Yon Visell, PhD
Electrical and Computer Engineering Department
Drexel University
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(267) 800 8960

Drexel Engineering
Electrical and Computer Engineering

Philadelphia, 8 November 2014

To the Search Committee,

Please find enclosed my application for a Faculty Position in Mechanical Engineering. I believe, and hope that the committee agrees, that I am an excellent candidate for this position, based on the quality of my research, my professional and teaching credentials, and the relevance of my research to trends in robotics, haptics, cyber-physical systems, sensors, neuroscience, and medicine.

My research interests are diverse, and are motivated by a vision of future engineering systems that can utilize the sense of touch, through sensing and feedback, in ways that are as diverse, natural, and effective as biological systems are able to do. I find that this is a focus that excites interest from both graduate and undergraduate students, and have been fortunate to be able to involve students of all levels in my research.

The laboratory I direct at Drexel University is funded through awards from the National Science Foundation and Independence Blue Cross. Through it, I undertake research on the science and engineering of human human haptic (touch) perception and interaction, on new electronic technologies for capturing and reproducing touch sensations, and on applications of the resulting advancements in robotics, virtual reality, and medicine.

I have been a faculty member at Drexel University since the start of 2013. I completed a PhD in Electrical and Computer Engineering at McGill University in 2011, and a postdoctoral fellowship at the Institute of Intelligent Systems and Robotics at UPMC Université Paris 6 in 2012. My Bachelor and Master's degrees are in Physics. I have published more than 45 peer-reviewed scientific articles or chapters, have edited two recent volumes on interaction in virtual reality, and have received several awards for my research. I have a strong record of professional leadership, and have been successful at fundraising (including more than $2M in past research funding). I have been fortunate to teach both graduate and undergraduate courses in engineering at several universities, and have enjoyed supervising a wide range of interdisciplinary student projects in engineering.

Included with this application are the following documents:

- This cover letter
- Curriculum vitae, including list of publications
- Statement of research highlights and plans
- Statement of teaching philosophy
- Contact information for references

Please feel free to contact me for any further information. Thank you for your consideration.

Sincerely,
Yon Visell

Yon Visell

Haptics, Robotics, Sensors, Virtual Reality

Drexel University, Philadelphia PA
www.re-touch-lab.com
yon.visell@gmail.com
(267) 800 8960

Education

2011	**PhD** Electrical and Computer Engineering	McGill University
1999	**MA** Physics	The University of Texas, Austin
1995	**BA** Physics	Wesleyan University

Experience

2013–Present	**Assistant Professor** of Electrical and Computer Engineering	Drexel University
2011–2012	**Postdoctoral Researcher**	Université Pierre et Marie Curie
2006–2011	**Research Fellow**	Zurich University of the Arts
1999–2004	**Industrial Research and Development**	Ableton, Loquendo, ARL Austin

Research Highlights

Author of over 40 papers or chapters in science and engineering, and two pending technology patents.

Editor of two books on virtual reality, including *Human Walking in Virtual Reality*, Springer Series in Engineering, 2013.

h-index: 14 (Google Scholar).

Best paper award, IEEE Haptics Symposium 2010. Ranked 1st from more than 100 submissions.

Finalist for best paper award, Eurohaptics Symposium 2014. Ranked 4th from more than 200 submissions.

Nominated for Eurohaptics Society best PhD thesis award 2011.

Designer and author of audio DSP algorithms for multiple award winning music software *Ableton Live*.

Current research projects on wearable haptics, soft tactile sensors, medical sensing, and haptic teleoperation for soft robotics.

Funding Sources

NSF Cyber Physical Systems, CPS: Breakthrough: From Whole-Hand Tactile Imaging to Interactive Simulation (ID 1446752), 2015-2017. $500,000. Sole PI.

Independence Blue Cross, Medical Simulation Grant. "Wearable Soft Electronic Sensing for Palpation Simulation, Assessment, and Documentation". 2015. $50,000. With D. Scott Lind, M.D.

Awarded more than $2M in research funding in North America and Europe to date. Several proposals pending or in preparation.

Service Highlights

Lead Guest Editor IEEE Transactions on Haptics, Special Issue on Active Touch Sensing (announced).

Organizing committee & local arrangements chair for IEEE Haptics Symposium 2016, the primary haptics conference in the USA.

Organizer of the IEEE/RSJ IROS 2014 Workshop on Active Touch Sensing in Robots and Animals, and the ACM CHI 2013 Course on Walking in VR, among others.

Teaching and Mentoring

Advisor to five current PhD students. The first will defend in 2016. Mentor to multiple graduate and undergraduate students.

Exhibition and outreach at internationally renowned venues including Centre Pompidou, SIGGRAPH Emerging Technologies, Ars Electronica, La Gaité Lyrique, the Philadelphia Science Festival, and others.

Responsible for the core graduate sequence on linear and nonlinear systems in the ECE Department at Drexel University.

Publications

Books

B1. F. Steinicke and Y. Visell and J. Campos and A. Lecuyer, Eds. (Eds.),
Human walking in virtual environments: Perception, technology, and applications.
Springer Verlag, 2013, Series in Engineering

B2. Federico Fontana, Yon Visell* (Eds.),
Walking with the Senses: Perceptual Techniques for Walking in Simulated Environments.
*Logos Verlag, 2012, (*Equal contrib.)*

Journal Articles, In Preparation

J1. Hengjun Cui, Yon Visell,
Heirarchical Synergies and Grasping Statistics.
***J Neurophysiology* (2014)**

J2. Marco Janko, Richard Primerano, Yon Visell,
Instability of Frictional Forces During Sliding of a Finger on a Textured Surface.
***Journal of Biomechanics* (2014)**

J3. Bin Li, Adam Fontecchio, Yon Visell,
Direct filament casting of microfluidic arrays for highly elastic capacitive tactile image sensors.
***Advanced Functional Materials* (2014)**

J4. Yitian Shao, Vincent Hayward, Yon Visell,
Spatial Patterns of Cutaneous Vibration During Whole-Hand Haptic Interaction.
***Proc Nat Acad Sci* (2014)**

J5. Yon Visell, Keerthi Duraikkannan, Vincent Hayward,
Augmenting Haptic Softness via Force-Rate Contingent Vibration Feedback.
***IEEE Trans on Haptics* (2014)**

