

# Kenneth Yi-wen Chao

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## RESEARCH INTERESTS

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Robotics, biped locomotion, control of mechatronics systems, mechanism design, human-robot interaction, biomechanics of human gait and rehabilitation technology.

## EDUCATION

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**Texas A&M University (TAMU)** **Texas, USA**  
 A third-year PhD student in Mechanical Engineering (MEEN) 08/2013 – present  
 Advisor: Dr. Pilwon Hur (HUMAN Rehabilitation Group)

**National Taiwan University (NTU)** **Taipei, Taiwan**  
 Master of Science in Mechanical Engineering, System and Control Division 09/2008 – 08/2010  
 Thesis: “Mechatronic Design of a Biped Robot and Gait Coordination Control”  
 Advisor: Dr. Han-Pang Huang (Robotics Laboratory)

**National Tsing Hua University (NTHU)** **Hsin-chu, Taiwan**  
 Bachelor of Science in Power Mechanical Engineering (PME) 09/2004 – 06/2008  
*Rank 4 in class of 50 students, and top 5.1% in PME of graduating 98 students*

## RESEARCH EXPERIENCE

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**Texas A&M University, Dept. of Mechanical Engineering**  
**Research Assistant/Grader** **01/2015 – present**

- Research on human-inspired slip-recovery controller design for bipedal/humanoid robot based on stepping strategy (undergoing).
- Developed a unified quadratic program-based controller with control Lyapunov functions (QP-CLFs) unifying COM planning and ZMP-based locomotion.
- Implementing unified QP-CLFs with COM planning and ZMP-based locomotion on bipedal robot AMBER 3 (undergoing).
- Implemented simulation of ZMP-based locomotion on bipedal robot DURUS from SRI, with two passive springs on foot.

**Teaching Assistant** **07/2014 – 06/2015**

- Developed quadratic program-based controller with control Lyapunov functions (QP-CLFs) with online COM planner for ZMP-based bipedal robot locomotion.
- Implemented simulation of ZMP-based bipedal robot locomotion with QP-CLFs controller and quadratic-based model predictive control of linear pendulum model for each foot stride.

**National Taiwan University, Dept. of Mechanical Engineering****Research Assistant****02/2012 – 05/2013**

- Designed a real-time IK solver capable of solving motions with stretching swing limbs
- Developed biped locomotion with human walking features
- Modified a bipedal robot with a distributed electrical system of EtherCAT and torque controlled joints, implemented the computed torque control with incremental learning scheme for the humanoid robot walking on stairs.
- Assisted in the design of five-finger robotic hands

**Graduate Student****09/2008 – 08/2010**

- Designed of a 12-DOF biped mechanism with a 2-DOF trunk mechanism
- Developed distributed electrical system via CAN bus and USB
- Developed gait coordination control to improve the adaptiveness of locomotion
- Assisted in the development of a rehabilitation system with SEA mechanism

**National Tsing Hua University, Dept. of Power Mechanical Engineering****Undergraduate Student****02/2007 – 06/2008**

- Designed and developed a 2-DOF prototype of biomimetic robotic fish
- Designed and developed a revised biomimetic robotic fish with the vibration reduction mechanism
- Managed a team of five members to design and develop an automatic page-flipping machine

**HONORS AND AWARDS**

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**Scholarship**

- Studying Aboard Scholarship, 2015 – 2016  
Taiwan government scholarship for outstanding students to pursue graduate study abroad

**Competitions**

- “*Design and development of bio-mimetic robot fish*”, 1st prize out of 97 undergraduate teams, **Microcomputer Application System Design Contest**, Taiwan, 2007.
- “*Automatic page-flipping machine*”, 1st prize among 60 undergraduate groups, **National University Student Creativity-in-action Contest**, Taiwan, 2007.
- “*Robot ZAKU*”, 1st prize in the college group, **Autodesk 3D Design Contest**, Taiwan, 2005.

**JOURNAL PUBLICATIONS**

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- [1] Han-Pang Huang, Jiu-Lou Yan, and Kenneth Yi-Wen Chao, “A Whole Body Inverse Kinematics Solver for Humanoid Robots,” *Journal of the Chinese Society of Mechanical Engineers*, 2012.

**CONFERENCE PROCEEDINGS**

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- [1] Kenneth Yi-Wen Chao, Matthew J. Powell, Aaron D. Ames and Pilwon Hur, “Unification of Locomotion Pattern Generation and Control Lyapunov Function-Based Quadratic Programs,” *American Control Conference*, Boston, MA, USA, July 6-8, 2016.

- [2] Kenneth Yi-Wen Chao and Pilwon Hur, "Toward General Capture Point-Based Analysis on Standing, Walk and Slip: the Connection between Robotic Motions to Human Behaviors," *Dynamic Walking*, Holly, MI, USA, June 4-7, 2016.
- [3] Kenneth Yi-Wen Chao, Jiu-Lou Yan, Meng-Ku Chi, and Han-Pang Huang, "Natural Walking Pattern Generation for Humanoid Robots with Toe and Heel Mechanism," *The 43rd International Symposium on Robotics (ISR)*, Taipei, Taiwan, Aug. 29-31, 2012.
- [4] Pin-Yong Ling, Kenneth Yi-wen Chao, Han-Pang Huang, and Jiu-Lou Yan, "Footprint Searching and Trajectory Design of a Humanoid Robot," *IEEE International Conference on Robotics and Biomimetics (ROBIO)*, Dec.12-14, 2012.
- [5] Teng-Hu Cheng, Han-Pang Huang, Jiu-Lou Yan, and Yi-wen Chao "Development of a Walking Stabilizing Controller for Humanoid Robots," *IEEE-RAS International Conference on Proceeding of Humanoid Robots (Humanoids)*, pp. 40-45, 6-8 Dec. 2010.
- [6] Kenneth Yi-Wen Chao, Han-Pang Huang, "Gait Coordination Control of a Biped Robot on Rough Terrain," *Proceedings of the 27th National Conference on Mechanical Engineering of Chinese Society of Mechanical Engineers (CSME)*, Nov. 20-21, 2009.

## **PATENTS**

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- [1] Dein Shaw, Ting-Jen Yeh, Yi-Wen Chao, Hsin-Fu Chen, Chuan-Yi Kuo, Chun-Wei Liu, "Automatic Page-flipping Device," Taiwan patent pending.

## **TECHNICAL SKILLS**

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- Mechanism design: Autodesk Inventor, CATIA, SolidWorks
- Stress analysis: CATIA, SolidWorks Cosmos Analysis
- Language programming and simulation software: C/C++, MATLAB, Mathematica, LabVIEW, MSC ADAMS
- Experience of programming of micro-controller: Intel 8051, Hitachi H8, Microchip PIC 18, PIC 30, PIC32...etc.
- Electronic design automation: OrCAD

## **TEACHING IN CLASS**

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### **Teaching Assistant**

Digital Electronic Circuit – National Taiwan University (Fall 2009)

### **Grader and Lecture TA**

Dynamics Systems and Controls (MEEN 364) – Texas A&M University (Fall 2013)

Advanced System Dynamic and Control (MEEN 431) – Texas A&M University (Fall 2013)

Dynamics Systems and Controls (MEEN 364) – Texas A&M University (Spring 2014)

Engineering Laboratory (MEEN 404) – Texas A&M University (Fall 2014)

Material in Design (MEEN 475) – Texas A&M University (Fall 2014)

Mechanical Vibrations (MEEN 617) – Texas A&M University (Spring 2015)