Dana Kulić

Nakamura Yamane Laboratory
Department of Mechano-Informatics
University of Tokyo
7-3-1 Hongo, Bunkyo-ku, 113-0021 Japan
Tel. +81-3-5841-6380
Email: dana@ynl.t.u-tokyo.ac.jp

Education

University of British Columbia, Department of Mechanical Engineering, Vancouver, BC

2002 - 2005 **Doctor of Philosophy**

Thesis Topic:	Safety for Human-Robot Interaction
Specialization:	Robotics, modelling and control, robot vision, instrumentation, real-time software engineering
Research Advisor:	Dr. Elizabeth Croft

1997 - 1998 **Master of Engineering**

Thesis Topic:	Automated Portable Stack Testing System and Humidity Exchanger Development
Specialization:	Electro-mechanical design option (precursor to Mechatronics)
Research Advisor:	Dr. Elizabeth Croft

1993 - 1997 **Bachelor of Applied Science**

Specialization:	Electro-mechanical design option (precursor to Mechatronics)
Graduated with Honours	

Awards

2006 - 2008	Japanese Society for the Promotion of Science Post Doctoral Fellowship
2006	Natural Sciences and Engineering Research Council Post Doctoral Fellowship - Declined
2003 – 2004	Natural Sciences and Engineering Research Council Post Graduate Fellowship (PGSB)
2002 – 2003	Natural Sciences and Engineering Research Council Post Graduate Fellowship (PGSA)
2002 – 2003	University of British Columbia Top-Up Award
1996 – 1997	Fletcher Challenge Scholarship for Academic Achievement
1996	NSERC Undergraduate Industrial Research Scholarship
1995 – 1996	Frank Vernon Memorial Scholarship for Academic Achievement
1992 – 1993	BC University Entrance Award

Academic Experience

University of Tokyo, Department of Mechano-Informatics, Tokyo, Japan

2006 - present **JSPS Post-Doctoral Fellow** - Nakamura Yamane Laboratory (Dr. Yoshihiko Nakamura)

Developing mechanisms for robot learning and human robot interaction. Developing algorithms for interactive robot learning of human motion patterns and gestural communications for humanoid robots. The designed algorithms will be tested during human robot interaction with a humanoid robot and a real-time motion capture system.

University of British Columbia, Department of Mechanical Engineering, Vancouver, BC

2006 **Research Engineer** - Manufacturing Automation Laboratory (Dr. Yusuf Altintas)

Developed software for dynamic simulation of a 5-axis CNC machine. Development and integration of smooth path and trajectory generation software for 5-axis machining, flexible modeling of the drive dynamics, graphical user interface and system integration and testing.

2006 **Post Doctoral Researcher** – CARIS Lab (Dr. Elizabeth Croft)

Developed and implemented novel strategies for human-robot interaction with articulated manipulators that ensure the safety and comfort of the human participant. Developed methods for use of physiological data during human-robot interaction. Developed vision base tracking of the human position and orientation for use during interaction. Supervised masters level graduate students.

2005 **Sessional Instructor -** Mech 421 (*Mechatronic System Instrumentation)*

Delivered the first instalment of a new course on mechatronic system instrumentation and integration for senior students. Delivered lecture content, course exams, and supervised laboratory exercises.

2004 - 2005 **Academic Assistant**

Mech 421 *Mechatronic System Instrumentation*

Designed a new course on mechatronic system instrumentation and integration for the Mechatronics program at UBC. Developed the course laboratory, course syllabus and lecture notes. Developed laboratory and lecture content on large scale mechatronic system design and integration, including sensor integration, FPGA, PLCs, industrial computer vision and networked control.

Mech 221 *2nd Year Mechanical Engineering*

Assisted with course development and planning for a new integrated 2nd Year Mechanical engineering program at UBC (Mech2), which combines all core 2nd year courses into a single integrated program.

2003 - 2004 **Teaching Assistant**

Mech 221 *Integrated 2nd Year Mechanical Engineering* (Dr. Elizabeth Croft)
Leading weekly question and answer sessions, grading student presentations and reports.

Academic Experience - Continued

2003 - 2004 **Teaching Assistant – continued**

Mech 265 *Kinematics and Dynamics* (Dr. Elizabeth Croft, Ms. Daniela Constantinescu)
Leading weekly tutorials, answering students questions, exam grading.

Mech 352 *Machine Component Design* (Mr. Pat Cramond)

Design of the course project, project grading.

Mech 551 *Electro-mechanical (Mechatronics) Design Project* (Dr. Yusuf Altintas, Dr. Elizabeth Croft)

Senior Teaching Assistant to 5th year Mechatronics students in their Master design projects involving sensor and electronic instrumentation, precision mechanical design, real-time software design and control. Assisting 5th year students in their final defence preparations and 4th year students in their presentations to industry.

2003 **Research Assistant –** Industrial Automation Laboratory

Designed and supervised implementation of a 6-axis open architecture robot controller for the CRS A460 robot. Supervised an engineering physics co-op student to build and test the hardware controller including control amplifiers and signals, encoder reading circuitry, and the emergency stop circuit. Supervised a computer science co-op student to implement basic control software including an independent axis PID controller, safety shutdown logic and user interface.

Industrial Experience

2002 **Ballard Power Systems, Burnaby, BC**
Systems Engineer

Designed and tested an automated diagnostic system for determining the causes of failure of portable fuel cell systems during factory acceptance testing. Developed design specifications for large scale fuel cell test stations.

