Chan-Su Lee

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AREAS OF INTEREST

Computer Vision, Machine Learning, Human-Computer Interaction, Image/Video Processing, Multimedia Data Processing, Virtual Reality, Human Perception

ACADEMIC PREPARATION

Ph.D.	in Computer Science	Rutgers University	2007 (expected)

Concentrations: Computer Vision, Human Motion Analysis, Machine Learning, Gait/Facial Expression Recognition

Dissertation: *Modeling Human Motion Using Manifold Learning and Factored Generative Models*

Advisor: Dr. Ahmed Elgammal

M.S.	in Electrical Engineering	KAIST (Korea Advanced Institute of Science and Technology)	1997

Concentrations: Dynamic Motion Analysis, Gesture Recognition, HCI

Thesis: *A Study on Real-time Recognition System for the Korean Sign Language (KSL) mixed with Korean Manual Alphabet (KMA)*

Advisor: Dr. Zeungnam Bien

B.S.	in Electronics Engineering	Yonsei University	1995

RESEARCH EXPERIENCE

Research Assistant Rutgers University NJ August 2002 — Present

- Proposed model for articulated human motion for analysis and inferring 3D body pose ICPR'06a][AMDO'06a][AMDO'06b][WDV'05][CVPR'04a][CVPR'04b].
- Developed gait recognition system and style adaptive human motion tracking system [AMDO'06b][FGR'06][BMVC'05][AVBPA'05][FGR'04].
- Developed recognition system and synthesis system for high-resolution facial expressions [ICPR'06b] [ICME'06] [SCA-poster'06] [AMFG'05][EG'04].
- Developed hand tracking interface for rehabilitation system and boat simulation game for desktop rehabilitation exercise [VRMHR'03] [Haptics'03]

Programmer Rutgers University NJ August 2001 — July 2002

- Developed program for web-based data visualization/interface for web-based rehabilitation system [VRMHR'02][PSPIE'04]

Engineering Staff Electronics and Telecommunications Research Institute (ETRI) Korea May 1997 — January 2001

- Developed haptic interface for hand rehabilitation, 2000
- Developed gesture-based interface for authoring 3D models in virtual environment [ICMT'99][VSMM'99a][VSMM'99b][VRST'98][patent-6445387], 1998-1999
- Developed virtual environment authoring system [VRSTAC'97][patent-6149435], 1997

Research Assistant KAIST(Korea Advanced Institute of Science and Technology) Korea March 1995 — February 1997

- Developed Korean sign language recognition system and applied for gesture interface in virtual environment [FUZZ'97] [IFSA'97]

TEACHING EXPERIENCE

Teaching Assistant Rutgers University NJ January 2001 — July 2001

- Created new lab sessions with programming assignment and related materials and assisted students in each lab session
- Taught java 3D and VRML language to create 3D virtual world and interact with glove device
- Graded quizzes, examinations and programming assignments, and term projects

Lab Assistant/Programmer Rutgers University NJ August 2001 — July 2002

- Designed laboratory for VR class and developed device interface programs, libraries for VR laboratory experiment
- Wrote a laboratory manual book for the introductory course of virtual reality which is published as a supplementary material for a virtual reality textbook [VR-manual'03]

HONORS AND AWARDS

Best Student Paper Award

- **World Automation Congress'98**, Alaska, USA

  Title: Real-time Sign Language Recognition/Generation for Two-Way Communication

  Propose communication system between deaf and normal person using sign language recognition system and sign generation system using 3D avatar

DIMACS Student-Initiated Project Awards

Research Project Title	*Period*	*Result*
Motion analysis using low dimensional representation and clustering	Summer 2004	Applied nonlinear dimensionality reduction to find low dimensional motion sequence representation and clustering for motion primitive
Tensor Analysis of gait image data for data mining	Winter, 2003/2004	Implement tensor decomposition for image sequence and applied for gait image representation
Physically Accurate Haptic Rendering of Elastic Object for a Haptic Glove	Summer, 2002	Implemented haptic interaction using Rutgers-Master II haptic device. Analyze interaction force using boundary-element based analysis.