Journal Articles, Submitted

J1. Yon Visell, Guillaume Millet,
Fracture in Disordered Heterogeneous Materials as a Stochastic Process.
***Phys Rev E* (arXiv preprint arXiv:1408.5303) (2014)**

Journal Articles, Published

J1. Yon Visell,
Fast, physically accurate rendering of multimodal signatures of distributed fracture in heterogeneous materials.
***IEEE Trans. on Visualization and Computer Graphics* (2014)** *, (To Appear)*

J2. Bruno L Giordano, Yon Visell, Hsin-Yun Yao, Vincent Hayward, Jeremy R Cooperstock, Stephen McAdams,
Identification of walked-upon materials in auditory, kinesthetic, haptic, and audio-haptic conditions.
***J Acoust Soc Am* 131.5 (2012)** *, pp. 4002–14*

J3. Guillaume Lemaitre, Olivier Houix, Patrick Susini, Yon Visell, Karmen Franinovic,
Feelings elicited by auditory feedback from a computationally augmented artifact.
***IEEE Transactions on Affective Computing* 3.3 (2012)** *, IEEE, pp. 335–348*

J4. Yon Visell,
Frictional stick-slip oscillation as a first-passage problem.
***EPL (Europhysics Letters)* 95.6 (2011)** *, IOP Publishing, p. 68006*

J5. Yon Visell, Bruno L Giordano, Guillaume Millet, Jeremy R Cooperstock,
Vibration influences haptic perception of surface compliance during walking.
***PLoS one* 6.3 (2011)** *, Public Library of Science, e17697*

J6. Guillaume Lemaitre, Olivier Houix, Yon Visell, Karmen Franinović, Nicolas Misdariis, Patrick Susini,
Toward the design and evaluation of continuous sound in tangible interfaces.
***International Journal of Human-Computer Studies* 67.11 (2009)** *, Academic Press, pp. 976–993*

J7. Yon Visell,
Tactile sensory substitution: Models for enaction in HCI.
***Interacting with Computers* 21.1-2 (2009)** *, Oxford University Press, pp. 38–53*

J8. Yon Visell, Federico Fontana, Bruno L Giordano, Rolf Nordahl, Stefania Serafin, Roberto Bresin,
Sound design and perception in walking interactions.
***International Journal of Human-Computer Studies* 67.11 (2009)** *, Elsevier, pp. 947–959*

J9. Yon Visell, Alvin Law, Jeremy R Cooperstock,
Touch is everywhere: Floor surfaces as ambient haptic interfaces.
***IEEE Transactions on Haptics* 2.3 (2009)** *, IEEE, pp. 148–159*

J10. Yon Visell,
Spontaneous organisation, pattern models, and music.
***Organised Sound* 9.2 (2004)** *, Cambridge University Press, pp. 151–165*

Conference Proceedings, Peer Reviewed

C1. Hengjun Cui, Yon Visell,
Linear and Nonlinear Subspace Analysis of Hand Movements During Grasping
Proc. IEEE Engineering in Medicine and Biology Conference (EMBC), 2014

C2. Marco Janko, Richard Primerano, Yon Visell,
Scale dependence of force patterns during the scanning of a surface by a bare finger
Proc. Eurohaptics, 2014
Finalist for best paper (Top 4 out of over 200 submissions)

C3. Hikaru Nagano, Yon Visell, Shogo Okamoto,
On the Effect of Vibration on Slip Perception During Bare Finger Contact
Proc. of Eurohaptics, 2014

C4. Yon Visell, Keerthi Adithya Duraikkannan, Vincent Hayward,
A Device and Method for Multimodal Haptic Rendering of Volumetric Stiffness
Proc. Eurohaptics, 2014

C5. Jeffrey Kahn, David Peretz, James Tangorra, Yon Visell,
Touch Sensing in a Robotic Fish Fin (demonstration)
Living Machines: The International Conference on Biomimetic and Biohybrid Systems, 2013

C6. Yon Visell, Vincent Hayward,
An asymmetry in force perception contingent on motion reversal
Proc. IEEE World Haptics Conference (WHC), 2013

C7. Amir Berrezag, Yon Visell, Vincent Hayward,
Compressibility and crushability reproduction through an amorphous haptic interface (demonstration)
Haptics: Perception, Devices, Mobility, and Communication, 2012

C8. Rishi Rajalingham, Yon Visell, Jeremy Cooperstock,
Probabilistic Tracking of Pedestrian Movements from In-floor Force Measurements
Proc. 7th Canadian Conference on Computer and Robot Vision (CRV'10), 2010

C9. Yon Visell, Jeremy R Cooperstock,
Design of a vibrotactile display via a rigid surface
Proc. IEEE Haptics Symposium, 2010
Awarded Best Paper (From over 100 submissions)

C10. Yon Visell, Alvin Law, Jessica Ip, Severin Smith, Jeremy R Cooperstock,
Interaction capture in immersive virtual environments via an intelligent floor surface.
Proc. IEEE Virtual Reality (VR), 2010

C11. Yon Visell, Severin Smith, Alvin Law, Rishi Rajalingham, Jeremy R Cooperstock,
Contact sensing and interaction techniques for a distributed, multimodal floor display
Proc. IEEE 3D User Interfaces (3DUI), 2010

C12. Alvin W Law, Jessica W Ip, Benjamin V Peck, Yon Visell, Paul G Kry, Jeremy R Cooperstock,
Multimodal floor for immersive environments
ACM SIGGRAPH Emerging Technologies, 2009

C13. Yon Visell, Alvin Law, Jeremy R. Cooperstock,
Toward Iconic Vibrotactile Information Display Using Floor Surfaces
Proc. IEEE World Haptics Conference (WHC), 2009

C14. R. Bresin, S. Della Monache, F. Fontana, S. Pappetti, P. Polotti, Y. Visell,
Auditory Feedback from Crumpling Sound Synthesis
Extended Abstracts on Human Factors in Computing Systems (ACM CHI'08), 2008

C15. Bruno L Giordano, Stephen McAdams, Yon Visell, Jeremy Cooperstock, Hsin-Yun Yao, Vincent Hayward,
Non-visual identification of walking grounds
Proc. of Acoustics 2008 (J Acoust Soc Am 123.5), 2008

C16. Thomas Hermann, John Williamson, Roderick Murray-Smith, Yon Visell, Eoin Brazil,
Sonification for sonic interaction design
CHI'08 Extended Abstracts Conf. Human Factors in Computing Systems, 2008

