



FORM 100
Personal Data Form
PART I

Date

2012/10/28

Family name Kry	Given name Paul	Initial(s) of all given names PG	Personal identification no. (PIN) Valid 214237
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☐ I hold a faculty position at an eligible Canadian college
(complete Appendices B1 and C)

☐ I do not or will not hold an academic appointment at a
Canadian postsecondary institution

Place of employment other than a Canadian postsecondary
Institution (give address in Appendix A)

APPOINTMENT AT A POSTSECONDARY INSTITUTION

Title of position Assistant Professor	Tenured or tenure-track academic appointment	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Department Computer Science, School of	Part-time appointment <input type="checkbox"/>	Full-time appointment <input checked="" type="checkbox"/>
Campus	<ul style="list-style-type: none">For all non-tenured or non tenure-track academic appointment and Emeritus Professors, complete Appendices B & CFor life-time Emeritus Professor and part-time positions, complete Appendix C	
Canadian postsecondary institution McGill		

ACADEMIC BACKGROUND

Degree	Name of discipline	Institution	Country	Date yyyy/mm
Bachelor's	BMath	Waterloo	CANADA	1997 / 09
Master's	MSc	British Columbia	CANADA	2000 / 09
Doctorate	PhD	British Columbia	CANADA	2005 / 11

TRAINING OF HIGHLY QUALIFIED PERSONNEL

Indicate the number of students, fellows and other research personnel that you:

	Currently		Over the past six years (excluding the current year)		Total
	Supervised	Co-supervised	Supervised	Co-supervised	
Undergraduate	1		8	1	10
Master's	1	1	6	1	9
Doctoral	2	1		2	5
Postdoctoral			1		1
Others					
Total	4	2	15	4	25

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Kry

ACADEMIC, RESEARCH AND INDUSTRIAL EXPERIENCE (use one additional page if necessary)

Position held (begin with current)	Organization	Department	Period (yyyy/mm to yyyy/mm)
Assistant Professor	McGill	Computer Science, School of	2008/01
Post Doctoral Researcher	Université René Descartes, Paris 5, France	LNRS	2006/12 to 2008/01
Post Doctoral Researcher	INRIA Rhone Alps, France	EVASION	2005/12 to 2006/12
DSP Developer	Telexis Corporation	Video Compression Group	1998/05 to 1998/09
Software Developer	Televisse Systems	Search Group	1997/05 to 1998/05
Software Developer (co-op)	Nortel	Marne La Vallee, France	1996/02 to 1996/08
Robotics Programmer (co-op)	Canadian Space Agency	Space Mechanics	1995/01 to 1995/05
Research Programmer (co-op)	Communications Research Centre	New Broadcast Technologies	1993/09 to 1994/01

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RESEARCH SUPPORT

Family name and initial(s) of applicant	Title of proposal, funding source and program, and time commitment (hours/month)	Amount per year	Years of tenure (yyyy)
List all sources of support (including NSERC grants and university start-up funds) held as an applicant or a co-applicant: a) support held in the past four (4) years but now completed; b) support currently held, and c) support applied for. For group grants, indicate the percentage of the funding directly applicable to your research. Use additional pages as required.			
a) Support held in the past 4 years			
Paul Kry	University start-up funds	55,000	2008
Paul Kry	Simulation physique de la locomotion d'humains et animaux virtuels FQRNT Établissement de nouveaux chercheurs 40 hours/month	33,270 20,000	2008 2009
Paul Kry	A Sensor Wall for Capture and Animation of Human Climbing Strategies NSERC RTI	54,507	2009
Paul Kry	Fast approximate simulation of complex structures and contact in immersive virtual environments CINQ / MITACS / CMLabs CINQ / MITACS Accelerate / Industrial support 10 hours/month	27,500	2012

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List all sources of support (including NSERC grants and university start-up funds) held as an applicant or a co-applicant: a) support held in the past four (4) years but now completed; b) support currently held, and c) support applied for. For group grants, indicate the percentage of the funding directly applicable to your research. Use additional pages as required.			
b) Support currently held			
Paul Kry	Reality based virtual humans and animals	18,000	2008
	NSERC	18,000	2009
	Discovery	18,000	2010
	40 hours/month	18,000	2011
		18,000	2012
Paul Kry	Graphics Animation and New Media	49,000	2010
	GRAND	38,000	2011
	NCE	35,000	2012
	40 hours/month		
Paul Kry	Interaction Capture Laboratory	150,000	2012
	CFI		
	Leaders Opportunity Fund		
	15 hours/month		
c) Support applied for			
Paul Kry	Modèles couplés pour l'animation et le rendu réalistes multi-échelle FQRNT Projet de recherche en équipe		
	20 hours/month		

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RESEARCH SUPPORT**Family name and initial(s)
of applicant****Title of proposal, funding source and program,
and time commitment (hours/month)****Amount
per year****Years of
tenure
(yyyy)**

List all sources of support (**including NSERC grants and university start-up funds**) held as an applicant or a co-applicant: a) support held in the past four (4) years but now completed; b) support currently held, and c) support applied for. For group grants, indicate the percentage of the funding directly applicable to your research. Use additional pages as required.

c) Support applied for

James Forbes

Nouvelles méthodes d'estimation pour la posture
des systèmes robotiques, des appareils grand
public, et pour la réhabilitation
FQRNT
Projet de recherche en équipe

20 hours/month

Highly Qualified Personnel (HQP)

Provide personal data about the HQP that you currently, or over the past six years, have supervised or co-supervised.

