Curriculum Vitae

Konstantinos Dermitzakis, Ph.D.

Dynamic Devices AG,
Technoparkstrasse 1,
Zurich, CH-8005,
Switzerland
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Website

Research Interests

Robotics Bionics, prosthetics, human-machine interfaces, rehabilitation engineering, sensorimotor control
Biomechanics Joint biomechanics, tendon-pulley systems, prosthetic structural optimization

Education

Oct 2007 *to* Mar 2014 — **Artificial Intelligence Laboratory, University of Zurich** — Zurich, Switzerland
Ph.D. in Artificial Intelligence
Research focus: Upper-limb prosthetic robotics
Dissertation: *Improving the design of upper-limb robotic prostheses using biomechanical properties and sensorimotor control principles*
Advisors: Prof. Dr. Rolf Pfeifer, Prof. Dr. Silvestro Micera

Sep2006 *to* Aug 2007 — **Edinburgh University** — Edinburgh, UK
M.Sc. in Artificial Intelligence
Specialisms: Intelligent Robotics, Computational Neuroscience
Dissertation: *A GPU Implementation of the SIFT algorithm*
Advisor: Dr. Eric McKenzie
Director of studies: Dr. J. Douglas Armstrong

Sep2001 *to* Jun2006 — **Edinburgh University** — Edinburgh, UK
B.Sc. in Computer Science with Honours
Dissertation: *FlyTrackerUI: Creating a highly modular and simplified User Interface for FlyTracker*
Advisor: Dr. J. Douglas Armstrong
Director of studies: Marcelo Cintra

Awards

Apr 2014 Outstanding Researcher Travel Award for the NCSRR Advanced User and Developer Workshop
Mar 2011 Participation Travel Award for the RobotDoc training workshop
Oct 2007 Ph.D. Tuition Fees, Swiss National Science Foundation
Sep 2006 Postgraduate EU Student award, Student Awards Agency for Scotland

Media / Exhibitions

Jan 2015	Kleintheater Luzern, "ECCE Homo", Luzern (Theater)
Apr 2014	Fabriktheater Rote Fabrik, "*ECCE Homo*", Zürich (Theater)
Oct 2013	Beobachter Nature: "*Mutter Natur hat einen guten Job gemacht*" (Magazine article)
Jun 2013	Bημαscience: *"Bionic hands: Hands that are almost real!"* (Magazine article)
Jan 2011	Beobachter: *"Mensch-Maschine: Der erste Cyborg"* (Magazine article)
Aug 2009	Sciencesuisse: L'intelligence du corps (TV-show)
Sep 2008	Inventions-TV: Mensch-Maschine-Schnittstelle Hand-Prothese (TV-show)
Mar 2008	Brainfair Zurich (Exhibition)

Invited Talks

Jul 3rd, 2013	Hosoda Laboratory, Dept. of Multimedia Engineering, Osaka University, Osaka, Japan. Title: *Design of upper-limb robotic prostheses: Insights from biomechanical properties.*
Mar 1st, 2013	Bio-Robotics Network in Zurich (BiRoNZ), Zurich. Title: *Improving the design of upper-limb robotic prostheses using biomechanical properties and sensorimotor control principles.*
Sep 19th, 2011	Prosthetics-Orthotics Center, Northwestern University, Chicago, IL. USA. Title: *Exploiting morphological properties for a robotic prosthetic hand*.
Sep 23rd, 2011	Collaborative Haptics and Robotics in Medicine Lab (CHARM Lab), Stanford University, Palo Alto, CA, USA. Title: *Bio-inspired design for an upper-limb robotic prosthesis*.

Publications

Book Chapters

2008 Alejandro Hernandez Arieta, Konstantinos Dermitzakis, Dana D. Damian, Massimiliano Lungarella, and Rolf Pfeifer, *Sensory-motor coupling in rehabilitation robotics.* Handbook of Service Robotics, I-Tech Education and Publishing, pp: 21-36. 2008.

Journal Articles

2013 Sadeq H. Bakhy, Shaker S. Hassan, Somer M. Nacy, K. Dermitzakis and Alejandro Hernandez Arieta, *Contact mechanics for soft robotic fingers: modeling and experimentation.* Robotica, doi:10.1017=S0263574712000653, Vol. 31, Issue 4, p.p. 599-609, 2013.

2012 Dermitzakis, Konstantinos and Morales, Marco Roberto and Schweizer, Andreas, *Modeling the Frictional Interaction in the Tendon-Pulley System of the Human Finger for Use in Robotics.* Artificial Life, doi: 10.1162/ARTL_a_00087, Vol 19, Issue 1, pp 149-169, 2012.