C17. AW Law, BV Peck, Y Visell, PG Kry, JR Cooperstock,
A multi-modal floor-space for displaying material deformation underfoot in virtual reality
Proc. IEEE International Workshop on Haptic Audio Visual Environments (HAVE), 2008

C18. D. Rocchesso, S. Serafin, F. Behrendt, N. Bernardini, R. Bresin, G. Eckel, K. Franinovic, T. Hermann, S. Pauletto, P. Susini, Y. Visell,
Sonic interaction design: sound, information and experience
Extended Abstracts on Human Factors in Computing Systems (ACM CHI'08), 2008

C19. Y Visell, J R Cooperstock, B L Giordano, K Franinovic, A Law, S McAdams, K Jathal, F Fontana,
A vibrotactile device for display of virtual ground materials in walking
Proc. Eurohaptics, 2008

C20. K. Adilogu, R. Annies, Y. Visell, K. Franinovic, C. Drioli,
Adaptive Bottle: Active Learning of User Preferences (demonstration)
Proc. Neural Information Processing Systems (NIPS'07), 2007

C21. Karmen Franinovic, Daniel Hug, Yon Visell,
Sound Embodied: Explorations of sonic interaction design for everyday objects in a workshop setting
Proc. Intl. Conf. on Auditory Display (ICAD), 2007

C22. Karmen Franinovic, Yon Visell,
New musical interfaces in context: sonic interaction design in the urban setting
Proc. Intl. Conf. on New interfaces for musical expression, 2007

C23. Yon Visell, Jeremy Cooperstock,
Enabling gestural interaction by means of tracking dynamical systems models and assistive feedback
Proc. IEEE Systems, Man and Cybernetics, 2007

C24. P. Susini, N. Misdariis, G. Lemaitre, O. Houix, D. Rocchesso, P. Polotti, K. Franinovic, Y. Visell, K. Obermayer, H. Purwins,
Closing the loop of sound evaluation and design
Proc. Perceptual Quality of Systems, 2006

C25. Yon Visell,
Gesture Learning and Sensorimotor Interaction Design
Proc. ACM Intl. Conf. on Multimodal Interfaces (ICMI), Doctoral Symposium, 2006

C26. Karmen Franinovic, Yon Visell,
Recycled Soundscapes
Proc. ACM Designing Interactive Systems (DIS'04), 2004

Book Chapters

Ch1. Yon Visell, Shogo Okamoto,
Vibrotactile Sensation and Softness Perception
in *Multisensory Softness*, M. Di Luca (Ed.),
Springer Verlag, 2014

Ch2. Maud Marchal, Gabriel Cirio, Yon Visell, Federico Fontana, Stefania Serafin, Jeremy Cooperstock, Anatole Lécuyer,
Multimodal Rendering of Walking over Virtual Grounds
in *Human Walking in Virtual Environments*, F. Steinicke, Y. Visell, J. Campos, A. Lecuyer, Eds.,
Springer New York, 2013

Ch3. Yon Visell, Roderick Murray-Smith, Stephen Brewster, John Williamson,
Continuous auditory and tactile interaction design
in *Sonic interaction design*, K. Franinovic, S. Serafin (Eds.),
MIT Press, 2013

Ch4. Yon Visell, Severin Smith, Jeremy R Cooperstock,
Interacting with Augmented Floor Surfaces
in *Human Walking in Virtual Environments*, F. Steinicke, Y. Visell, J. Campos, A. Lecuyer, Eds.,
Springer, 2013

Ch5. Yon Visell, Frank Steinicke, Jennifer Campos, Anatole Lécuyer,
Introduction: Human Walking in Virtual Environments
in *Human Walking in Virtual Environments*, Visell, Yon and Steinicke, Frank and Campos, Jennifer and Lécuyer, Anatole,
Springer Verlag, 2013

Ch6. Gabriel Cirio, Yon Visell, Maud Marchal, Anatole Lécuyer,
Multisensory and Haptic Rendering of Complex Virtual Grounds
in *Walking with the Senses*, F. Fontana, Y. Visell (Eds.),
Logos Verlag, 2012

Ch7. Vincent Hayward, Yon Visell, Stefania Serafin, Federico Fontana, Marco Civolani,
Novel haptic displays for walking interactions
in *Walking with the Senses*, F. Fontana, Y. Visell (Eds.),
Logos Verlag, 2012

Ch8. Yon Visell, Rishi Rajalingham, Jeremy Cooperstock,
A review of nonvisual signatures of human walking with applications to person tracking in augmented environments
in *Walking with the Senses*, F. Fontana, Y. Visell (Eds.),
Logos Verlag, 2012

Ch9. Yon Visell, Severin Smith, Jeremy Cooperstock,
Distributed human-computer interaction with augmented floor surfaces
in *Walking with the Senses*, F. Fontana, Y. Visell (Eds.),
Logos Verlag, 2012

Theses

T1. Yon Visell,
Walking on Virtual Ground: Physics, Perception, and Interface Design
PhD Thesis, McGill University, 2011

T2. Yon Visell,
String Theory on Quantum Tori
MA Thesis, The University of Texas, Austin, 1999

Patents

P1. Yon Visell, Karmen Franinovic, Alvin Law, Jeremy Cooperstock (McGill University),
Floor-Based Haptic Communication System
USPTO No. 20,100,308,982 (Pending)

P2. Yon Visell, Bin Li (Drexel University),
Stretchable Tactile Sensing Array
USPTO No. 62/045,273 (Provisional)

Funding

Proposals in Preparation

NSF National Robotics Initiative
NRI: Small: Underwater Co-Robots: Multimodal Exploration and Fluid-Mediated Interaction
Drexel University
Budget: $1,500,000
Role: Principal Investigator, with J. Tangorra, M. A. Hsieh

Proposals Under Review

NSF Information & Intelligent Systems
CRI: II-NEW: The Ocean in a Box - A Novel Marine Robotic Testing Facility
Drexel University
Budget: $930,000
Role: Co-Principal Investigator, with J. Tangorra, M. A. Hsieh

NSF Communications, Circuits, and Sensing Systems
Reconfigurable Microfluidic Antennas
Drexel University
Budget: $390,000
Role: Co-Principal Investigator, with T. Kurzweg, K. Dandekar

Current Funding Awards

NSF Cyber Physical Systems
CPS: Breakthrough: From Whole-Hand Tactile Imaging to Interactive Simulation (ID 1446752), 2015-2017
Drexel University
Budget: $500,000
Role: Principle Investigator (Sole PI)

Independence Blue Cross, Medical Simulation Grant
Wearable Soft Electronic Sensing for Palpation Simulation, Assessment, and Documentation, 2015
Drexel University
Budget: $50,000
Role: Principal Investigator, with D. Scott Lind, M.D.