			Personal identification no. (PIN) Valid 214237	Family name Kry
Name	Type of HQP Training and Status	Years Supervised or Co-supervised	Title of Project or Thesis	Present Position
Simon Courtemanche	Doctoral (In Progress)	Co-supervised 2012 -	Inverse dynamics for human motion analysis (Exploradoc)	PhD at INRIA Grenoble
Simon Labute	Undergraduate (In Progress)	Supervised 2012 -	Perception of defocus blur in scenes with motion	Undergraduate Research Assistant
Olivier Remillard	Master's (In Progress)	Supervised 2010 -	Embedded Thin Shells for Physically Simulated Wrinkles	MSc Student at McGill
Timothy Drews	Master's (In Progress)	Co-supervised 2010 -	Sequential Pose Estimation Using Linearized Rotation	MSc Student at McGill
Sheldon Andrews	Doctoral (In Progress)	Supervised 2009 -	Data-Driven Methods for Robust Human Grasping Control	PhD student at McGill
Amir Hossein Rabbani	Doctoral (In Progress)	Supervised 2008 -	Humanoid Balancing	PhD Student at McGill
Thomas Ng	Undergraduate (Completed)	Co-supervised 2012 - 2012	Haptic rendering for hybrid deformation models	Undergraduate student at McGill
Rami Aladdin	Master's (Completed)	Supervised 2010 - 2012	Pose Reconstruction with an Instrumented Bouldering Wall	working at a startup
Ben Kirwin	Undergraduate (In Progress)	Supervised 2011 - 2011	Multiresolution Spacetime Optimization	Software Developer at Hopper
Benjamin Sprott	Master's (Completed)	Supervised 2009 - 2011	Constraint Based Simulation and Stabilization	Product Verification Specialist at Optelian
Cyrus Rahgoshay	Master's (Completed)	Supervised 2009 - 2011	Inverse Kinodynamics	Software Developer at CMLabs
Yasaman Sedaghat	Master's (Completed)	Co-supervised 2009 - 2011	Combined static-dynamic deformations with haptic rendering	Technology Associate at Morgan Stanley
Clement Mattia	Master's (Completed)	Supervised 2010 - 2010	Secondary Dynamics For Motion Graph Character Animation	Engineer in France
Olivier Remillard	Undergraduate (Completed)	Supervised 2010 - 2010	Gaussian Processes for Human Motion With Contact	MSc student at McGill
Victor Cano Becerril	Master's (Completed)	Supervised 2008 - 2010	Quaternion Skinning	unknown
Alexandre Sénécal	Undergraduate (Completed)	Supervised 2009 - 2009	proximity and interpenetration depth for deformable models	unknown
Cecile Picard	Doctoral (Completed)	Co-supervised 2009 - 2009	Robust Modal Analysis for Sound Synthesis	Postdoc at Haute Ecole de Musique de Genève
Francis Guérin	Undergraduate (Completed)	Supervised 2009 - 2009	Efficient Stiffness Computation for Hexahedral FEM	unknown
Jean-Philippe April	Undergraduate (Completed)	Supervised 2009 - 2009	Friction Simulation Using Gauss-Seidel Like Algorithm	unknown
Matthew Jay Williams	Undergraduate (Completed)	Supervised 2009 - 2009	Composite Elements on the iPhone	MSc Student at University of Toronto

Highly Qualified Personnel (HQP)

Provide personal data about the HQP that you currently, or over the past six years, have supervised or co-supervised.

			Personal identification no. (PIN) Valid 214237	Family name Kry
Name	Type of HQP Training and Status	Years Supervised or Co-supervised	Title of Project or Thesis	Present Position
Maxime Tournier	Doctoral (In Progress)	Co-supervised 2009 - 2009	Physically Based Character Animation (French Exploradoc)	Postdoc at INRIA Montpellier France
Emmanuel Piuze-Phaneuf	Undergraduate (Completed)	Supervised 2008 - 2009	Interactive fine tuning of mocap driven facial animation	PhD student at McGill
Mattieu Nesme	Postdoctoral (Completed)	Supervised 2008 - 2009	Preserving topology and elasticity of deformable embeddings	Software Engineer at INRIA Grenoble France
Benjamin Peck	Undergraduate (Completed)	Supervised 2008 - 2008	Visualization of material deformation for underfoot VR	Software Developer at Double Fine Productions
Christopher Harvey	Undergraduate (Completed)	Supervised 2008 - 2008	motion capture tools for controlling physical simulation	working in industry
(Name withheld)	Master's (Completed)	Co-supervised 2006 - 2007	La sculpture virtuelle, à portée de main	Auto-entrepreneur Conception Web at Pikichaki
(Name withheld)	Undergraduate (Completed)	Supervised 2003 - 2003	mesh reparameterization	Kognito Interactive

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Personal information collected on this form and appendices will be stored in the Personal Information Bank for the appropriate program.

