

TZU-HAO HUANG

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EDUCATION

National Taiwan University (NTU) Ph.D. in System and Control Division, Department of Mechanical Engineering Doctoral Dissertation: "Rehabilitation and assistive exercises using biofeedback signals and series elastic mechanism" Advisor: Professor Han-Pang Huang (Robotics Laboratory)	Taipei, Taiwan 09/2006 – 08/2013
Massachusetts Institute of Technology (MIT) Visiting Student, Media Lab Advisor: Prof. Hugh Herr (Biomechatronics Group)	Cambridge, USA 02/2012 – 11/2012
National Yang Ming University (NYMU) Master of Science in Institute of Rehabilitation science and Technology Master's Thesis: "Optimization design of thumb spica splint using finite element method" Advisor: Prof. Chen-Sheng Chen (Computational Biomechanics Laboratory)	Taipei, Taiwan 09/2004 – 06/2006
National Cheng Kung University (NCKU) Bachelor of Science in Occupational Therapy	Tainan, Taiwan 09/2000 – 06/2004

WORK AND RESEARCH EXPERIENCE

Taiwan Textile Research Institute

System Development Section, Department of Products, Taiwan (01/2015 – present)

- Develop the novel methods for the textile and electronics combination.
- Design the ECG smart clothing for heart rate and respiration rate measurement
- Design the EMG smart clothing for muscle strength and fatigue measurement
- Design the lighting bag and lighting skirt for fashion and entertainment
- Integrate the electrical muscle stimulation system into smart cloth
- Circuit design for biosignal measurement in the smart cloth
- Android based mobile application for the data collection and user feedback by Bluetooth 4.0

Taiwan Semiconductor Manufacturing Company

F12 Advanced Material Handling System Department, Taiwan (11/2013 – 01/2015)

- Principal Engineer and manage the product productivity and storage in F12B AMHS.

National Taiwan University

Department of Mechanical Engineering, Robotics Lab, Taiwan (09/2006 – 08/2013)

- Design and control of leg and elbow exoskeletons with Variable Stiffness SEA Systems
- Development of a brain computer rehabilitation system
- Control of power assisted systems with EMG human intention estimation
- Development of 12-DOF Five Fingered Robot Hand with SEA mechanism
- Control of 6-DOF NTU humanoid robot Arms
- Development of three fingered robot hand

Massachusetts Institute of Technology

Media Lab, Biomechatronics Group, USA (02/2012 – 12/ 2012)

- Design of exoskeleton and assistive control based on EtherCAT

National Yang Ming University, Institute of Rehabilitation Science and Technology

Computational Biomechanics Lab, Taipei, Taiwan (08/2004 – 07/2006)

- Optimal Design of Thumb spica for De Quervain's tenosynovitis

HONORS AND AWARDS

The Graduate Students Study Abroad Program, National Science Council, Taiwan, 2012
2st Place, the 9th Virtual Instrumentation Paper Contest, National Instruments, Taiwan, 2010
1st Place, the 8th Virtual Instrumentation Paper Contest, National Instruments, Taiwan, 2009
Championship, National Robot Contest "HIWIN Intelligent Robot Arm Contest," Taiwan, 2009

TEACHING EXPERIENCE

Served as a teaching assistant in the following classes:

Signal and System Processing – National Taiwan University (Spring 2009)

Instructor: Professor Hang-Pang Huang

Finite Element Method – National Yang Ming University (Fall 2005)

Instructor: Professor Chen-Sheng Chen

PRACTICE EXPERIENCE

Practice of Occupational Therapist (07/2003 – 06/2004)

- Practice about Psychiatric Occupational Therapy in Bali Psychiatric Center, Taipei, Taiwan (07/2003 - 11/2003)
- Practice about Physical Occupational Therapy in the department of Physical Medicine and Rehabilitation in Nation Cheng Kung University Hospital, Tainan, Taiwan (11/2003 - 02/2004)
- Practice about Pediatric Occupational Therapy in the branch for Women and Children of Taipei City Hospital, Taipei, Taiwan (02/2004 – 06/2004)

Pass the Occupation Therapist Licensing Examination in Taiwan (10/2004)

TECHNICAL SKILLS

- Mechanical design and analysis: SOLIDWORKS, ANSYS, CATIA
- Language programming and simulation software: C/C++, MATLAB, Labview, Java in Android, Swift in IOS, Python
- Experience of Hardware programming: mobile phone, RFDuino, Arduino, ARM Chip, TI TMS320C6416, TI TMS320C6437, PIC 18, PIC 30, PIC32, NI SbrIO-9642

