stripe Projection*," Optical Engineering, vol. 48, no. 3, March 2009.[# of citation 24] In this work, an iris image capture method at a distance (1.5m-3m) was proposed which won the Best Paper Award at the International Conference on Biometrics 2007 producing the patent Korea 0869998, "Iris image acquisition system at a long distance". Prof. Kim was the leader and the corresponding author of this paper..

The following two papers describe new iris segmentation and recognition algorithms for noisy iris images that were also evaluated in NICE.I (Noisy Iris Challenge Evaluation) and NICE II contests. The performance of these two algorithms achieved the 5th highest rank among 97 world-wide participants and 4th among 67 participants, respectively.

- Dae Sik Jeong, Jae Won Hwang, Byung Jun Kang, Kang Ryoung Park, Chee Sun Won, Dong-Kwon Park, and Jaihie Kim, "*A New Iris Segmentation Method for Non-ideal Iris Images*", Image and Vision Computing, pp. 254-260, February 2010.

- Kwang Yong Shin, Gi Pyo Nam, Dae Sik Jeong, Dal Ho Cho, Byung Jun Kang, Kang Ryoung Park, and Jaihie Kim, "*New Iris Recognition Method for Noisy Iris Images*", Pattern Recognition Letters, pp. 991-999, June 2012.

Jain Jang, Kang Ryoung Park, Jaihie Kim, and Yillbyung Lee, "*New Focus Assessment Method for Iris Recognition Systems*", Pattern Recognition Letters, pp. 1759-1767, October 2008. In this work, a wavelet-based approach using the ratio of high and low-frequency sub-band averages was proposed for accurate and fast focus measuring and it was the key technology transferred for mobile iris recognition to Digent (2009) and Samsung (2012). Prof. Kim was the leader of this work.

Biometric System Security

Chulhan Lee, Jeung-Yoon Choi, Kar-Ann Toh, Sangyoun Lee, and Jaihie Kim, "*Alignment-Free Cancelable Fingerprint Templates Based on Local Minutiae Information*", IEEE Transactions on SMC-Part B, Vol. 37, No. 4, pp. 980-992, August 2007. [# of citations 53]
A cancelable scheme is adopted to replace the compromised template by producing a new template by a non-invertible transform of the original biometric data. Previous approaches required a query fingerprint image to be accurately aligned to a gallery image in order to obtain identically transformed minutiae which was the major reason for performance degradation. The proposed method does not require the alignment. Prof. Kim was the leader of this work.

Youn Joo Lee, Kang Ryoung Park, Sung Joo Lee, Kwanghyuk Bae, and Jaihie Kim, "*A New Method for Generating an Invariant Iris Private Key Based on the Fuzzy Vault System*", IEEE Transactions on SMC -Part B, pp.1302-1313, Oct. 2008. [# of citations 23] This is the first paper using iris image to securely store a 128 bit private key by a fuzzy vault scheme. This scheme was registered in Korea patent 0749380, and Prof. Kim was the corresponding author of the paper

Heeseung Choi, Raechoong Kang, Kyoungtaek Choi, Andrew Teoh Beng Jin and Jaihie Kim, "*Fake Fingerprint Detection Using Multiple Static Features*," Optical Engineering, vol. 48, no. 4, April 2009. This paper for fake fingerprint detection proposed a purely software approach adoptable to any existing fingerprint recognition system; this technology was transferred to Digent (2010) with the later Korea patent 1054314, "Spoof Detection Method for Touchless Fingerprint Acquisition Apparatus". Prof. Kim was the corresponding author of the paper.

Sung Joo Lee, Kang Ryoung Park, Youn Joo Lee, Kwanghyuk Bae, and Jaihie Kim, "*Multi-feature Based Fake Iris Detection Method*", Optical Engineering, Vol. 46, Issue 12, December 2007. In this paper, a fake iris detection algorithm using two wavelengths (750nm and 850nm) was proposed which are used in most iris recognition systems to make this algorithm easily adoptable. This work is registered as Korean Patent 0691772, and Prof. Kim was the corresponding author.

Please refer to the lists of more publications and patents in the separate file.

IEEE ACTIVITIES

IEEE Korea Section Office
- Secretary, IEEE Korea Section, 1986-1987

Awards & Honors
- Plaque of Appreciation, IEEE Korea Section, 1987

Editorial Board:
- Associate Editor, IEEE Trans. Information Forensics and Security, 2011 - present

Conference Organization:
- Program Co-Chair, IAPR/IEEE International Conference on Biometrics (ICB), 2012
- Conference Secretary, IEEE Region 10 Conference, 1987

Program Committee Member:
- IAPR/IEEE International Conference on Biometrics (ICB), 2009, 2012
- IEEE Fifth International Conference on Biometrics: Theory, Applications and Systems (BTAS), 2012
- IEEE International Joint Conference on Biometrics (IJCB), 2011
- IEEE International Workshop on Information Forensics and Security (WIFS), 2011
- IEEE Computer Society and IEEE Biometrics Council Workshop on Biometrics (BCWB), 2011

NON-IEEE ACTIVITIES AWARDS, PROFESSIONAL SOCIETY MEMBERSHIPS, COMMITTEE MEMBERSHIPS

Awards:
- Best Paper Presentation Award, 19th Intelligent System Symposium, Japan, 2009
- Best Research Accomplishment Award, Yonsei University, 2007
- Best Paper Award, International Conference on Biometrics, 2007
- Haedong Research Award, Institute of Electronics Engineers, Korea, 2002

Society Activity:
- President, Institute of Electronics Engineers, Korea, 2008

- Chairman, Korean Biometric Association, 2007 - 2011
- Member, National Academy of Engineering of Korea, 2004 - Present

Editorial Board:

- Associate editor, Neurocomputing, 1998 - 2002
- Editor-in-chief, Associate editor, Journal of the Institute of Electronics Engineers, Korea, 1985 - 1999
- Editor-in-chief, Journal of Korean Information and Communication Society, 1999 - 2000

National Committee:

- Chairman, Biometric Authentication Committee, Korea National Biometric Test Center, 2006 - present
- Advisory member, Committee of National Police Scientific Investigation, 2012 - present
- Chairman, Technology Division Committee of the Ministry of Industry and Resources, Korea, 2007 - 2008
- Advisory member, Information Policy in the Ministry of Defense, Korea, 1998 - 1999

Conference Organization:

- General Chair, International Conference on Electronics, Information and Communication, 2008
- Conference Secretary, International Conference on VLSI and CAD, 1989

Invited Talks

- Chinese Conference on Biometric Recognition, China, 2012
- International Workshop on Image & Signal Processing and Retrieval, Japan, 2012
- International Conference on Hand-based Biometrics, Hong Kong, 2011
- 19th Intelligent System Symposium, Japan, 2009
- IEICE General Meeting, Japan, 2008
- Biometric Consortium Conference, USA, 2007