Version française disponible

Canada

PROTECTED WHEN COMPLETED

1. Most Significant Contributions to Research

My research primarily concerns physically based simulation and the animation of humans and animals, including skeletal motion, deformation, contact, and control. In my research, I strive to capture subtleties of the real world when possible, to design models that effectively approximate the relevant details, and to develop efficient methods for simulating complex interactions with natural phenomena. I have made my most significant contributions in the following three areas.

Interaction Capture and Synthesis. This contribution advances the idea that it is important to combine data driven methods with physically based models, and that force measurements in addition to motion capture is required. Most recently, with MSc student Aladdin I have developed a pose-estimation technique that uses measurements from an *instrumented climbing wall*, which captures forces and torques at the holds. When both motion and force are captured, improved inverse computations allow for estimates of activations and stiffness. Furthermore, force measurements combined with a plausible compliant biomechanical model allow for a interfaces that I call the *HandNavigator*, a device primarily designed by me in collaboration with researches in France (and now under French patent protection). The device provides hands-on interaction in a desktop virtual reality setting. Further, my initial work has inspired a multi-year research program at INRIA that builds upon my invention and ideas.

Reduced Deformation and Contact. Lowering the computational costs of physics based simulations with reduced models and appropriate parameterizations is an important contribution I have made, and the recent work I have completed in this area helps advance the state of the art. Postdoc Nesme and I designed *composite elements* to deal with complex variations in elasticity and topology using an embedded deformation approach and a coarse level finite element model. With collaborators in France, I also helped develop a *volume-contact* constraint formulation, which uses intersection volumes in expressing contact equations easily at any desired resolution. Finally, Sedaghat's recent MSc thesis contributes in this area through the development of an explicit decoupling of the dynamic and static parts of a deformation, with simulations that run at rates suitable for haptic interaction.

Character Motion Control and Editing. I have made important contributions to character animation by drawing attention to reduced models, in particular the use of natural elastic modal vibrations. My work on *modal locomotion* shows how to compute vibration modes for skeletal structures, and presents heuristics for automatically creating complex and natural kinematic motions of running and jumping. This work was extended with PhD student Nunes and collaborator Zordan, to create a system for optimizing *physically valid motion from a sketch* designed with modes. In the context of hands, PhD student Andrews and I have shown how to create policies for *goal directed multi-finger manipulation*, which makes use of reduced control spaces during optimization. The resulting policies are discrete event driven controllers that can solve manipulation problems in real time. Finally, *inverse kinodynamics* provides a friendly kinematic editing workflow that allows precise interactive editing of space-time constraints in animations with short-lived dynamics. This work won a best poster at I3D, a best paper at Graphics Interface, and now appears in an extended journal form in Computers & Graphics.

2. Research Contributions (each mention of funding lists the primary source first)

Articles in Refereed Journals

- P. G. Kry, C. Rahgoshay, A. Rabbani, K. Singh, Inverse Kinodynamics: Editing and constraining kinematic approximations of dynamic motion, Computers & Graphics, 36(8):904-918, 2012. doi:10.1016/j.cag.2012.08.010. Funding: GRAND NCE, NSERC. *I wrote the code and evaluation for the extensions in this journal version. I wrote all new material in the journal paper and made extensive edits to the conference version of this work (see below).*

- **S. Stolpner**, P. G. Kry, K. Siddiqi, Medial Spheres for Shape Approximation, IEEE Transaction on Pattern Analysis and Machine Intelligence, 34(6):1234-1240, 2012. Funding: NSERC. *I participated in research on deformation and validation, and provided a computer graphics perspective to the work. I wrote the code used in simulations and some validations, the visualizations for some figures, and provided edits to the paper.*
- **E. Piuze**, P. G. Kry, K. Siddiqi, Generalized helicoids for modeling hair geometry. Computer Graphics Forum (Proceedings of Eurographics), 30(2):247-256. 2011. Funding: NSERC. *I participated in the research and design with respect to applications and validation (real hair fitting, interpolation examples, editing styles), and provided edits to the paper.*
- **C. Picard**, C. Frisson, F. Faure, G. Drettakis, P. G. Kry, Advances in modal analysis using a robust and multiscale method. EURASIP Journal on Advances in Signal Processing, 2010, v. 2010, pp. 1-12. doi:10.1155/2010/392782. Funding NSERC: *I provided edits to the paper, and was involved closely in the conference version that this paper extends.*
- J. Allard, F. Faure, **H. Courtecuisse**, F. Falipou, C. Duriez, P. G. Kry, Volume Contact Constraints at Arbitrary Resolution, ACM Transactions on Graphics (SIGGRAPH), 29(3):82:1-10, 2010. Funding: NSERC. *I participated in the research leading to the volume partitioning approach, and helped with the LCP and NLCP formulations of the problem. I wrote most of the related work and background sections, and provided extensive edits to the other sections.*
- **M. Nesme**, P. G. Kry, **L. Jeřábková**, F. Faure, Preserving Topology and Elasticity for Embedded Deformable Models, ACM Transactions on Graphics (SIGGRAPH), 28(3):52:1-9, 2009. Funding: FQRNT, NSERC. *I worked closely with Nesme to devise the solution, helped with debugging, wrote many sections of the paper (introduction, related work), and provided extensive edits and ideas in writing the other sections.*
- P. G. Kry, L. Reveret, F. Faure, and M.-P. Cani, Modal Locomotion: Animating Virtual Animals with Natural Vibrations, Computer Graphics Forum (Eurographics), 28(2):289-298, 2009. Funding: INRIA, NSERC. *I devised the technique, wrote all the code, and wrote the paper, with help in some sections and edits from co-authors.*