PUBLICATIONS

Books & Book Chapters

[VR-manual'03] **Chan-Su Lee** and Grigore C. Burdea, "Virtual Reality Laboratory Manual" CD-ROM Supplements of the book *Virtual Reality Technology, 2nd Edition* by Grigore C. Burdea and Philippe Coiffet, Wiley-IEEE Press, 2003.

[HumanMotion-submit'06] Ahmed Elgammal and **Chan-Su Lee**,"The Role of Manifold Learning in Human Motion Analysis," in *Human Motion Understanding, Modeling, Capture and Animation* edited by B. Rosenhahn, D. Metaxas, and R. Klette.

Conferences (peer review) & Journals (by topic)

- **Modeling & Analysis of Human Motion:**

Manifold Learning, Decomposable Generative Models, Multi-linear Analysis, Gait Recognition, 3D Body Pose Reconstruction, Human Motion Tracking

[CVIU, accepted] Ahmed Elgammal, **Chan-Su Lee**, **Nonlinear Manifold Learning for Dynamic Shape and Dynamic Appearance**, accepted in Computer Vision and Image Understanding (CVIU) Journal

[ICPR'06a] **Chan-Su Lee**, Ahmed Elgammal, **Simultaneous Inferring View and Body Pose Using Torus Manifolds** , International Conference on Pattern Recognition (ICPR), vol.3, pp. 489-494,2006

[AMDO'06a] **Chan-Su Lee**, Ahmed Elgammal, **Human Motion Synthesis by Motion Manifold Learning and Motion Primitive Segmentation** , IV Conference of Articulated Motion and Deformable Objects (AMDO), pp.464-473, 2006

[AMDO'06b] **Chan-Su Lee**, Ahmed Elgammal, **Carrying Object Detection Using Pose Preserving Dynamic Shape Model** , IV Conference of Articulated Motion and Deformable Objects (AMDO), pp.315-325, 2006

[FGR'06] **Chan-Su Lee** and Ahmed Elgammal, **Gait Tracking and Recognition Using Person-Dependent Dynamic Shape Model** , IEEE International Conference on Automatic Face and Gesture Recognition (FGR), pp.553-559, 2006

[WDV'05] **Chan-Su Lee** and Ahmed Elgammal, **Homeomorphic Manifold Analysis: Learning Decomposable Generative Models for Human Motion Analysis**, IEEE International Workshop on Dynamical Vision (WDV), WDV 2005/2006 LNCS 4358, pp. 100-114, 2006

[BMVC'05] **Chan-Su Lee** and Ahmed Elgammal, **Style Adaptive Bayesian Tracking Using Explicit Manifold Learning** , British Machine Vision Conference (BMVC), pp.739-748, 2005

[AVBPA'05] **Chan-Su Lee** and Ahmed Elgammal, **Towards Scalable View-Invariant Gait Recognition: Multilinear Analysis for Gait** , Audio- and Video-based Biometric Person Authentication(AVBPA) 2005, LNCS 3546, pp. 395-405, 2005

[FGR'04] **Chan-Su Lee** and Ahmed Elgammal, **Gait Style and Gait Content: Bilinear Model for Gait Recognition Using Gait-Resampling** , Proceedings of the 6th International Conference on Automatic Face and Gesture Recognition (FGR), pp.147 - 152, Korea, 2004

[CVPR'04a] Ahmed Elgammal and **Chan-Su Lee**, **Separating Style and Content on a Nonlinear Manifold** , Proceedings of The IEEE International Conference on Computer Vision and Pattern Recognition (CVPR), USA, 2004

[CVPR'04b] Ahmed Elgammal and **Chan-Su Lee**, **Inferring 3D Body Pose from Silhouettes using Activity Manifold Learning** , Proceedings of The IEEE International Conference on Computer Vision and Pattern Recognition (CVPR), USA, 2004

- **Facial Expression Recognition and Synthesis:**

Facial Expression Tracking, Recognition and Synthesis in 2D and 3D Facial Expressions