JOURNAL PUBLICATIONS

- [1] Xuyuan Tao, Vladan Koncar, Tzu-Hao Huang, Chien-Lung Shen, Ya-Chi Ko, Gwo-Tsuen Jou, "How to Make Reliable, Washable, and Wearable Textronic Devices," *Sensors (Basel, Switzerland)*, vol. 17, No. 4, p.673, 2017. (SCI:2.677)
- [2] Chien-Lung Shen, Tzu-Hao Huang, Po-Chun Hsu, Ya-Chi Ko, Fen-Ling Chen, Wei-Chung Wang, Tsair Kao, and Chai-Tai Chan, "Respiratory Rate Estimation by Using ECG, Impedance, and Motion Sensing in Smart Clothing," *Journal of Medical and Biological Engineering*, July 01 2017. (SCI:0.989)
- [3] T.-H. Huang, H.-P. Huang, Jiun-Yih Kuan, "Mechanism and Control of Continuous-State Coupled Elastic Actuation," *Journal of Intelligent & Robotuc Systems*, vol.74, pp.517-587, 2014. (SCI:1.512)
- [4] T.-H. Huang, H.-P. Huang, Y.-H. Liu, Z.-H. Kang, Jiun-Yih Kuan, "Development of a Brain-Controlled Rehabilitation System (BCRS)," *Journal of Neuroscience and Neuroengineering*, Vol. 2, No. 2, pp. 2168-2011, 2013.
- [5] Y.-H. Liu, H.-P. Huang, T.-H. Huang, Z.-H. Kang, and J.-T. Teng, "Controlling a Rehabilitation Robot with Brain-Machine Interface: An approach based on Independent Component Analysis and Multiple Kernel Learning," *International Journal of Automation and Smart Technology*, vol. 3, pp. 67-75, 2013.
- [6] J.-Y. Kuan, T.-H. Huang, H.-P. Huang, and Y.-T. Chen, "Adaptive Coupled Elastic Actuator Developed for Physical HumanRobot Interaction," *Advanced Robotics*, vol. 25, No. 11-12, pp. 1473-1491, 2011. (SCI:0.571)
- [7] T.-H. Huang, C.-K. Feng, Y.-W. Gung, M.-W. Tsai, C.-S. Chen, and C.-L. Liu, "Optimization design of thumbspica splint using finite element method," *Medical and Biological Engineering and Computing*, vol. 44, No. 12, pp. 1105-1111, 2006. (SCI:1.379)

REFEREED CONFERENCE PROCEEDINGS

- [1] Chien-Lung Shen, Gwo-Tsuen Jou, Tzu-Hao Huang, Ya-Chi Ko, Fen-Ling Chen, Wei-Chung Wang, Po-Chun Hsu, Tsair Kao and Chia-Tai Chan. "Smart EMG Sleeve for Muscle Torque Estimation." *Uncertainty Modelling in Knowledge Engineering and Decision Making: Proceedings of the 12th International FLINS Conference*. 2016.
- [2] C.-A. Cheng, T.-H. Huang, and H.-P. Huang, "Bayesian Human Intention Estimator for Exoskeleton System," *Proceedings of IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM)*, Wollongong, Australia, 2013.
- [3] T.-H. Huang, C.-A. Cheng, and H.-P. Huang, "Self-Learning Assistive Exoskeleton with Sliding Mode Admittance Control," *Proceedings of IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Tokyo, Japan, 2013.
- [4] Y.-H. Liu, H.-P. Huang, T.-H. Huang, Z.-H. Kang, and J.-T. Teng, "Controlling a Robot with the Mind: A Brain-Machine Interfacing Approach," *Proceedings of the International Symposium on Robotics*, Taipei, Taiwan, 2012.
- [5] T.-H. Huang, H.-P. Huang, C.-A. Cheng, J.-Y. Kuan, P.-T. Lee, and S.-Y. Huang, "Design of a New Hybrid Control and Knee Orthosis for Human Walking and Rehabilitation," *Proceedings of IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Vilamoura, Algarve, Portugal, 2012, pp. 3653-3658.
- [6] H.-P. Huang, T.-H. Huang, Y.-H. Liu, Z.-H. Kang, and J.-T. Teng, "A Brain-Controlled Rehabilitation System with Multiple Kernel Learning," *Proceedings of IEEE International Conference on Systems, Man, and Cybernetics (SMC)*, Anchorage, Alaska, 2011, pp. 591-596.
- [7] T.-H. Huang, J.-Y. Kuan, and H. Han-Pang, "Design of a New Variable Stiffness Actuator and Application for Assistive Exercise Control," *Proceedings of IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, San Francisco, California, 2011, pp. 372-377.
- [8] C.-T. Chang, H.-P. Huang, and T.-H. Huang, "Fractal Analysis of Motor Imagery Recognition in the BCI

