

Zhibin Li

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Research Interests

Control of dynamic balancing/locomotion of legged robots, bio-inspired compliant actuators, torque controlled robots, and the resulting technology transfer in real world applications.

Education

Ph.D., Robotics, 2012

Italian Institute of Technology (IIT) and University of Genova (joint PhD program), Italy

B.Eng., Automation, 2007

Department of Control Science and Engineering, Harbin Institute of Technology (HIT), China

Current Position

Senior postdoctoral researcher, leader of [locomotion group](#), ADVR, IIT

Awards

- Best Paper Nomination Finalist, *Humanoids* 2012
- Excellent Graduate Award, Harbin Institute of Technology, 2007
- 1st Prize, Technical Innovation Competition, 2006

Expertise

- Dynamic walking and stabilization control of humanoid robots
- Impedance and torque control of rigid/compliant actuators
- Design of discretized feedback controllers of dynamical systems
- Analog/digital signal processing, state estimation and sensor fusion

Research Experience

Oct 2013 - June 2015	WalkMan-DRC team <ul style="list-style-type: none">• Internal model control and reflex control for dynamic walking
Jan 2009 - Present	Department of Advanced Robotics, Italian Institute of Technology <ul style="list-style-type: none">• Walking and stabilization control of humanoids• Whole-body state feedback and sensor fusion
Aug 2007 - Dec 2008	Robotics Research Centre, Nanyang Technological University (NTU), Singapore <ul style="list-style-type: none">• Control of EMG driven lower body exoskeleton for spinal cord injury patients
Nov 2006 - Jul 2007	Technical Innovation Centre of Control Science & Engineering, HIT <ul style="list-style-type: none">• Design of digital motion control system of RM-501 Robotic Arm
Oct 2005 - Sep 2006	Technical Innovation Group, HIT <ul style="list-style-type: none">• Design of miniaturized GPS based tracking device
Oct 2005 - Jul 2006	Asia-Pacific Robot Contest (ABU Robocon) - HIT Team <ul style="list-style-type: none">• Design of the electronics of encrypted infrared line-tracking robots

Academic Activities

- Corresponding workshop organizer of [Dynamic Locomotion and Balancing of Humanoids: State of the Art and Challenges](#), ICRA 2015
- Workshop co-organizer of [benchmarking bipedal locomotion](#), *Humanoids*, 2014

- Invited talk “On The Control Of Push Recovery For Humanoids” at the workshop of [cognition, perception and postural control for humanoids](#), *Humanoids*, 2014
- Visiting researcher in the Biorobotics Laboratory (BioRob), EPFL, Switzerland
- Visiting researcher in the Robotics Lab, Zhejiang University, China
- Invited talk at SYSTeMS research group, Ghent University, Belgium
- Invited talk at Institute for Cognitive Systems, Technical University of Munich, Germany
- Invited talk at Institute of Robotics and Mechatronics, German Aerospace Center (DLR)

Project Experience

- Participation in successful projects: [VIATORS](#), [AMARSi](#)
- Currently involved project: [WALK-MAN](#) (Contributed to the proposal writing)
- Prepared two EU proposals SYNCROID (H2020-ICT-2014-1) and RINOID (FP7 ECHORD++)
- FET-Open proposal (H2020-FETOPEN-2014-2015-RIA) in preparation

Supervision

Feb 2015 - Present	Songyan Xin: Development and balance control of a mini-size humanoid robot
Nov 2014 - Present	Yangwei You: Control and planning of running robots
2014 - Present	Wesley Roozing: Design and control of high performance robotic actuations
2013 - Present	Juan Castano: Model Predictive Control on reactive bipedal walking Chengxu Zhou: Humanoid gait stabilization using whole-body sensor fusion
2007 - 2008	Yew-Meng Ng, Jeevan Wong: Sensorization and control of a gait device for stroke and incomplete spinal cord injury (SCI) patients

Review Services

- IEEE conferences ICRA, IROS, Humanoids, BioRob, RoboCup Symposium, International Symposium on Robotics Research (ISRR).
- IEEE Transactions on Robotics, IEEE/ASME Transactions on Mechatronics, IEEE Transactions on Industrial Electronics, International Journal of Humanoid Robotics, Journal of Biomechanics.

Publications

- First author of 12 peer-reviewed publications, [Google Scholar](#) (citations 223, h-index 7).
- Author and co-author of 24 peer-reviewed publications.