Other Refereed Contributions

- **T. M. Drews**, J. R. Forbes, C. Verbrugge, P. G. Kry, Sequential Pose Estimation Using Linearized Rotation Matrices, submitted to IEEE International Conference on Robotics and Automation (ICRA), 8 pages, 2013. Funding: GRAND NCE. *I helped the student define the problem and the formulation of the solution based on previous work of Forbes. I wrote the introduction, related work, and conclusion, along with edits to the rest of the paper.*
- **R. Aladdin**, P. G. Kry, Static Pose Reconstruction with an Instrumented Bouldering Wall, ACM Virtual Reality Software and Technology, 8 pages, 2012. Funding: NSERC, GRAND NCE.
- **S. Andrews**, P. G. Kry, Policies for Goal Directed Multi-Finger Manipulation, In 9th Workshop on Virtual Reality Interaction and Physical Simulation (VRIPHYS), 9 pages, 2012.
- **C. Rahgoshay**, **A. Rabbani**, K. Singh, P. G. Kry, Inverse Kinodynamics: Editing and Constraining Kinematic Approximations of Dynamic Motion, Graphics Interface, 185-192, 2012 (best graphics paper). Funding: GRAND NCE. *I defined the problem with Singh, I designed the solution, helped the students with implementation, and wrote the paper, with Singh providing some material for the introduction and facial animation results.*
- B. Wyvill, P. Kry, R. Seidel and D. Mould, Determining an Aesthetic Inscribed Curve, Proc. Computational Aesthetics in Graphics, Visualization, and Imaging, pp 63-70, 2012. Funding: GRAND NCE. *I designed the curves with Wyvill and Seidel, wrote the code implementation that generated all examples used in the study. I wrote the section of the paper on splines, and provided edits throughout the rest of the paper.*

- **R. Nunes**, J. Cavalcante-Neto, C. Vidal, P. G. Kry, V. Zordan, Using Natural Vibrations to Guide Control for Locomotion, ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games, pp 87-94, 2012. doi:10.1145/2159616.2159631. Funding: NSERC, GRAND NCE. *I participated in research discussions, and helped guide all aspects related to modal analysis and the design the terms for the objective function. I wrote early drafts of several sections of the paper (related work, control, modal analysis), and made edits throughout.*
- **S. Stolpner**, P. Kry, K. Siddiqi. Medial Spheres for Shape Approximation, Symposium on Brain, Body and Machine, 12 pages, 2010, Springer. *I participated in research on validation of the technique, provided perspective on applications in graphics, wrote simulation code for collision detection evaluation, and visualizations used in some figures. I also provided edits to the paper.*
- **C. Picard**, F. Faure, G. Drettakis, P. G. Kry, A Robust and Multi-scale Modal Analysis for Sound Synthesis DAFX, 2009. *I helped Picard devise the validations of her approach, helped with debugging of her implementation, and provided extensive edits to the paper.*
- **A. W. Law**, **B. V. Peck**, **Y. Visell**, P. G. Kry, J. R. Cooperstock, A Multi-modal Floor-space for Experiencing Material Deformation Underfoot in Virtual Reality, IEEE HAVE 2008. *I supervised Peck's work on snow deformation simulation and rendering, and edited this section of the paper.*
- P. G. Kry, **A. Pihuit**, **A. Bernhardt**, and M.-P. Cani, HandNavigator: Hands-on Interaction for Desktop Virtual Reality, ACM VRST 2008, Funding: INRIA, NSERC. *This paper extends the MSc work of Pihuit that I supervised. I built the prototype, wrote most of the software with extra simulations provided by Bernhardt, and I wrote the paper.*