[ICPR'06b] **Chan-Su Lee**, Ahmed Elgammal, **Nonlinear Shape and Appearance Models for Facial Expressions** , International Conference on Pattern Recognition (ICPR), vol. 1, pp. 497-502, 2006

[SCA-poster'06] **Chan-Su Lee**, Zhiguo Li, Yang Wang, Atul Kanaujia, Ahmed Elgammal, Dimitris Sarmara, Dimitris Metaxas, Xianfeng Gu, Peisen Huang, **Subtle Facial Expression Synthesis with Motion Manifold Embedding and Nonlinear Decomposable Generative Models**, SCA Poster, 2006

[ICME'06] **Chan-Su Lee**, Ahmed Elgammal and Dimitris Metaxas, **Synthesis and Control of High Resolution Facial Expressions for Visual Interactions** , IEEE International Conference on Multimedia & Expo (ICME), pp.64-67,2006

[AMFG'05] **Chan-Su Lee** and Ahmed Elgammal, **Facial Expression Analysis using Nonlinear Decomposable Generative Models** , IEEE International Workshop on Analysis and Modeling of Faces and Gestures (AMFG), pp.17-31, 2005

[EG'04] Yang Wang, Xiaolei Huang, **Chan-Su Lee**, Song Zhang, Zhiguo Li, Dimitris Samaras, Dimitris Metaxas, Ahmed Elgammal, and Peisen Huang, **High Resolution Acquisition, Learning and Transfer of Dynamic 3D Facial Expressions**, Eurographics (EG), Computer Graphics Forum, volume 23, Number 3, pp.677-686, 2004

- **Human Computer Interaction in Virtual Environments:**

Gesture Recognition, Virtual Reality System Interface, Desktop Rehabilitation System

[PSPIE'04] Hyungjeen Choi, Jeha Ryu, and **Chansu Lee**, **A Kickball Game for Ankle Rehabilitation by Java, JNI and VRML** Proceedings of SPIE-Volume 5444, pp. 439-444, 2004, doi:10.1117/12.561184

[Haptics'03] R.F Boian, J.E. Deutsch, **C.S. Lee**, G.C. Burdea, J. Lewis, **Haptic Effects for Virtual Reality-based Post-Stroke Rehabilitation**, , Proceedings of the Eleventh Symposium on Haptic Interfaces for Virutal Environment and Teleoperation Systems, Los Angeles, CA, pp. 247-253, 2003

[VRMHR'02] R.F. Boian, **C.S. Lee**, J.E. Deutsch, G. Burdea and J.A. Lewis, **Virtual Reality-based System for Ankle Rehabilitation Post Stroke,**" 1st International Workshop on Virtual Reality Rehabilitation (Mental Health, Neurological, Physical, Vocational) VRMHR 2002 Lausanne, Switzerland, November 7-8, 2002, pp. 77-86, 2002

[ICMT'99] **Chan-Su Lee**, Kwang-Man Oh, Chan-Jong Park, "**Virtual Environment Interaction Based on Gesture Recognition and Hand Cursor**", Proceedings of International Conference on Mechatronic Technology(ICMT'99), pp. 398-403, Oct. 1999, Pusan, Korea.

[VSMM'99a] **Chan-Su Lee**, Jeong-Dan Choi, Kwang-Man Oh, Chan-Jong Park, " **Hand Interface for Immersive Virtual Environment Authoring System,**" Proceedings of International Conference on Virtual Systems and MultiMedia(VSMM'99), pp.361-366, Sep. 1999, Dundee, U.K.

[VSMM'99b] Jeongdan Choi, **Chansu Lee**, Kwangman Oh, Chanjong Park, "**A Design and Implementation of Immersive Virtual Space Authoring System,**" Proceedings of International Conference on Virtual Systems and MultiMedia(VSMM'99), pp.316-312, Sep. 1999, Dundee, U.K.