Past Funding Awards

EU FP7 ICT-FET Cognitive Robotics Initiative, 2012-
WEARHAP: Distributed robotic interfaces for wearable haptic interaction
UPMC Univ. Paris 06, U. Sienna (IT), U. Pisa (IT), TU Munich, 6 others
Budget: 7M Euro (Local budget: 600K Euro)
Role: Local project coordinator, Coauthored proposal (PI: D. Pratichizzo, U. Siena)

EU FP7 ICT-FET project NIW: Natural Interactive Walking (no. 222107), 2008-2011
Additional funding from Quebec Ministry of Economic Development (Separate grant)
Partners: McGill Univ. (CA), INRIA-IRISA (FR), UPMC Paris 6 (FR), Aalborg Univ. (DK), Univ. Verona (IT)
Budget: 1.8M Euro
Role: Conceived project, Lead author of proposal, Coordinated research (McGill Univ.)

EU FP6 NEST Pathfinder (no. 029085), 2006-2009
CLOSED: Closing the Loop of Sound Evaluation and Design
Partners: Zurich Univ. of the Arts (CH), IRCAM (FR), TU Berlin (DE), Univ. Verona (IT)
Budget: 1.5M Euro
Role: Conceived project, Lead author of proposal, Research, coordination, financial admin. (Zurich)

EU ESF/COST Action (no. IC0601), 2007-2011
SID: Sonic Interaction Design
Budget: 1.6M Euro
Partners: 25 countries represented (approx.)
Role: Coauthored proposal, Management committee member, National delegate (Canada)

Professional Experience

2013–Present	**Assistant Professor** of Electrical and Computer Engineering	**Drexel University** RE Touch Lab Director
2011–2012	**Postdoctoral Researcher**	**Université Pierre et Marie Curie** Prof. V. Hayward, PI
2006–2011	**Research Fellow**	**Zurich University of the Arts**
2005-2010	**Graduate Researcher**	**McGill University** Center for Intelligent Machines & CIRMMT Prof. J. Cooperstock, PI
2006	**Faculty Lecturer**	**McGill University** Dept. of Electrical and Computer Engineering
2006 – 2009	**Visiting Professor**	**Nuova Accademia di Belli Arti** Department of Design
2005 - 2006	**Adjunct Professor**	**Concordia University**, Montreal Intermedia and Cyberarts Program Department of Studio Arts
2004	**Founder and Co-Director**	**Zero-Th Association** (http://www.zero-th.org) Interaction design practice
2004	**Visiting Researcher**	**Interaction Design Institute Ivrea** (IDII), Italy
2001 – 2003	**Principal DSP Engineer, Audio**	**Ableton** (http://www.ableton.com) Award-Winning Music Software Berlin, Germany
1999 – 2001	**Research Scientist, Speech recognition**	**Loquendo Inc.** Now: **Nuance Inc.** (by aquisition) Formerly: **Vocal Point Inc.** (by aquisition) San Francisco, USA
1999	**Graduate Researcher, Sonar**	**Applied Research Laboratories** Sonar Development Division Austin, TX
1997 – 1999	**Graduate Researcher**	**University of Texas-Austin** Center for Particle Physics Prof. Yuval Ne'eman, PI
Summer 1995	**Summer Research**	**University of Texas-Austin** Center for Relativity
Summer 1994	**Engineering technician, Robotics**	**Hine Design** (now **Lam Research**) Redwood City, CA

Awards

Best Paper, IEEE Haptics Symposium 2010. Ranked 1st from more than 100 submissions.

Finalist for Best Paper, Eurohaptics Symposium 2014. Ranked 4th from more than 200 submissions.

Nominated for Eurohaptics Society best PhD thesis award 2011.

Multiple industry awards for Ableton Live music software, including: Keys magazine, Macworld, Keyboard magazine, Future music, MacAddict, Mac Life, Remix, Computer Music, Electronic Musician, DJ Tech, PC World, and MusicTech. The software is used by many notable artists, including several Grammy and Oscar award winning musicians, composers, and producers.

Intel Corporation Galileo 2 Development Board Grant for Education ($1200)

NSERC Industrial graduate fellowship, Electronic Arts 2009 (declined for administrative reasons).

Entrance fellowship (competitive) Dept. of Electrical and Computer Engineering, McGill University.

Student research award Center for Interdisciplinary Research in Music, Media, and Technology, McGill Univ., 2006.

Student research award Center for Interdisciplinary Research in Music, Media, and Technology, McGill Univ., 2007.

Graduate research support Department of Electrical and Computer Engineering, McGill Univ. (J. Cooperstock).

Graduate research support Department of Psychology, McGill Univ. (D. Levitin).

Graduate fellowship (3 years), Department of Physics, The University of Texas at Austin.

1st Place, Hughes Corporation High School Physics Competition.

American High-School Invitational Mathematics Examination (AIME) competition regional finalist.

National Merit Scholarship semifinalist.

National French language examination 1st place (Arizona) 4th place (southwest region).

Mathcounts, junior high school mathematics contest, state championship team.

Professional Service

Lead Guest Editor IEEE Transactions on Haptics, Special Issue on Active Touch Sensing (announced).

Organizing committee & local arrangements chair for IEEE Haptics Symposium 2016, the primary haptics conference in the USA.