2012 Sadeq H. Bakhy, Shaker S. Hassan, Somer M. Nacy, Alejandro Hernandez Arieta and K. Dermitzakis, *Optimal design of three-phalanx prosthesis underactuated fingers using genetic algorithm.* Engineering & Technology Journal, Vol. 31, Issue 6, p.p. 1045-68, 2012.

2011 Dermitzakis, Konstantinos and Carbajal, Juan Pablo, *Scaling Laws in Robotics*, Procedia Computer Science, doi: 10.1016/j.procs.2011.09.038, Vol. 7, p.p. 250-252, 2011.

Refereed Conference Papers

2013 Konstantinos Dermitzakis and Juan Pablo Carbajal, *Bio-inspired friction switches: adaptive pulley systems.* IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS '13), Tokyo, Japan. 2013.

2013 Konstantinos Dermitzakis, Andreas Ioannides and Hwai-ting Lin, *Robotic thumb grasp-based range of motion optimization*. International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC '13), Osaka, Japan. 2013.

2011 Monika Seps, Konstantinos Dermitzakis and Alejandro Hernandez Arieta, *Study on lower back electrotactile characteristics for prosthetic sensory feedback*. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS '11), San Francisco, USA.

2011 Konstantinos Dermitzakis, Marco Roberto Morales and Andreas Schweizer, *Frictional interaction in the tendon-sheath system of the human finger and its use in robotics*. International Conference on Morphological Computation (MorphComp '11), Venice, Italy. 2011.

2011 Konstantinos Dermitzakis, Alejandro Hernandez Arieta and Rolf Pfeifer, *Gesture recognition in upper-limb prosthetics: A viability study using Dynamic Time Warping and gyroscopes*. International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC '11), Boston, Massachusetts. 2011.

2010 Dana D. Damian, Harold Martinez, Konstantinos Dermitzakis, Alejandro Hernandez Arieta and Rolf Pfeifer, *Artificial Ridged Skin for Slippage Speed Detection in Prosthetic Hand Applications*. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS '10), Taipei, Taiwan. 2010.

Conference Posters

2011 Konstantinos Dermitzakis and Alejandro Hernandez Arieta, *Gesture recognition for controlling dexterous upper-limb prostheses*. International Neurorehabilitation Symposium (INRS '11), Zurich, Switzerland, June 2011.

2011 Alejandro Hernandez Arieta, Maresa Afthinos and Konstantinos Dermitzakis, *Apparent moving sensation recognition in prosthetic applications*. The European Future Technologies Conference and Exhibition (FET '11), Budapest, Hungary, May 2011.

2010 Dana Damian and Konstantinos Dermitzakis, *Morphological design for a prosthetic hand: bone curvature and ridged skin*. International Conference on Cognitive Systems (CogSys '10), Zurich, Switzerland, Jan 2010.

2009 Dana D. Damian, Markus Cadonau, Konstantinos Dermitzakis and Alejandro Hernandez-Arieta, *Grip Stabilization of a Robot Hand through a Ridged Artificial Skin*. Workshop on Tactile Sensing, IEEE-RAS International Conference on Humanoid Robots (Humanoids '09), Paris, France, Dec 2009.

2009 Monika Seps, Jose Gonzalez-Vargas, Alejandro Hernandez-Arieta, Konstantinos Dermitzakis and Rolf Pfeifer, *Mastering the Man-Machine Communication: Sensory Feedback for the Perceptual Embodiment of a Neuroprosthesis*. ZNZ Symposium, Zurich, Switzerland, Sep 2009.

2009 Konstantinos Dermitzakis and Alejandro Hernandez Arieta, *Anthropomimetic approach to the design of a prosthetic robot hand*. Robotics: Science and Systems V, Seattle USA, Jun 2009.

2007 Konstantinos Dermitzakis, *Actuated bipeds based on passive dynamic principles*. Dynamic Walking III: Principles and Concepts of Legged Locomotion, Marienhamn, Finland, Jun 2007.

2007 Konstantinos Dermitzakis, *A GPU implementation of the SIFT algorithm*. Informatics jamboree poster competition, University of Edinburgh, May 2007.

Other publications

2010 Alejandro Hernandez Arieta, Konstantinos Dermitzakis, and Dana D. Damian, *Sensory feedback for body awareness in prosthetic applications*. Institute of Neuromorphic Engineering, article.