Non-Refereed Contributions

- P. G. Kry, Modal Vibrations for Character Animation, Motion in Games (MIG), 12 pages, 2012. Funding: NSERC. *Publication associated with invited keynote.*
- **R. Aladdin**, Static Pose Reconstruction with an Instrumented Bouldering Wall, M.Sc. thesis, August 2012. Funding: GRAND NCE, NSERC.
- **C. Rahgoshay**, Editing and Constraining Kinematic Approximations of Dynamic Motion, M.Sc. thesis, January 2012. Funding: GRAND NCE.
- **Y. Sedaghat**, Combined static-dynamic deformations with haptic rendering, M.Sc. thesis co-supervised by Robert Funnell in Biomedical Engineering, November 2011. Funding: NSERC, GRAND NCE. *I served as primary supervisor.*
- **C. Rahgoshay**, **A. Rabbani**, K. Singh, P. G. Kry, Editing and Constraining Kinematic Approximations of Dynamic Motion, ACM SIGGRAPH Symposium on Interactive 3D Graphics posters (best poster honourable mention), 2012. Funding: GRAND NCE.
- **O. Remillard**, P. G. Kry, Human Motion and Contact with Gaussian Processes, Poster at Graphics Interface 2010 (best graphics poster). Funding: GRAND NCE, NSERC.
- **S. Andrews**, P. G. Kry, D. Precup, Learning Control Policies for Virtual Grasping Applications, Poster at Graphics Interface 2010. Funding: NSERC, GRAND NCE.
- **A. Pihuit**, P. G. Kry, and M.-P. Cani. La Sculpture Virtuelle à portée de main. Poster at Journées de l'Association Française de Réalité Virtuelle, Augmentée, Mixte et d'Interaction 3D. October 2007. Funding: INRIA.
- **A Pihuit**. La Sculpture Virtuelle... à portée de main. Master's thesis (Rapport Master Recherche) co-supervised with M.-P. Cani. June 2007. Funding: INRIA. *I served as primary supervisor.*
- P. G. Kry, L. Reveret, F. Faure, M.-P. Cani, Modal Locomotion: Controlling Passive Elastic Dynamics, ACM SIGGRAPH Sketch Presentation, San Diego (2007). Funding: ANR Kameleon, INRIA.

Other Contributions

- Patent related to HandNavigator (see publications), filed in France. Intitulé du brevet: Périphérique d'entrée amélioré, Brevet n°: 08/03877, date de dépôt: 08/07/08. Participation des inventeurs: KRY, Paul 75%, CANI, Marie-Paule 15%, PIHUIT, Adeline 10%.

3. Other Evidence of Impact and Contributions**Invited Lectures**

- Invited talk at Google Montreal Lecture Series (December 5, 2012), Creature Animation and Squishy Stuff
- Keynote at Motion in Games (November 16, 2012), Modal Vibrations for Character Animation
- Invited talk in Biomedical Engineering (May 16, 2012), Natural vibrations in locomotion control and simplification of deformation
- REPARTI Workshop Colloquium, Montreal (June 3, 2011) Computer Animation of Characters, Deformation, and Contact
- University of California Riverside Computer Science Colloquium, Riverside, USA (April 18, 2011), Computer Animation of Characters, Deformation, and Contact
- School of P&OT Research Seminar, McGill University, Montreal (February, 2011), Measurement and Models for Animation of Skeletal Motion
- Canadian University Software Engineering Conference (CUSEC), Montreal (January 13, 2011), Physics Simulation for Interactive Characters and Environments
- Montreal International Games Summit (MIGS), Montreal (November 9, 2010), Physics Simulation for Interactive Characters and Environments
- Industrial Materials Institute - NRC, Boucherville (October 28, 2010), Preserving Topology and Elasticity for Embedded Deformable Models
- Walt Disney Animation Studios, invited presentation, Burbank, CA (August 2010), Character Animation, Reduced Models, Interaction, and Deformation
- CVGC Seminar Columbia University, New York, NY (July 2010), Character Animation with Reduced Models
- REWIND ACM SIGGRAPH Montreal, Montreal, QC (April 2010), Skeletal Motion, Deformation, and Contact, (REWIND is a chapter event highlighting accomplishments of the previous year).
- Cornell University Graphics Group, Ithaca, USA (March 2010), Animation of Human Motion, Deformation, and Contact.
- CGGAR'09, keynote at M.I.T. Graphics Group Annual Retreat, Ashland MA (October 2009), From Composite Elements to Coarse Rods and Thin Shells
- Computer Graphics Group, Seminar lecture, UBC, Canada (June 2008), Animating Virtual Character Locomotion and Other Oscillatory Motions
- Cognitive Animation Workshop, Presentation, Yosemite, USA (June 2008), Animating Virtual Character Locomotion and Other Oscillatory Motions

Chairs / Committees / Referee / Other

Program committee member for ACM SIGGRAPH (2013)

Program co-chair for the Symposium on Computer Animation (2012)

Program committee member for Symposium on Computer Animation (2009, 2010, 2011)

Program committee member for Graphics Interface (2010, 2011)

ACM SIGGRAPH ASIA technical sketches and posters program advisory board (2010)

Program committee member for Eurographics (2009, 2010)

SIGGRAPH general submission jury (2008, 2009)

ACM SIGGRAPH student research competition jury (2008) and jury chair (2009)

I regularly review papers for all major conferences and journals in the areas of computer graphics and animation including ACM Transactions on Graphics (SIGGRAPH), Eurographics (papers and courses), ACM SIGGRAPH / Eurographics Symposium on Computer Animation, ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games, ACM Symposium on User Interface Software and Technology, Graphics Interface, IEEE Transactions on Visualization and Computer Graphics, The Visual Computer.