Organizer of the IEEE/RSJ IROS 2014 Workshop on Active Touch Sensing in Robots and Animals

Organizer ACM CHI 2013 Course on Walking in VR

NSF Reviewer, Division of Information & Intelligent Systems

Journal Reviewing

PLoS one

Behavioral Brain Research

IEEE Transactions on Haptics

IEEE Transactions on Mechatronics

IEEE Transactions on Systems, Man, and Cybernetics

IEEE Transactions on Human-Machine Systems

Journal of Experimental Psychology

Acta Psychologica, Elsevier

Displays

International Journal of Human-Computer Interaction Studies, Elsevier

Assistive Technology (Journal), Taylor & Francis

Conference Committees

Organizing Committee, IEEE Haptics Symposium, 2016

Editorial Committee, IEEE World Haptics Conference, 2015

Awards Committee, Eurohaptics Symposium, 2014

Program Committee, IEEE Virtual Reality Conference, 2014 (IEEE VR)

Program Committee, Sound and Music Computing Conference, 2011 (SMC)

Program Committee, ACM International Conference on Multimodal Interfaces, 2007 (ICMI)

Conference Reviewing

ACM Conference on Human Factors in Computing Systems (ACM CHI)

IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

IEEE Haptics Symposium

Eurohaptics Symposium

IEEE World Haptics Conference

IEEE International Symposium on Robots and Human Interactive Communication (Ro-Man)

ACM Conference on Multimodal User Interfaces (ACM IMUI)

IEEE International Symposium on 3D User Interfaces (3DUI)

International Symposium on Haptic and Audio Interaction Design (HAID)

International Computer Music Conference (ICMC)

Laval Virtual - International Conference on Virtual Reality (VRIC)

International Conference on Auditory Display (ICAD)

Sound and Music Computing Conference (SMC)

Courses Taught

● denotes a course that was newly designed and taught

♢ denotes significant revisisions to material of a course that was taught

Drexel University, Department of Electrical and Computer Engineering

ECE 490/690: **Haptic Engineering** (Spring 2013 ●, Spring 2015)

ECES 511: **Fundamentals of Systems I** (Fall 2013 ♢, Fall 2014)

ECES 512: **Fundamentals of Systems II** (Winter 2013-4 ♢, Winter 2014-5)

ECES 513: **Fundamentals of Systems III** (Spring 2014 ♢, Spring 2015)

McGill University, Electrical and Computer Engineering Department

ECSE 526: **Artificial Intelligence** (Spring 2006 ♢)

Nuova Accademia di Belle Arti Milano, Design Department

Interaction Design (Spring 2009 ●)

University of the Arts (ZHdK) Zurich, Interaction Design Program

Interaction Design (Summer 2006)

Concordia University, Montreal, Intermedia and Cyberarts Program

IMCA 221: **Interactive Programming for Artists** (Fall 2005 ♢)

The University of Texas-Austin, Department of Physics

PHY101L: **Laboratory for Mechanics** (Instructor)

Mentoring

Advisor to five PhD students in the Electrical and Computer Engineering Department at Drexel University:

Bin Li
Thesis Title: Soft tactile sensing for medical palpation.
Expected graduation in 2016

Marco Janko
Thesis Title: Recovering surface microgeometry through active touch.
Expected graduation in 2017

Phil Hengjun Cui
Thesis Title: Haptic perceptual information processing.
Expected graduation in 2017

Yitian Shao
Thesis Title: Mechanical waves accompanying whole hand haptic interaction.
Expected graduation in 2018

Xianda Long
Thesis Title: Soft tissue deformation and whole hand haptic perception.
Expected graduation in 2017

Advisor to two interdisciplinary senior engineering design teams at Drexel University, 2014-2015.

Advisor to one visiting PhD student in the ECE Department at Drexel University:

Hikaru Nagano (Nagoya Univ.)
Project Title: Vibration signatures of incipient slip in bare finger contact, 2014

Advisor to one Master's degree student in the ECE Department at Drexel University:

Abhilash Iyer
Thesis Title: Estimating soft tissue deformations accompaning finger movements
Expected graduation in 2015

Advisor to one undergraduate summer research coop student in the ECE Department at Drexel University:

Bengisu Ozbay
Project Title: The perceptual space of hand movements
Summer 2014

Current supervisor and mentor to six additional graduate and undergraduate student researchers, and more than a dozen former graduate and undergraduate students.

Service on PhD Committees

Heather Culbertson, University of Pennsylvania, Mechanical Engineering (Advised by Prof. K. Kuchenbecker)

Jeff Gregorio, Drexel University, Electrical and Computer Engineering (Advised by Prof. Y. Kim)

Jeff Scott, Drexel University, Electrical and Computer Engineering (Advised by Prof. Y. Kim)

Michael Caro, Drexel University, Electrical and Computer Engineering (Advised by Prof. Y. Kim)

Matthew Prockup, Drexel University, Electrical and Computer Engineering (Advised by Prof. Y. Kim)

David Grunwald, Drexel University, Electrical and Computer Engineering (Advised by Prof. Y. Kim)

Jared Coyle, Drexel University, Electrical and Computer Engineering (Advised by Prof. A. Fontecchio)

Zhihuan Wang, Drexel University, Electrical and Computer Engineering (Advised by Prof. B. Nabet)

Other University Service

Systems Area Committee, ECE Department, Drexel University

Programming Education Subcommittee, ECE Department, Drexel University

Nomination and Recognition Subcommittee, ECE Department, Drexel University

Weekend Open House, ECE Department, Drexel University

Accepted Students Day, ECE Department, Drexel University

Organization of Courses and Workshops

2014 IEEE/RSJ IROS Workshop on Active Touch Sensing in Humans and Robots, Chicago, USA

2013 ACM CHI Course on Interactive Walking in VR, Paris, France

2012 Hands-on Haptics, point Atelier, La Gaité Lyrique, Paris

2012 Workshop on haptics and movement, Ecole des Beaux Arts, Strasbourg

2010 Interactive Sonification Workshop, Deutsch Telekom Labs, Berlin

2009 CIRMMT Workshop on Multimodal Interaction, Montreal

2008 ACM CHI Workshop on Sonic Interaction Design, Firenze

2008 Workshop on Tangible Auditory Interfaces, Oboro Centre, Montreal

2006 Tangible and auditory interaction design, Advanced Sound (II) Course, Concordia University

2006 Tangible human-computer interaction and Ubiquitous computing, HCI Course, McGill University

2004 X-Med-K Workshops (experimental media art), FoAM vzw, Brussels

Exhibitions, Performances, and Outreach

2014 Philadelphia Science Festival

2014 International Noise Conference (with Irene Moon), Miami

2013 Silent Barn (with Irene Moon), Brooklyn, New York

2012 Noise Festival (with Irene Moon), Red Light Room, Brooklyn, New York

2014 Best of Nerd Night (with Irene Moon), New York

2012 Fondation Claude Verlan – Musée de la Main, Lausanne, Switzerland

2010 SIGGRAPH Emerging Technologies, New Orleans

2010 IEEE Haptics Symposium, Boston

2009 International Design Biennale, St Etienne, France

2009 OBORO Center for the Arts, Montreal, Canada

2005 Phaeno Science Center, Wolfsburg, Germany

2004 Ircam/Centre Pompidou, Paris, France

2004 Happy New Ears festival, Kortrijk, Belgium

2004 Next 5 Minutes festival, Amsterdam, Netherlands

2003 FoAM, Brussels, Belgium

2002 Hippodrome Circus, Great Yarmouth, UK

2001 Ars Electronica, Linz, Austria

2000 Deluxe Music Festival, Tokyo, Japan

Discography

1996 Public Safety LP, with Brett Larner, Public Safety Records

2001 Live at the Deluxe Music Festival, Deluxe Records

2004 Hmmm, in: Organized Sound Annual, CD Compilation, Cambridge Univ. Press

2014 Three Men in a Tub, as Moth Magnet (with Irene Moon), in: The Thirteenth Letter, WFMU Records

Consulting

3M Corporation (Robotics)