Apr. 2010.

Research Experience

University of Zurich Zurich, Switzerland
Research Assistant at the Artificial Intelligence Laboratory

Dec 2012 *to* Nov 2013
- *eSMC: Extending sensorimotor contingencies to cognition* (FP7-ICT, #270212)
  - Designed and implemented a test-bed for a pneumatic robotic finger platform used to examine the influence of Parkinson disease on finger tapping.
  - Designed a pneumatic robotic hand system for prosthetic applications.

Aug 2011 *to* Nov 2013
- *NCCR Robotics 3.2: sEMG-based hybrid control*
  - Designed and implemented a gaming platform test-bed for upper-limb prosthesis control cross-comparison and validation. The software test-bed, along with the electronic devices designed for it underwent thorough testing for compliance with the Kantonale Ethikkommission Zürich trials for humans.
  - Developed an index finger model used to examine the influence of tendon-pulley friction of the human hand.

Aug 2009 *to* Jun 2010
  - Designed and implemented a variable friction pulley device for use in robotic tendon-driven systems. The variable friction device is being continuously tested (currently at 671 trials) for its force output performance and tendon material fatigue characteristics using an in-house test-bed developed for this particular purpose.

Oct 2007 *to* Oct 2012
- *The ShanghAI Lectures*
  - Implemented and maintained real time audio recording capabilities in the Open Wonderland project for research being performed for the ShanghAI Lectures.
  - Implemented video recording and playback capabilities using Axis network cameras as the source in the Open Wonderland project.
- *Dynamical Coupling in Motor-Sensory Function Substitution* (# k-23k1-116717/1)
  - Designed and created an anthropomorphic robotic hand for prosthetic applications.
  - Implemented real-time data recording and control software for various electrical stimulators (both current and voltage based, e.g. Compex electrical stimulator). The software was developed for the purpose of running, debugging and testing the stimulators for use in experiments with human participants as approved by the Kantonale Ethikkommission Zürich.
  - Implemented force, position and speed control algorithms for an Otto Bock System Electric Hand. The modified prosthesis was then tested against long-running experiments using a purpose-built test-bed designed in-house.
  - Designed a real-time hybrid prosthesis control system using IMU and sEMG sensors. The control system underwent extensive testing and a number of revisions to achieve compliance with the Kantonale Ethikkommission Zürich trials for humans.
  - Performed studies on motor mass versus lifespan versus torque production. A custom test-bed was designed in-house, purpose-built for long running (~200 hours in average) continuous motor operation and data collection, with automated capabilities of identifying soon-to-fail or failed motors.

Supervision/Teaching Experience

Project Supervision, University of Zurich — Zurich, Switzerland

Feb 2014 *to* Jul 2014	B.Sc. Thesis, UZH Daniel Häusler Title: *Robot Thumb Kinematic Model Optimisation*	Co-supervisor: Prof. Dr. Davide Scaramuzza
Mar 2013 *to* Oct 2013	Semester Project & B.Sc. Thesis, UZH Benjamin Ellenberger Title: *Development of a portable pneumatic system for prosthetic hands*	Co-supervisors: Prof. Dr. Rolf Pfeifer, Prof. Dr. Koh Hosoda
Mar 2012 *to* Jul 2012	B.Sc. Eng. Thesis, ETHZ and UZH Benedikt Seitz Title: *Optimizing Actuator Design for Prosthetic Hands*	Co-supervisor: Prof. Dr. Robert Riener
Apr 2012 *to* Jun 2012	M.Sc. Eng. Semester Project, ETHZ and UZH Andreas Ioannides Title: *Robot Thumb Kinematic Model Optimisation*	Co-supervisor: Prof. Dr. Fumiya Iida
Feb 2011 *to* Feb 2012	Semester Project & B.Sc. Thesis, UZH Francesco Luminati Title: *Gaming engine platform for prosthetic sensory interface*	Co-supervisor: Prof. Dr. Rolf Pfeifer
Mar 2011 *to* Dec 2011	M.Sc. Eng. Thesis, ETHZ and UZH Marco Roberto Morales Title: *Influence of Tendon-Pulley Friction on an Index Finger Model*	Co-supervisor: Prof. Dr. Fumiya Iida

Teaching Assistance, University of Zurich — Zurich, Switzerland

Fall 2013	Formal Methods II	(BSc/3+)
Fall 2012	Formal Methods II	(BSc/3+)
Fall 2010	Bio-Inspired Robotics	(BSc/3+)
	Artificial Life	(BSc/3+)
Fall 2009	Formal Methods II	(BSc/3+)
Fall 2008	Formal Methods II	(BSc/3+)