2001 **Ballard Power Systems GmbH, Germany**
Development Engineer, Software and Electronics Development

Designed and implemented a real-time embedded control system for an automotive fuel cell and ancillary hardware, using automotive standard development tools and methods. Designed, implemented and tested the controller CAN and serial communication interfaces. Developed fuel cell health monitoring, characterization and control algorithms.

1999 - 2000 **MacDonald Dettwiler, Richmond, BC**
Systems Engineer, Space Station Project

Designed, implemented and tested real-time embedded software for Operations Control of a robotic arm for the International Space Station. Worked on timing and memory usage analysis and optimization of the software.

Technical lead for sustaining engineering effort on the project. Generated work packages, reviewed modified code and test scripts and provided systems engineering support for sustaining engineering developers.

1998 - 1999 **Ballard Power Systems, Burnaby, BC**
Systems Engineer, Portable Power Systems

Designed and implemented real-time embedded control software for portable fuel cell controllers. Designed data acquisition systems and Windows-based control software for automated testing equipment for fuel cell systems. Conducted testing and analysis of fuel cell system components.

Publications

Refereed Journal Articles - Published

D. Kulić and E. Croft, Affective State Estimation for Human-Robot Interaction, *IEEE Transactions on Robotics,* In Press, 2007.

D. Kulić and E. Croft, Pre-Collision Safety Strategies for Human-Robot Interaction, *Autonomous Robots,* Vol. 22, No. 2, pp. 149—164, 2007.

D. Kulić and E. Croft, Physiological and Subjective Responses to Articulated Robot Motion, *Robotica*, In Press, 2006.

D. Kulić and E. Croft, Safety Based Control Strategy For Human-Robot Interaction, *Journal of Robotics and Autonomous Systems,* Vol. 54, No. 1, pp. 1 – 12, 2006.

D. Kulić and E. Croft, Safe Planning for Human-Robot Interaction, *Journal of Robotic Systems*, Vol. 22, No. 7, pp. 383 – 396, 2005.

Refereed Journal Articles - Submitted

D. Kulić, W. Takano and Y. Nakamura, Incremental Learning, Clustering and Hierarchy Formation of Whole Body Motion Patterns using Adaptive Hidden Markov Chains, Submitted to *International Journal of Robotics Research*, August 2007.

Refereed Conference Articles - Published

D. Kulić, W. Takano and Y. Nakamura, Lifelong learning and organization of whole body motion patterns, *International Symposium of Robotics Research*, 2007, To Appear.

D. Kulić, W. Takano and Y. Nakamura, Representability of Human Motions by Factorial Hidden Markov Models, *IEEE International Conference on Intelligent Robots and Systems*, 2007, To Appear.

K. Radkah, D. Kulić and E. Croft, Dynamic Parameter Identification for the CRS A460 Robot, *IEEE International Conference on Intelligent Robots and Systems,* 2007, To Appear.

W. Takano, D. Kulić and Y. Nakamura, Interactive Topology Formation of Linguistic Space and Motion Space, *IEEE International Conference on Intelligent Robots and Systems,* 2007, To Appear.

D. Kulić, W. Takano and Y. Nakamura, Incremental On-line Hierarchical Clustering of Whole Body Motion Patterns, *IEEE International Symposium on Robot and Human Interactive Communication,* pp. 1016 – 1021, 2007.

D. Kulić and E. Croft, Mechatronic System Integration for Senior Students, *ASME International Mechanical Engineering Congress and Exposition*, pp. 1 – 9, 2006.

D. Kulić and E. Croft, Estimating Robot Induced Affective State using Hidden Markov Models, *IEEE International Symposium on Robot and Human Interactive Communication, pp. 257 – 262, 2006*.

D. Kulić and E. Croft, Anxiety Detection for Human Robot Interaction, *IEEE International Conference on Intelligent Robots and Systems,* pp. 389 – 394, 2005.

Publications – contd.

Refereed Conference Articles - Published

D. Kulić and E. Croft, Real-time Safety for Human Robot Interaction, *IEEE International Conference on Advanced Robotics*, pp. 719 – 724, 2005

D. Kulić and E. Croft, Safe Planning for Human Robot Interaction, *IEEE International Conference on Robotics and Automation*, pp. 1882 – 1887, 2004.

D. Kulić and E. Croft, Strategies for Safety in Human Robot Interaction, *IEEE International Conference on Advanced Robotics,* pp. 644 – 649, 2003.

D. Kulić and E. Croft, Estimating Intent for Human Robot Interaction, *IEEE International Conference on Advanced Robotics*, pp. 810 – 815, 2003.

Refereed Conference Articles - Submitted

D. Kulić, W. Takano and Y. Nakamura, Incremental Learning of Full Body Motions via Adaptive Factorial Hidden Markov Models, Submitted to *International Conference on Epigenetic Robotics*, August 2007.

Book Chapters

D. Kulić and E. Croft, Safe motion planning for human-robot interaction: design and experiments, In: *Mobile Robots Moving Intelligence*, V. Kordic, A. Lazinica and M. Merdan (Eds.) Advanced Robotic Systems, Vienna, Austria, pp. 149 – 170, 2006.

Conference Presentations

W. Takano, D. Kulić and Y. Nakamura, Embodied Communication based on Identification and Control of Physical Interaction, *Annual Conference of the Robotics Society of Japan*, 2007. (In Japanese)

D. Kulić Poster and Demonstration on Intent Based Human Robot Interaction. *Advanced Systems Institute Exchange*, 2003.