[VRST'98] **ChanSu Lee**, SangWon Ghyme, ChanJong Park, KwangYun Wohn, " **The Conrol of Avatar Motion Using Hand Gesture,**" Proceedings of the ACM Symposium on Virtual Reality Software and Technology(VRST'98), pp. 59-65, Nov. 1999, Taipei, Taiwan.

[WAC'98] Gyu-Tae Park, ZeungNam Bien, **Chan-Su Lee**, Won Jang, Jong-Hyeong Kim, "**Real-Time Sign Language Recognition/Generation for Two-Way Communication,**" Proceedings of World Automation Congress(WAC'98), May 1998, Alaska, USA.

[VRSTAC'97] **ChanSu LEE**, JiHyung LEE, ChanJong PARK, DongHyun KIM, " **Real-time Gesture Recognition for the Control of Avatar,**" Proceedings of VRSTAC'97. pp.242-245, Nagoya, Japan.

[IFSA'97] Jong-Sung Kim, **Chan-Su Lee**, Zeungnam Bien, Byoung-Tae Choi, and Kyung-Joon Song, "**A Dynamic Hand Gesture Recognition System for Virtual Reality,**" Proceeding of 8th International Fuzzy Systems Associated World(IFSA'97), 1997

[FUZZ'97] **Chan-Su Lee**, Gyu-tae Park, Jong-Sung Kim, Zeungnam Bien, Won Jang, Sung-Kwon Kim, "**Real-time Recognition System of Korean Sign Language based on Elementary Components,**" Proceedings of Sixth International Conference on Fuzzy Systems(IEEE FUZZ'97), pp.1463-1468, 1997, Spain.

Journal papers under review or preparation

[PAMI, under review] **Chan-Su Lee** and Ahmed Elgammal, "Nonlinear Decomposable Generative Models for Human Motion Analysis: Separating Style and Content" *IEEE Trans. on Pattern Analysis and Machine Intelligence* (under review).

[IVC, under preparation] **Chan-Su Lee** and Ahmed Elgammal, “Style Adaptive Contour Tracking and Recognition of Human Motion Using Explicit Manifold Learning” *Image and Vision Computing* (under preparation)

[TMM, under preparation] **Chan-Su Lee**, Ahmed Elgammal, Dimitris Metaxas and Dimitris Samaras, “Modeling and Controlling High Resolution Facial Expressions for Affective Computing”, *IEEE Trans. on Multimedia* (under preparation)

[VC, under preparation] **Chan-Su Lee**, Yang Wang, Zhiguo Li, Atul Kanaujia, Ahmed Elgammal, Dimitris Samaras, Dimitris Metaxas, Xianfeng Gu, and Peisen Huang, “Subtle Facial Expression Synthesis with Motion Manifold Embedding and Nonlinear Factored Generative Models”, *The Visual Computer* (under preparation)

Conference papers under review

[CVPR07, under review] **Chan-Su Lee** and Ahmed Elgammal, Topic: tracking people on an explicit manifold, IEEE Conference on Computer Vision and Pattern Recognition (under review).

[CVPR07, under review] **Chan-Su Lee** and Ahmed Elgammal, Topic: modeling continuous view manifold for complicated motion tracking, IEEE Conference on Computer Vision and Pattern Recognition (under review).

[CVPR07, under review] Ahmed Elgammal and **Chan-Su Lee**, Topic: multiple manifold learning, IEEE Conference on Computer Vision and Pattern Recognition (under review).

Patents

[patent-6445387] Jeong Dan Choi, **Chan Su Lee**, Jin Sung Choi, Chan Jong Park, "_Interface Method for Searching Virtual Space Based on Body Icon", Patent No: US6445387 B1, Sep. 3, 2002.

[patent-6149435] Chan Jong Park, Jin Sung Choi, Man Kyu Sung, Ji Hyung Lee, Sang Won Km, Dong Hyun Kim, Jung Kak Kim, **Chan Su Lee**, "Simulation method of a radio-controlled model airplane and its system", Patent No: US6149435 Nov. 21, 2001.

REFERENCES

1. Prof. Ahmed Elgammal

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5. Prof. Z. Zenn Bien

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