I have organized 4 Bellairs Workshops on Computer Animation that bring together top researchers from around the world for focused discussion on topics related to computer animation:

2012 Pseudospectral Optimal Control for Character Animation (12 participants Canada US Europe Asia)

2011 GRAND challenges, Animation and Geometry (32 participants, Canada, USA)

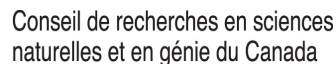
2010 Reduced Physics, Simulation, and Control (16 participants, Canada, USA, France)

2009 Simulated Humans and Animals (9 participants, Canada, USA, France)

5. Contributions to the Training of Highly Qualified Personnel

I now have five years of experience supervising highly qualified personnel at all levels, and I maintain a steady state of approximately five to six students in my Computer Animation and Interaction Capture Lab. I have hosted three PhD students from France as part of ongoing collaborations and an exchange program with the INRIA in the Rhone-Alpes region, which is the largest and most active center for computer animation research in France. I have listed these three visiting PhD students as co-supervised, though I have effectively served as primary supervisor during their visits. Likewise, for all other co-supervised students, I have served more as a primary advisor with respect to ideas and mentoring, with the other co-supervisor providing funding or equipment along with supplementary advice, typically from the perspective of another discipline. I have worked closely with two students of McGill University professor Kaleem Siddiqi (one MSc, one PhD) to the point of publishing several papers at conferences and journals. These interactions can be seen as a contribution to training, though I was not participating in the capacity of a co-supervisor, and as such, these students do not appear in the HQP totals. Similarly, in collaboration with University California professor Victor Zordan, I have participated in the training of a Brazilian PhD student (again not listed in HQP totals) over an extended period of time (more than a year and a half), with this collaboration leading to a top tier conference publication.

The Interaction Capture Lab at McGill University houses a collection of specialized equipment for capturing human motion and contact forces, and provides a unique training environment for HQP. The research projects undertaken by students in my lab can be seen as training in a variety of advanced techniques. Much of the research and training involves data driven methods, with students becoming well versed in methods related to optical motion capture, data gloves, pressure sensors, force plates, and force-torque transducers. They develop skills and knowledge to deal with important issues such as calibration, synchronization, filtering, modeling, fitting, and reduction. Finally, students in my lab become well versed in physically based animation methods including the simulation of deformation, contact, numerical integration methods, solution of large sparse linear and nonlinear systems, constrained optimization, unilateral constraints, and the application of Lie theory to rigid kinematic motion and filtering. There is an important learning curve for many of the fundamentals of physically based animation, data driven techniques, and the related mathematical tools and software. This has an important impact on the time that students must devote before they advance to the stage where they are able to make contributions in this area.



APPENDIX A

Personal Data (Form 100)

Date	2012/10/28
Personal identification no. (PIN)	Valid 214237

2007/12/26

Telephone number (alternate)	<div> <div></div> <div>Give an alternate telephone number only if you can be reached at that number during business hours.</div> </div>	Gender (completion optional) <input checked="checked" type="checkbox"/> Male <input type="checkbox"/> Female
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I wish to receive my correspondence:	in English	<input checked="" type="checkbox"/>	in French
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Appendix D (Form 100) Consent to Provide Limited Personal Information About Highly Qualified Personnel (HQP) to NSERC

NSERC applicants are required to describe their contributions to the training or supervision of highly qualified personnel (HQP) by providing certain details about the individuals they have trained or supervised during the six years prior to their current application. HQP information must be entered on the Personal Data Form (Form 100). This information includes the trainee's name, type of HQP training (e.g., undergraduate, master's, technical etc.) and status (completed, in-progress, incomplete), years supervised or co-supervised, title of the project or thesis, and the individual's present position.

Based on the federal *Privacy Act* rules governing the collection of personal information, applicants are asked to obtain consent from the individuals they have supervised before providing personal data about them to NSERC. In seeking this consent, the NSERC applicant must inform these individuals what data will be supplied, and assure them that it will only be used by NSERC for the purpose of assessing the applicant's contribution to HQP training. To reduce seeking consent for multiple applications, applicants will only need to seek consent one time for a six-year period. If the trainee provides consent by e-mail, the response must include confirmation that they have read and agree to the text of the consent form.

When consent cannot be obtained, applicants are asked to not provide names, or other combinations of data, that would identify those supervised. However, they may still provide the type of HQP training and status, years supervised or co-supervised, a general description of the project or thesis, and a general indication of the individual's present position if known.

An example of entering HQP information on Form 100 (with and without consent):

Name	Type of HQP Training and Status	Years Supervised or Co-supervised	Title of Project or Thesis	Present Position
Consent Received from Marie Roy				
Roy, Marie	Undergraduate (Completed)	Supervised 1994 - 1997	Isotope geochemistry in petroleum engineering	V-P (Research), Earth Analytics Inc., Calgary, Alberta
Consent Not Obtained from Marie Roy				
(name withheld)	Undergraduate (Completed)	Supervised 1994 - 1997	Isotope geochemistry	research executive in petroleum industry - western Canada

Consent Form

Name of Trainee	
Applicant Information	
Name Kry, Paul PG	
Department Computer Science, School of	Postsecondary Institution McGill
I hereby allow the above-named applicant to include limited personal data about me in grant applications submitted for consideration to NSERC for the next six years. This limited data will only include my name, type of HQP training and status, years supervised or co-supervised, title of the project or thesis and, to the best of the applicant's knowledge, my position title and company or organization at the time the application is submitted. I understand that NSERC will protect this data in accordance with the <i>Privacy Act</i> , and that it will only be used in processes that assess the applicant's contributions to the training of highly qualified personnel (HQP), including confidential peer review.	
_____ Trainee's signature	_____ Date
Note: This form must be retained by the applicant and made available to NSERC upon request.	