L-3 Communications (Smart Displays)

Presentations, Selected

Engineering Touch, Inst Res Cognitive Sciences, University of Pennsylvania, November, 2014.

Engineering Touch, University of Florida, October, 2014.

Engineering Touch, Psychonomic Society, Tactile Research Group Workshop, 2013.

Reverse Engineering the Sense of Touch, School of Biomedical Engineering, Drexel University, 2013 Hands-

on Haptics. Ecole des Beaux Arts de Strasbourg, April, 2012.

Tactile Interaction with Augmented Floor Surfaces. NTT Research Laboratories, Atsugi, Japan, Dec., 2010.

Walking in Virtual Worlds. Department of Computer Science, University of Verona, April, 2009.

Augmented Reality Floor Surfaces, Design Symposium Pecha Kucha, Montreal, 2008.

Haptic and auditory interaction with ground surfaces. CIRMMT Workshop on Multimodal Integration, Montreal, 2008.

Multimodal Interaction with Virtual Ground Surfaces. REPARTI McGill University, 2008.

Multisensory Display of Virtual Ground Materials. CIRMMT Workshop on Multimodal Influences on Perceived Self Motion, McGill University, 2008.

Sonic Interaction Design and Public Spaces. Design Symp. Pecha Kucha, Montreal, 2007.

Sensorimotor Human Computer Interaction. AI Lab, University of Zurich, 2007.

Machine Learning Methods for Sensorimotor Human Computer Interaction, BIRG Lab, EPFL, 2007.

Press, Selected

New Scientist - Magnetic bricks beam 3D objects into your screen - [31.03.2013]

Technology Review (MIT) – The Year in Enhancing Reality [28.12.2010]

New Scientist – Nokia touchscreen creates texture illusion [28.10.2010]

New Scientist – Putting the touch into touchscreens [26.04.2010]

New Scientist – Touch floors could be next step in computer interfaces [13.04.2010]

Technology Review (MIT) – Augmented-Reality Floor Tiling [28.04.2010]

Fast Company – Augmented Reality Floor Simulates Walking [29.04.2010]

Boing Boing – Augmented reality feedback flooring [29.04.2010]

Wired Magazine Online – Augmented Reality: Haptic flooring [29.04.2010]

Communications of the ACM – Augmented-Reality Floor Tiling [29.04.2010]

Future Digital Life – 10 Cool Things Going On Right Now in Augmented Reality [05.2010]

Golem.de – Ein Touchscreen für die Füße [29.04.2010]

Associated Press [08.2009] (NY Times, Minn. Star Trib, San Diego Trib, ...)

KTIRIO (Architecture) [09.2010]

ISPR Presence News [30.04.2010], Corriere della Sera (IT) [17.05.2010]

Toronto Sun [29.04.2010], News of the Weird [30.04.2010]

FloorCrunch.com [30.04.2010], Magyar Nemzet (Hungarian) [02.05.2010], NeoTeo.es [03.05.2010], Others ...

Musical Training

Acoustic Guitar Performance under Stephanie Khoury, Montreal Canada

Electronic and Computer Music Composition under Alvin Lucier and Ron Kuivila, Wesleyan University

Jazz Performance (Bass) under Roy Wiseman and Anthony Braxton, Wesleyan University

Youth Orchestra, Tucscon Junior Strings (Grade 7-12)

Arts Funding

Support from the Daniel Langlois Foundation for project TGarden.

Support from the City of Wolfsburg Germany for project Lyta.

Support from Culture 2000 framework of the European Commission for project Txoom.

Other Synergistic Activities

Director for experimental music and on-air DJ at WESU radio, Middletown, CT

Programming and Software Development: C/C++, Java, Matlab, Mathematica, Maple, Perl, Max/MSP, Supercollider, MCU/DSP

Electronic music, Computer music, Guitar, Voice, Digital and analog sound synthesis, Video processing, Physical computing

Electronic and Computer Engineering, Mechatronics, Digital and analog electronics and control design, CAD, Rapid prototyping, Interaction design methods

Personal Detail

Citizenship: USA

Language Skills: English (native), French (fluent), Serbo-Croatian (intermediate), German (basic-intermediate), Italian (basic).

References

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Research Highlights

My research interests have diversified in the year that has passed since I established my lab at Drexel University. My work is motivated by the overarching goal of advancing our understanding of **haptic (touch) perception** in order to create new **technologies for haptic display, sensing, and robotics** – expanding our ability to interact with real environments and digital content through the sense of touch. I draw on methods from engineering, computer science, and neuroscience to investigate the technological, biological and computational foundations of haptic (touch) sensing. I use these investigations to guide the design of **new haptic interfaces, tactile sensors, and haptic display methods**, that enable us to precisely quantify and stimulate the sense of touch, providing unique windows onto haptic perception. I also use them to advance applications in **robotics, medicine, and virtual reality**, toward improving haptic interaction with virtual environments, medical diagnosis, and bilateral teleoperated control of compliant robots in challenging environments.

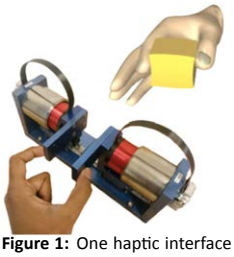

Figure 1: One haptic interface developed by the PI to study multimodal haptic perception.

