CHUN-KAI HUANG (JEFF)

Curriculum Vitae

Address: 5F., No.27, Qiaoxiao St., Beitun Dist., Taichung City 40654, Taiwan (R.O.C.)
Email: ckhuang911@ntu.edu.tw Phone: +886-911-646-366
Personal website: http://biorola.me.ntu.edu.tw/ChunKaiHuang

EDUCATION

National Taiwan University (NTU), Taipei, Taiwan Sep 2008–Jun 2014

M.S. in Mechanical Engineering (ME), System and Control Division, 2014

- Overall GPA: 4.28/4.3, Major GPA: 4.24/4.3, Rank: 1/33 in the System and Control Division

B.S. in Mechanical Engineering (ME), 2012

- Overall GPA: 4.11/4.3, Major GPA: 4.14/4.3, Rank: 4/153 in the graduating class

Stanford University, California, USA Aug 2012

American Language and Culture Program

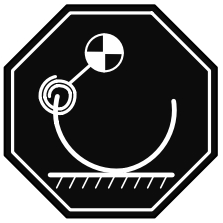
RESEARCH EXPERIENCE

Research Areas

- Robotics and bio-inspired robots
- Mathematical legged models and model-based control strategy
- System control and stability analysis

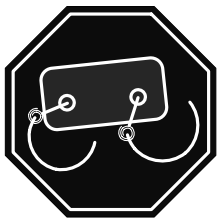
Thesis Development of Dynamic Legged Models with Rolling Contact and Their Role as Templates for Inducing Dynamic Gaits on a Hexapod Robot

- Advisor: Dr. Pei-Chun Lin (Bio-inspired Robotics Laboratory)



Reduced-order Models (Main work in MS study), MST, Taiwan 2012–2014

- Analyzed the stability property of the Rolling SLIP (R-SLIP) model, which is a 2-DoF dynamic model with compliance and rolling contact
- Developed the Two-rolling-leg (TRL) model, which is a 3-DoF dynamic model with rigid body and two compliant rolling legs
- Investigated the gait-level stability property of the TRL model

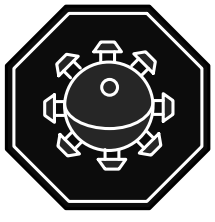


Bio-inspired Legged Robots (Main work in MS study), MST, Taiwan 2012–2014

- Revealed the mapping between dynamic models and the experimental robot
- Designed a stability-based and model-based control strategy to excite dynamic locomotion of the empirical robot, including jogging, pronking and bounding
- Introduced a model-based state estimator, which relies on IMU and encoder feedback, as a feedback strategy to improve the stability of the robot's motion

Chicken Head Project, Introduction to Robotics, Dept. of ME, NTU 2012

- Developed the control strategy, based on MATLAB codes, to keep track of a point by utilizing sensory feedback, such as camera and IMU
- Designed a 2-DoF robot arm; Skills included laser cutting, mechanical design, signal processing and building the mechatronic system for driving 2 DC motors
- Programmed the LabVIEW codes to govern the motion of the robot arm, including inverse kinematics and trajectory planning



Spherical Robot, College Student Participation in Research Projects, MST 2011–2012

- Constructed an omnidirectional spherical robot; Skills including laser cutting, glass fiber processing, lost foam casting and operating the winding machine
- Built the control strategy and mechatronic system to actuate 12 electromagnets by commanding different PWM signals to each electromagnet
- Programmed the LabVIEW codes to control the motion of the robot

HONORS AND AWARDS

- 1st Place, 2014 Master's Thesis Award, Robotics Society of Taiwan (RST) 2014
- Best Paper Award, MathWorks 2014 MATLAB & Simulink Tech Forum & Expo, Taiwan 2014
- 1st Place, MathWorks 2014 MATLAB & Simulink Paper Contest, TeraSoft Inc. 2014
- Presentation, 2013 IEEE Int. Conf. on Intelligent Robotics and Systems (IROS), Tokyo, Japan 2013
- Assistantship, Ministry of Science and Technology (MST), Taiwan 2012–2014
- College Student Research Creativity Award, MST, Taiwan 2012
- Undergraduate Research Assistantship, MST, Taiwan 2011–2012
- Scholarship (Prize: 3333 USD, highest in Taiwan), Lin-Hsiung-Cheng Foundation, Taiwan 2011
- Five times Academic Excellence Award (top 5% of the class), NTU 2009–2012