Journals and Book Chapters

1. **Zhibin Li**, Chengxu Zhou, Nikos Tsagarakis, Darwin Caldwell, “Compliance Control for Stabilizing a Humanoid on the Varying Slope Based on Terrain Inclination Estimation,” *Autonomous Robots* (AURO-D-14-00216R1), conditionally accepted.
2. Chengxu Zhou, **Zhibin Li**, Nikos Tsagarakis, Darwin Caldwell, “Stabilization of Bipedal Walking Based on Compliance Control,” *Autonomous Robots* (AURO-D-15-00114), under review.
3. Juan Alejandro Castano, **Zhibin Li**, Chengxu Zhou, Nikos Tsagarakis, Darwin Caldwell, “Reactive Gait Generation for Humanoid Robots Based on Analytic Foot Placement Control,” *International Journal of Humanoid Robotics* (IJHR-D-15-00003), revision.
4. Wesley Roozing, **Zhibin Li**, Gustavo Medrano-Cerda, Darwin Caldwell, Nikos Tsagarakis, “Development and Control of a Compliant Asymmetric Antagonistic Joint for Efficient Mobility”, *IEEE/ASME Transactions on Mechatronics* (TMECH-02-2015-4359), major revision.

5. Juan Castano, Andres Hernandez, **Zhibin Li**, Nikos Tsagarakis, Darwin Caldwell, Robin De Keyse, "Enhancing the Robustness of the EPSAC Predictive Control Using A Singular Value Decomposition Approach", *Robotics and Autonomous Systems* (ROBOT-D-15-00142), revision.
6. **Zhibin Li**, Nikos Tsagarakis, Darwin Caldwell, "Walking Pattern Generation for A Humanoid Robot with Compliant Joints," *Autonomous Robots*, vol. 35(1), pp. 1-14, 2013.
7. **Zhibin Li**, Bram Vanderborght, Nikos Tsagarakis, Darwin Caldwell, "Quasi-Straightened Knee Walking for the Humanoid Robot," *Modeling, Simulation and Optimization of Bipedal Walking, Cognitive Systems Monographs*, vol. 18, pp. 117-130, 2013.
8. Houman Dallali, Petar Kormushev, **Zhibin Li**, Darwin Caldwell, "On Global Optimization of Walking Gaits for the Compliant Humanoid Robot, COMAN Using Reinforcement Learning," *Journal of Cybernetics and Information Technologies*, vol. 12(3), pp. 39-52, 2012.

Conference Publications

1. **Zhibin Li**, Chengxu Zhou, Qiuguo Zhu, Rong Xiong, Nikos Tsagarakis, Darwin Caldwell, "Active Control of Under-actuated Foot Tilting for Humanoid Push Recovery," in IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2015 (accepted).
2. Yangwei You, **Zhibin Li**, Nikos Tsagarakis, Darwin Caldwell, "From One-legged Hopping to Bipedal Running and Walking: A Unified Foot Placement Control Based On Regression Analysis," in IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2015 (accepted).
3. Chengxu Zhou, Xin Wang, **Zhibin Li**, Nikos Tsagarakis, Darwin Caldwell, "Exploiting the Redundancy for Humanoid Robots to Dynamically Step Over A Large Obstacle," in IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2015 (accepted).
4. Yangwei You, **Zhibin Li**, Nikos Tsagarakis and Darwin Caldwell, "Foot Placement Control for Bipedal Walking on Uneven Terrain: An Online Linear Regression Analysis Approach," in International Conference on Climbing and Walking Robots and the Support Technologies for Mobile Machines (CLAWAR), 2015.
5. **Zhibin Li**, Chengxu Zhou, Juan Castano, Xin Wang, Francesca Negrello, Nikos Tsagarakis, Darwin Caldwell, "Fall Prediction of Legged Robots Based on Energy State and Its Implication of Balance Augmentation: A Study on the Humanoid," in IEEE International Conference on Robotics and Automation (ICRA), 2015.
6. **Zhibin Li**, Chengxu Zhou, Houman Dallali, Nikos Tsagarakis, Darwin Caldwell, "Comparison Study of Two Inverted Pendulum Models for Balance Recovery," in IEEE-RAS International Conference on Humanoid Robots, 2014.
7. **Zhibin Li**, Ka Deng, and Mingguo Zhao, "Powered Dynamic Walking Based on the Passive Dynamic Principles: A Virtual Slope Walking Approach," in IEEE-RAS International Conference on Humanoid Robots, 2014.
8. Chengxu Zhou, **Zhibin Li**, Juan Castano, Houman Dallali, Nikos Tsagarakis, Darwin Caldwell, "A Passivity Based Compliance Stabilizer for Humanoid Robots," in IEEE International Conference on Robotics and Automation (ICRA), 2014.
9. Juan A Castano, Andres Hernandez, **Zhibin Li**, Chengxu Zhou, Nikos Tsagarakis, Darwin Caldwell, Robin Keyser, "Implementation of Robust EPSAC on Dynamic Walking of COMAN Humanoid," in International Federation of Automatic Control (IFAC), 2014.
10. **Zhibin Li**, Nikos Tsagarakis, Darwin Caldwell, "Stabilizing Humanoids on Slopes Using Terrain Inclination Estimation," in IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2013.