- Research," *Seventh International Symposium on Precision Engineering Measurements and Instrumentation*, Taipei, Taiwan, 2011, pp. 83212L-83212L.
- [9] J.-Y. Kuan, T.-H. Huang, and H.-P. Huang, "Human Intention Estimation Method for a New Compliant Rehabilitation and Assistive Robot," *Proceedings of SICE Annual Conference*, Taipei, Taiwan, 2010, pp. 2348-2353.
- [10] R.-J. Wang, H.-P. Huang, T.-H. Huang, and H.-F. Liao, "A Vertically Intersected Dual Axes Modularized Actuator System (DAMA)," *Proceedings of International Conference on Control Automation and Systems (ICCAS)*, Gyeonggi-do, Korea, 2010, pp. 1029-1033.
- [11] H.-P. Huang, L.-P. Chou, T.-H. Huang, Y.-J. Tsai, and C.-H. Huang, "Design and Applications of the Three-Fingered Robotic Hand," *Proceedings of the International Conference on Service and interactive Robotics (SIRCon2009)*, Taipei, Taiwan, 2009.

OTHER SELECTED PUBLICATIONS

- [1] Tzu-Hao Huang, "Doctoral Dissertation, Rehabilitation and Assistive Exercises using Biofeedback Signals and Series Elastic Mechanism," Department of Mechanical Engineering, National Taiwan University, 2013.
- [2] Shin-Wei Lin, Sheng-Yen Lo, Tz-How Huang, Hsi-Fan Liao, Teng-Hu Cheng, and Han-Pang Huang, "Learning Based Arm Control with Vision Servoing" the 9th Virtual Instrumentation Paper Contest, National Instruments, Taiwan, 2010.
- [3] Jiun-Yih Kuan, Tz-How Huang, Yen-Tsung Chen, Shin-Wei Lin, and Han-Pang Huang, "An Active-Passive Coupled Elastic Rehabilitation Robotic System Integrating with EMG Signals," *Mechatronics Magazine*, vol. 145, pp. 120-131, 2010. (in Chinese)
- [4] Tz-How Huang, "Master Thesis, Optimization Analysis of Thumbspica Splint Design," Institute of Rehabilitation Science and Technology, National Yang Ming University, 2006.

PATENTS

- [1] Chien-Ling Shen, Tzu-Hao Huang, Kun-Chuan Tsai, Chien-Fa Tang, Fen-Ling Chen, Ya-Chi Ko, Po-Chun Hsu, "Conductive fabric module and smart clothe having the same," TW patent, No. I595129, 2017/08/11.
- [2] Tzu-Hao Huang, Chien-Ling Shen, Ya-Chi Ko, Fen-Ling Chen, Wei-Chun Wang, Kun-Chuan Tsai, "Smart fabric," TW patent, No. M546991, 2017/08/11.
- [3] Han-Pang Huang, Li-Peng Chou, Tzu-Hao Huang, Yi-Jeng Tsai, and Chin-Chi Hsiao, "Robot finger mechanism," TW patent, No. I383869, 2013/02/01.
- [4] Chien-Lung Shen, Tzu-Hao Huang, Fen-Ling Chen, Ya-Chi Ko, Po-Chun Hsu, "Textile electrode for body electric sensing" TW patent pending
- [5] Ya-Chi Ko, Tzu-Hao Huang, Chien-Lung Shen, Fen-Ling Chen, "Fabrication of the conductive textile," TW patent pending
- [6] Chien-Lung Shen, Tzu-Hao Huang, "The methods for the combination of lighting material and textile," TW patent pending
- [7] Chien-Lung Shen, Wei-Chung Wang, Fen-Ling Chen, Tzu-Hao Huang, Po-Chun Hsu, "A wearable textile systems for gesture discrimination," TW patent pending

LEADERSHIP AND EXTRACURRICULAR ACTIVITIES

- Presenter in the Proceedings of the 12th International FLINS Conference, Roubaix, France, 2017
- Presenter in the 2012 IEEE Int. Conf. on Robotics and Automation, USA, 2012
- Competition in the 9th Virtual Instrumentation Paper Contest, National Instruments, Taiwan, 2011
- Presenter in the Society of Instrument and Control Engineers Annual Conference, Taipei, 2010
- Swimming, "Crossing The Sun-Moon Lake", 3000m, completed, September, 2010
- Competition in the 9th Virtual Instrumentation Paper Contest, National Instruments, Taiwan, 2010
- Competition in the 4th Microchip 16/32-bit MCU Competition, Taiwan, 2009
- Competition in National Robot Contest "HIWIN Intelligent Robot Arm Contest," Taiwan, 2009
- Competition in National Robot Contest "HIWIN Intelligent Robot Arm Contest," Taiwan, 2008
- Volunteer in the intensive care unit in Nation Cheng Kung University Hospital, 2000-2002.
- Initiator and teaching assistant, roller-skating club, National Tainan First Senior High School, 1998/9-1999/6