Skills

Extensive hardware and software experience in prosthetic robotics and biomechatronics

Programming	Matlab (incl. Matlab Robotics Toolbox, Simulink, SimMechanics), Java SE (incl. JMF, JAI, JNI, JSP, JSSE), Android, C/C++, LabView, Embedded C, OPL (Open Programming Language), Python, Prolog
Design tools	SolidWorks, Altium Designer, Eagle PCB, LTSpice, OpenCV, Photoshop, Lightwave, Blender
Other	HTML, XML, PHP, SQL, Perl, CVS, SVN, UML, TEX/LATEX

Work Experience

Dec 2014 *to* present — **Dynamic Devices AG, Zurich, Switzerland** — Zurich, Switzerland

Working with Dynamic Devices AG for the design and creation of a robotic rehabilitation machine for children, in collaboration with the Bern University of Applied Sciences (Berner Fachhochschule).

Nov 2014 *to* Dec 2014 — **Starmind AG, Zurich, Switzerland** — Zurich, Switzerland

Technical Professional Specialist

Working with Starmind AG for the design and creation of a Functional Model device (NDA bound).

Nov 2014 — **Hocoma AG, Zurich, Switzerland** — Zurich, Switzerland

Technical Professional Specialist

Worked with Hocoma AG for the replication of a Functional Model device, based on existing specifications (NDA bound).

Jun 2014 *to* Oct 2014 — **BIRLab, ETH Zurich, Switzerland** — Zurich, Switzerland

Technical Professional Specialist

Working with the BIRLab, ETHZ under the FP7 Myorobotics project (FP7/2007-201 3-28821 9) for development of a tendon-driven quadruped robot (MyoCheetah):

- Assisting with mechanical hardware development for the MyoCheetah robot (designing and fabricating mechanical parts such as tendon pulleys and interconnects)
- Assisting with electronic hardware development for the MyoCheetah robot (designing and fabricating a CANBus interconnect board for hall-effect joint angle sensors)
- Developing a complete CANopen Java implementation (open source, soon on GitHub)
- Developing a complete Maxon EPOS2 CANopen Java control interface (open source, soon on GitHub)
- Developing a controller and data-logging Java framework for the MyoCheetah robot, utilizing the above EPOS2 CANopen control interface (open source, soon on GitHub)
- Implementing forward and inverse kinematics of the MyoCheetah robot and basic control routines (e.g. sitting and standing, trotting gait)

Oct 2007 *to* Nov 2013 — **AI Lab, University of Zurich, Switzerland** — Zurich, Switzerland

Research Assistant

(See research & supervision experience sections)

Jun 2004 *to* Aug 2004 — **Samsung Greece** — Athens, Greece

GSM Terminals & WOW Supervisor

Worked with Samsung for the duration of the Olympic Games held in Athens in the LIH Olympic Venue, under the Venue Technology Operations Centre, providing administration, maintenance and technical support for:

- GSM terminals
- Samsung's exclusive Olympic Games' SGH-i530 mobile phone, utilizing PalmOS
- Wireless Olympic Works (WOW). WOW provided effective and efficient communications at the 2004 Olympic Games, consisting of a set of applications as well as phone, smartphone and PDA equipment to access information related to the games

Jun 2000 *to* Aug 2000 — **Business Logic** — Agios Nikolaos, Crete, Greece

System Administrator, Technical Support

Within the scope of the internship I worked on the following topics:

- Administrating the branch's network
- Assembling and troubleshooting systems for sale
- Maintaining systems and data

- Providing technical support for dial-up customers

Other

Memberships

Mar 2011	IEEE Member
Mar 2010	RobotDoc project Research Associate
Mar 2010	European Network of researchers in Cognitive Science (EUCog)

Languages

English	Business fluent
Greek	Native
German	Basic (A1)

Interests

- Guitar, keyboard
- Squash, tennis, gym
- Cooking
- Repairing electronics

References

(Available upon request)

Prof. Dr. Rolf Pfeifer, Ph.D. – Supervisor, Professor at University of Zurich
Dr. Alejandro Hernandez–Arieta – Senior Engineer at Roche Diagnostics Ltd.
Dr. Max Lungarella – CTO of Dynamic Devices AG
Dr. Lijin Aryananda – Head of Technical Projects, Hocoma AG