PUBLICATIONS

Journal Articles

- C. K. Huang, C. J. Hu and P. C. Lin, "Gait-level Behavioral Analysis of a Sagittal Plane Model with Rolling Contact and its Role as a Template for Bounding and Pronking on a Quadruped Robot," *The International Journal of Robotics Research.* (In review)
- C. J. Hu, C. K. Huang, and P. C. Lin, "TDR-SLIP: a Torque-Actuated Dissipative Spring Loaded Inverted Pendulum Model with Rolling Contact," *Bioinspiration and Biomimetics.* (In preparation)
- C. P. Chen, J. Y. Chen, C. K. Huang, J. C. Lu and P. C. Lin, "Sensor data fusion for body state estimation in a bipedal robot and its feedback control application for stable walking," *Sensors,* vol. 15, pp. 4925-4946, 2015
- K. J. Huang[1], C. K. Huang[1], and P. C. Lin, "A simple running model with rolling contact and its role as a template for dynamic locomotion on a hexapod robot," *Bioinspiration and Biomimetics,* vol. 9, p. 046004, 2014. ([1]These two authurs contributed equally)

Conference Proceedings

- C. J. Hu, C. K. Huang and P. C. Lin, "A Torque-Actuated Dissipative Spring Loaded Inverted Pendulum Model with Rolling Contact and Its Use As the Template for Design and Dynamic Behavior Generation on a Hexapod Robot," in *IEEE International Conference on Robotics and Automation (ICRA),* 2015. (Accepted)
- C. K. Huang and P. C. Lin, "Assymmetric Stability property of a sagittal-plane model with a compliant leg and rolling contact," in *17th International Conference on Advanced Robotics (ICAR),* 2015. (In review)
- C. K. Huang, K. J. Huang, and P. C. Lin, "Rolling SLIP model based running on a hexapod robot," in *IEEE International Conference on Intelligent Robotics and Systems (IROS).* Tokyo, Japan, 2013, pp. 5608-5614.

TEACHING EXPERIENCE

Full-time Teaching Assistant, Dept. of ME, NTU Aug 2014–Present

- Instructed the course Measurement and Mechanical Engineering Laboratory
- Exp. of Op-Amp circuits: inverting circuits, instrumentation amplifier, charge amplifier, low pass filter
- Exp. of load cells: developed the strain gage transducer by using Wheatstone bridge circuits
- Exp. of piezoelectric sensors: investigated PVDF strain property and built PZT accelerometer
- Exp. of piezoresistive sensors: examined the characteristics of the piezoresistive pressure sensor

Teaching Assistant, Introduction to Robotics, Dept. of ME, NTU Sep 2013–Jan 2014

- Prepared course materials on topics including inverse kinematics, Jacobians, manipulator dynamics and trajectory planning algorithm

Teaching Assistant, Conservation Service Learning, Extracurricular Activities Section, NTU 2014 winter

Teaching Assistant (3 semesters), Badminton-basic, Dept. of Athletics, NTU Feb 2013–Jun 2014

SKILLS

Product Prototyping

- Machining, laser cutting, 3D printing, electrical discharge machining, winding machine

Programming Languages and Software

- MATLAB, LabVIEW, DREAMWEAVER*, SolidWorks, AutoCAD, Visual C++, Ansoft Maxwell
  * Designed and maintained the lab website: http://biorola.me.ntu.edu.tw/

LEADERSHIP AND EXTRACURRICULAR ACTIVITIES

Initiator (1st President and 2nd Vice President), Nature Trail Club, NTU Sep 2013–Jun 2014

- Established the first student association engaging in natural trail conservation in Taiwan

Webmaster, Bio-inspired Robotics Laboratory, NTU Feb 2013–Jan 2014