FORM 100
Personal Data Form
PART I

Date

2013/06/11

Family name Lang	Given name Jochen	Initial(s) of all given names J	Personal identification no. (PIN) Valid 206301
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☐ I hold a faculty position at an eligible Canadian college
(complete Appendices B1 and C)

☐ I do not or will not hold an academic appointment at a
Canadian postsecondary institution

Place of employment other than a Canadian postsecondary
Institution (give address in Appendix A)

APPOINTMENT AT A POSTSECONDARY INSTITUTION

Title of position Associate Professor	Tenured or tenure-track academic appointment	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Department	Part-time appointment <input type="checkbox"/>	Full-time appointment <input checked="" type="checkbox"/>
Campus	<ul style="list-style-type: none">For all non-tenured or non tenure-track academic appointment and Emeritus Professors, complete Appendices B & CFor life-time Emeritus Professor and part-time positions, complete Appendix C	
Canadian postsecondary institution		

ACADEMIC BACKGROUND

Degree	Name of discipline	Institution	Country	Date yyyy/mm
Dipl-IngFH	Elektrotechnik Electrical&Electronic	Fachhochschule Ulm	GERMANY	1992 / 07
Bachelor's	Electrical & Electronic Engineering	University of Plymouth	UNITED KINGDOM	1992 / 07
Master's	Computer Science	York	CANADA	1996 / 11
Doctorate	Computer Science	British Columbia	CANADA	2001 / 11

TRAINING OF HIGHLY QUALIFIED PERSONNEL

Indicate the number of students, fellows and other research personnel that you:

	Currently		Over the past six years (excluding the current year)		Total
	Supervised	Co-supervised	Supervised	Co-supervised	
Undergraduate	1		4		5
Master's	3	1	8	2	14
Doctoral		1	1	3	5
Postdoctoral				1	1
Others			1		1
Total	4	2	14	6	26

Personal identification no. (PIN)

Valid 206301

Family name

Lang

ACADEMIC, RESEARCH AND INDUSTRIAL EXPERIENCE (use one additional page if necessary)

Position held (begin with current)	Organization	Department	Period (yyyy/mm to yyyy/mm)
Associate Professor	Ottawa	Electrical Engineering and Computer Science , School of	2010/06
Assistant Professor	Ottawa	School of Information Technology and Eng	2004/09 to 2010/05
Researcher	Max-Planck-Institut für Informatik, Saarbrücken, Germany.	AG 4	2002/02 to 2004/09
Post-Doctoral Researcher	University of British Columbia, Vancouver, BC, Canada.	Computer Science	2001/10 to 2002/01
Scientific and Vision Computing Consultant	Point Grey Research, Vancouver, BC, Canada.	n/a	1999/10 to 2002/01
Software Development Engineer	Informatik Systemtechnik, Stuttgart, Germany.	Control Systems	1992/10 to 1994/08
Industrial Internship	Kodak AG, Stuttgart, Germany.	Copier- and Printsystems Development	1990/03 to 1990/08
Industrial Internship	AEG, Ulm, Germany.	various	1987/09 to 1988/02
Military Service	German Bundeswehr.	n/a	1986/07 to 1987/09

Personal identification no. (PIN)

Valid 206301

Family name

Lang

RESEARCH SUPPORT

Family name and initial(s) of applicant	Title of proposal, funding source and program, and time commitment (hours/month)	Amount per year	Years of tenure (yyyy)
List all sources of support (including NSERC grants and university start-up funds) held as an applicant or a co-applicant: a) support held in the past four (4) years but now completed; b) support currently held, and c) support applied for. For group grants, indicate the percentage of the funding directly applicable to your research. Use additional pages as required.			
a) Support held in the past 4 years			
Jochen Lang and 1 other	An Off-the-Shelf Video Camera Array for Three-Dimensional Television NSERC RTI - Category 1 20 hours/month	28,700 (50%)	2008
Jochen Lang	Interactive Acquisition of the Physical World NSERC Discovery Grant 40 hours/month	20,000 20,000 20,000 20,000 20,000	2008 2009 2010 2011 2012
Eric Dubois and 2 others	High-Quality Acquisition and Rendering of Image-Based Models for Tele-Presence in Remote Environments NSERC Strategic Project Grants 30 hours/month	126,150 (33%) 146,950 (33%) 140,150 (33%)	2008 2009 2010
Jochen Lang	Auto-Digitization with Artistic Style for Embroidery Design NSERC CRD 10 hours/month	33,500(100%) 33,500(100%)	2010 2011