11. Mohamad Mosadeghzad, **Zhibin Li**, Nikos Tsagarakis, Gustavo Medrano-Cerda, Houman Dallali, Darwin Caldwell, "Optimal Ankle Compliance Regulation for Humanoid Balancing Control," in IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2013.
12. Nikos Tsagarakis, Stephen Morfey, Gustavo Medrano-Cerda, **Zhibin Li**, Darwin Caldwell, "Compliant Humanoid COMAN: Optimal Joint Stiffness Tuning for Modal Frequency Control," in IEEE International Conference on Robotics and Automation (ICRA), 2013.
13. Houman Dallali, Mohamad Mosadeghzad, Gustavo A Medrano-Cerda, Nicolas Docquier, Petar Kormushev, Nikos Tsagarakis, **Zhibin Li**, Darwin Caldwell, "Development of A Dynamic Simulator for A Compliant Humanoid Robot Based on A Symbolic Multi-body Approach," in IEEE International Conference on Mechatronics (ICM), 2013.
14. Jorhabib Eljaik, **Zhibin Li**, Marco Randazzo, Alberto Parmiggiani, Giorgio Metta, Nikos Tsagarakis, Francesco Nori, "Quantitative Evaluation of Standing Stabilization Using Stiff and Compliant Actuators," Robotics: Science and Systems (RSS), 2013.
15. Luca Colasanto, Nikos Tsagarakis, **Zhibin Li**, Darwin Caldwell, "Internal Model Control for Improving the Gait Tracking of a Compliant Humanoid Robot," in IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2012.
16. **Zhibin Li**, Nikos Tsagarakis, Darwin Caldwell, "A Passivity Based Admittance Control for Stabilizing the Compliant Humanoid COMAN," in IEEE-RAS International Conference on Humanoid Robots, 2012 (Award for Best Paper Nomination Finalist).
17. Sylvain Calinon, **Zhibin Li**, Tohid Alizadeh, Nikos Tsagarakis, Darwin Caldwell, "Statistical Dynamical Systems for Skills Acquisition in Humanoids," in IEEE-RAS International Conference on Humanoid Robots, 2012.
18. **Zhibin Li**, Nikos Tsagarakis, Darwin Caldwell, "Walking Trajectory Generation for Humanoid Robots with Compliant Joints: Experimentation with COMAN Humanoid," in IEEE International Conference on Robotics and Automation (ICRA), 2012.
19. **Zhibin Li**, Bram Vanderborght, Nikos Tsagarakis, Luca Colasanto, Darwin Caldwell, "Stabilization for the Compliant Humanoid Robot COMAN Exploiting Intrinsic and Controlled Compliance," in IEEE International Conference on Robotics and Automation (ICRA), 2012.
20. Nikos Tsagarakis, **Zhibin Li**, Jody Saglia, Darwin Caldwell, "The Design of the Lower Body of the Compliant Humanoid Robot cCub," in IEEE International Conference on Robotics and Automation (ICRA), 2011.
21. **Zhibin Li**, Bram Vanderborght, Nikos Tsagarakis, Darwin Caldwell, "Fast Bipedal Walk Using Large Strides by Modulating Hip Posture and Toe-heel Motion," in IEEE International Conference on Robotics and Biomimetics (ROBIO), 2010.
22. **Zhibin Li**, Bram Vanderborght, Nikos Tsagarakis, Darwin Caldwell, "Trajectory Generation of Straightened Knee Walking for Humanoid Robot iCub," in International Conference on Control Automation Robotics and Vision, 2010.
23. **Zhibin Li**, Bram Vanderborght, Nikos Tsagarakis, Darwin Caldwell, "Human-like Walking with Straightened Knees, Toe-off and Heel-strike for the Humanoid Robot iCub," in UKACC International Conference on CONTROL, 2010.