A longstanding goal of engineering research has been to realize haptic displays that are as effective at conveying touch as video monitors are at producing visual stimuli or audio headphones at reproducing sound, but this objective remains far from reality. One reason is that haptic stimuli are difficult to specify and even harder to reproduce. This is due to their high-dimensionality – they consist of movement-dependent, time varying strain distributions in the skin – and to their strong dependences on motor activity and contact mechanical interactions with the environment. Consequently, a key objective of my research is to develop new **tactile sensing and actuation methods** for precisely capturing and reproducing mechanical stimuli that are felt when real objects are touched. These advances in sensing and actuation are also catalyzing emerging applications in **medical sensing** and **robotics**, as further described below.

Project 1: From Whole Hand Haptic Sensing to Wearable Robotics

This project seeks to enable **wearable cyber physical systems** that allow their users to **touch, feel, and manipulate virtual objects** with the whole hand (Fig. 2). With my students and collaborators, I am developing techniques for capturing and reproducing haptic stimuli that are felt during object palpation and grasping. We capture these signals with contact and non-contact sensing, using deformable image registration methods for tracking pose-dependent deformations of the skin, and input from wearable MEMS accelerometer arrays and laser doppler vibrometry to sense contact-induced transient mechanical signals that propagate widely within the skin when objects are touched. We then seek to develop models for the dependence of these high-dimensional signals on hand kinematics and object contacts. Finally, we are developing distributed, skin-conforming actuation methods to reproduce them via wearable haptic interfaces. The main outcome of this project will be to enable virtual touch sensations to be felt by the hand during interaction with real and computational objects, yielding novel experiences that span the physical and computational worlds, for medicine, personal technology, and robotics.

Current Funding

This project is funded by the **NSF Cyber Physical Systems** program via a single-investigator award “CPS: Breakthrough: A Wearable CPS for Haptic Interaction in VR: From Whole-Hand Tactile Imaging to Interactive Simulation” for $500,000 from January 2014 to December 2016.

Publications

H. Cui, Y. Visell, Linear and Nonlinear Subspace Analysis of Hand Movements During Grasping. Proc. of EMBC 2014.

M. Janko, R. Primerano, Y. Visell, Scale dependence of force patterns during the scanning of a surface by a bare finger. Proc. Eurohaptics, 2014. (Finalist, Best Paper Award)

H. Cui, Y. Visell, Heirarchical Synergies and Grasping Statistics. In preparation for submission to: J Neurophysiology.

Y. Shao, V. Hayward, Y. Visell, Spatial Patterns of Cutaneous Vibraton During Whole-Hand Haptic Interaction. In preparation for submission to: Proc Nat Acad Sci.

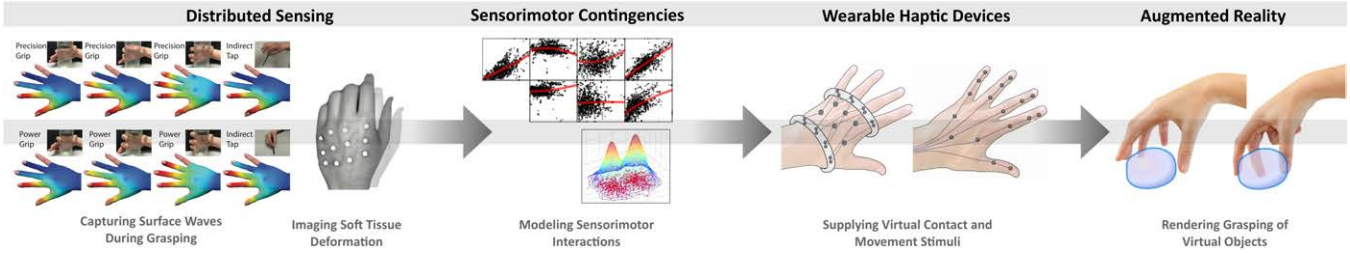

Figure 2: New methods for contact and non-contact sensing of mechanical signals during whole hand interaction guide the development of wearable cyber physical technologies.

Project 2: Soft Tactile Sensors for Healthcare and Robotics

This project aims to advance the state of the art in the design and fabrication of **skin-like electronic sensors** in order to make it possible to accurately capture contact mechanical interactions with touched objects or tissues. In my lab, we fabricate thin, deformable multi-layer electronic sensing devices using methods from **soft lithography and microfluidics** with low modulus elastomers (Fig. 3). Mechanical contacts with the resulting sensors are captured through electronic changes they produce as they undergo deformation. Through these devices, we are pursuing new applications in wearable **tactile sensing for medicine**, where palpation (the application of touch) is among the most widely applied, but least documented, diagnostic techniques, and in **robotic sensing**, to enable robots to more effectively interact with their environments through touch.

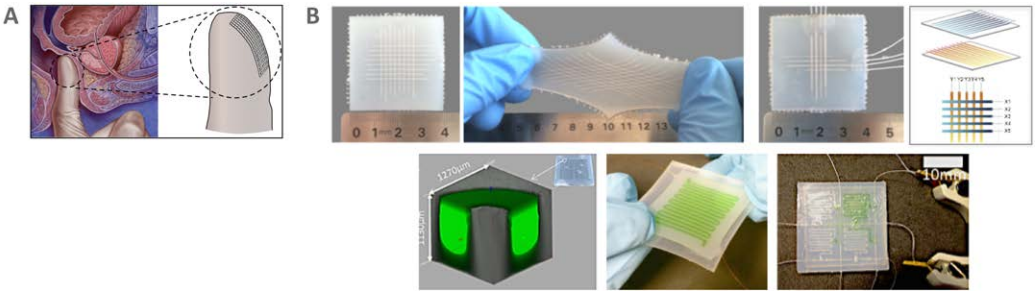

Figure 3: The project is pioneering the development of soft tactile sensors for applications (**A**) including medical sensing for prostrate examinations, using methods (**B**) from soft lithography and microfluidics to design and fabricate functional devices that achieve high sensitity, spatial resolution, and high conformability (Li and Visell, 2014).

Current Funding

This project is funded by the **Independence Blue Cross Medical Simulation Grant Program** via an award entitled "Wearable Soft Electronic Sensing for Palpation Simulation, Assessment, and Documentation", with co-PI D. Scott Lind M.D., Drexel University College of Medicine. The award for $50,000 runs from October 2014 through September 2015.

Publications

B. Li, Y. Guan, A. Fontecchio, Y. Visell, Direct filament casting of microfluidic arrays for highly elastic capacitive tactile image sensors. In preparation for submission to: Advanced Functional Materials.

B. Li, Y. Visell (Drexel Univ.), Soft Tactile Microfluidic Sensors. USPTO Patent Application No. 62/045,273 (Provisional), 2014.

Additional Research Projects

Compliant Underwater Robotics: This research aims to extend the capabilities of robots in underwater environments by enabling them to actively sense and interact with underwater objects, biological specimens, or other features. The project aims to contribute to the field of compliant robotics by informing the design and control of bio-inspired underwater manipulators that are subject to large fluidic disturbances, and by empowering robots to **control and exploit underwater flows for indirect manipulation**. It will extend mechanical sensing methods in order to capture flow dynamics, improving control, and will address the impact of fluid on active touch sensing, creating knowledge on the effects of fluidic loading on sensing structures and on the fluid-mediated responses of palpated objects. This work is the subject of pending proposals to the **NSF National Robotics Initiative** ($1.5M) and to the **NSF CISE Research Infrastructure** program ($1M), with co-investigators J. Tangorra and M.A. Hsieh (Drexel Univ.).

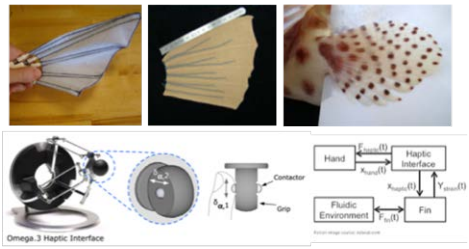

Figure 4: The project investigates compliant underwater robots that use fluid flow to interact in challenging aquatic environments.

Haptic Perception and Interaction in VR: This research aims to illuminate the basis of human sensorimotor interaction and movement in real and virtual environments, and to enable rich experiences of touching and interacting with objects in VR. One goal of this work is to explain the role of **touch feedback in the body's sense of movement**, during dynamic **balance, locomotion, and grasping**. Although conventional accounts of somatosensory information processing distinguish between tactile sensations of the skin and kinesthetic sensations of movement and force that are mediated by other organs, recent investigations reveal a surprising extent of interaction between these sensory modalities. By studying these interactions, I aim to enable the design of new, efficient technologies for providing force and simulated movement feedback in real and virtual environments. I have been awarded funding for this work through three multi-institution EU projects and through the Ministry of Economic Development of Quebec, Canada. This research has resulted in two edited books, and numerous other publications: see Curriculum Vitae.

Figure 5: The project investigates the role of touch feedback in kinesthesia, the brain's sense of movement, during object manipulation and in walking (as shown, Visell 2010-2013).

Teaching Statement

I have been fortunate to be involved in instruction and curriculum development at all levels of university education, and have contributed to graduate and undergraduate teaching, mentoring, and supervision at several universities. I have contributed more broadly to the profession and to the public at large, through courses, workshops, science festivals, public lectures, performances, and other forms of outreach. My approach to these activities is intended to be engaging and learner-centered. I aim to empower students to take leading roles in their education through active learning in various forms. I hope to enable them to acquire the broader sets of intellectual and problem solving tools that they need in order to grow and apply their knowledge, to ultimately to achieve their goals – meeting the demands that they will encounter in industry, or addressing the challenges that they themselves will decide to take on in an increasingly entrepreneurial world.

Teaching: To date, I have taught four different courses in the College of Engineering at Drexel University, one course in the Faculty of Engineering at McGill University, three courses in interaction design programs (which combine engineering with art and design), and one expert course on virtual reality tailored to the human-computer interaction research community. A complete list is provided in my Curriculum Vitae. The five engineering courses that I have taught are:

Drexel University, Electrical and Computer Engineering Department

- ECES 511: Fundamentals of Systems I (Fall 2013 ♢, Fall 2014)
  Topic: Linear Systems Theory (Graduate)
- ECES 512: Fundamentals of Systems II (Winter 2013 ♢, Winter 2014)
  Topics: Linear Systems, Control and Observation (Graduate)
- ECES 513: Fundamentals of Systems III (Spring 2014 ♢, Spring 2015)
  Topics: Nonlinear Systems Theory and Control (Graduate)
- ECES 490/690: Haptic Engineering (Spring 2013 ●, Spring 2014)
  Topics: Human Haptics, Haptic Device Engineering, Haptic Rendering (Graduate and Undergraduate)

McGill University, Electrical and Computer Engineering Department

- ECSE 326/526: Artificial Intelligence (Spring 2006 ♢)
  Topics: Artificial Intelligence and Machine Learning (Graduate and Undergraduate)

● Indicates an original course that was developed and taught.
♢ Indicates a course with significant original contributions to the curricula.

My academic training is relatively broad, and includes physics, electrical and computer engineering, and robotics. This enables me to teach a wide range of courses; From the core engineering curricula, they includes: systems, robotics, signals, transforms, control, and dynamics. My industrial experience in speech recognition research, audio DSP, and interactive technologies allow me to bring a unique perspective to related subjects, including machine learning, and audio and music DSP. I especially enjoy teaching classes that are more novel in the engineering curriculum, and that lie nearer to my research interests, including haptic engineering, embedded cyber physical systems, robotics, and virtual reality, and would welcome the opportunity to teach in such areas in the future.

Mentoring: I have mentored students from electrical, mechanical, and biomedical engineering at the graduate and undergraduate levels, through independent research projects, senior design projects, and graduate research supervision. I currently advise five PhD students, three masters students, and several more undergraduate students, including two interdisciplinary senior engineering design teams. Details are provided in my Curriculum Vitae.

In engineering education, we are fortunate that project-based work constitutes a key and integral part of the curriculum. Supervising such work poses unique challenges, such as matching activities to skills, aptitudes, and learning needs of students, guiding students in learning from the literature, and aiding them in project organization and team building. Although learning outcomes are also important, it is also rewarding when the systems that are designed exceed expectations. In Spring 2014, I was fortunate to advise a group of three students from our first year engineering design course. Drawing on ideas from the haptics research literature, this team augmented a state of the art haptic force feedback device with an additional rotational degree of freedom, and used it to render 3D object surface orientation as a means of conveying percepts of haptic shape through an interactive visuo-haptic simulation, a project that I am proud to feature on my lab's website.

One point that I emphasize to students is that every project provides us with a valuable and transformative opportunity to change our perspective from one that is inwardly directed, toward increasing our own knowledge and abilities, to one that aims at helping others, by engineering useful systems, and by creating knowledge that can benefit other people. I believe that this transition in perspective is a key step in the personal development of every engineer.