Personal identification no. (PIN)

Valid 206301

Family name

Lang

RESEARCH SUPPORTFamily name and initial(s)
of applicantTitle of proposal, funding source and program,
and time commitment (hours/month)Amount
per yearYears of
tenure
(yyyy)

List all sources of support (including NSERC grants and university start-up funds) held as an applicant or a co-applicant: a) support held in the past four (4) years but now completed; b) support currently held, and c) support applied for. For group grants, indicate the percentage of the funding directly applicable to your research. Use additional pages as required.

a) Support held in the past 4 years

Jochen Lang

Image-based registration of a patrolling mobile robot
NSERC
Engage
10 hours/month

25,000

2011

Jochen Lang

Computer Vision Modules for Increased
Autonomy of a Patrolling Officer Robot
Federal, Applied Research and Development
Initiative, FedDev
SME4SME
20 hours/month

92,000

2012

Jochen Lang

Extended panel methods for computation of flows
around solid objects for computer graphics
applications
Mitacs
Accelerate
10 hours/month

15,000(100%)

2012

Jochen Lang

A Vortex Particle Fluid Simulator (Prototype
Development Exocortex)
Ontario Ministry of Energy, Science and
Technology
Ont. Network of Excellence, iPoP
10 hours/month

10,000

2012

Personal identification no. (PIN)

Valid 206301

Family name

Lang

RESEARCH SUPPORT

Family name and initial(s) of applicant	Title of proposal, funding source and program, and time commitment (hours/month)	Amount per year	Years of tenure (yyyy)
List all sources of support (including NSERC grants and university start-up funds) held as an applicant or a co-applicant: a) support held in the past four (4) years but now completed; b) support currently held, and c) support applied for. For group grants, indicate the percentage of the funding directly applicable to your research. Use additional pages as required.			
b) Support currently held			
Jochen Lang	GRAND	16,000	2010
	NSERC NCE	16,000	2011
	Collaborating Network Investigator (CNI)	12,500	2012
	10 hours/month	11,000	2013
Jochen Lang	Computational Photography for Capturing Virtual Environments	15,000	2013
		15,000	2014
		15,000	2015
	NSERC	15,000	2016
	Discovery Grant	15,000	2017
	40 hours/month		
Jochen Lang and 1 other	A high-resolution omnidirectional video camera for computational photography	26,175 (50%)	2013
	NSERC		
	RTI		
	20 hours/month		

Highly Qualified Personnel (HQP)

Provide personal data about the HQP that you currently, or over the past six years, have supervised or co-supervised.

			Personal identification no. (PIN) Valid 206301	Family name Lang
Name	Type of HQP Training and Status	Years Supervised or Co-supervised	Title of Project or Thesis	Present Position
Fanping Zhou	Master's (In Progress)	Supervised 2012 -	High dynamic range panoramic imaging of dynamic scenes	Master's student (part-time), University of Ottawa
Hong Pan	Master's (In Progress)	Supervised 2012 -	Advanced user interface for haptic image exploration	Master's student, University of Ottawa
Phillips, Adon	Undergraduate (In Progress)	Supervised 2012 -	Complex environment sensing autonomous robot	Undergraduate student, University of Ottawa
Motahareh Tekieh	Master's (In Progress)	Supervised 2011 -	Registration of deformable 3D models	Master's Student, University of Ottawa
Ziyun Li	Master's (In Progress)	Co-supervised 2011 -	Experience-based haptic rendering of object interactions	Master's Student, University of Ottawa
Andres Solis Montero	Doctoral (In Progress)	Co-supervised 2010 -	Change detection in image-based virtual environments	Ph.D. student, University of Ottawa
Mauricio Vines	Doctoral (Completed)	Co-supervised 2011 - 2013	Vortex methods for fluid simulation in computer graphics	Physical animation software developer, Exocortex
(Name withheld)	Undergraduate (Completed)	Supervised 2012 - 2012	Optical flow methods for aligning photos for HDR imaging	Unknown
Edmunds, Corey	Undergraduate (Completed)	Supervised 2012 - 2012	Shadow detection using paired regions	Undergraduate student, University of Ottawa
Zhang, Fan	Res. Associate (Completed)	Supervised 2011 - 2012	Hierarchical image segmentation	Undergraduate student, University of Pennsylvania
Ana Laura Perez	Master's (Completed)	Supervised 2010 - 2012	Segmentation and line filling of 2D shapes	Research associate, University of Ottawa
Alan Brunton	Doctoral (Completed)	Co-supervised 2007 - 2012	Multi-scale methods for omnidirectional stereo with app.	Researcher, Max Planck Institute for Informatics
Antonio Rosa da Silva Jr	Doctoral (Not Completed)	Supervised 2010 - 2011	Auto-digitization with artistic style	Programme Manager, TMF Group B. V.
David Lareau	Master's (Completed)	Supervised 2009 - 2011	Haptic image exploration	Software Game Developer, Fuel Industries, Ottawa
Silk, Simon	Master's (Completed)	Supervised 2009 - 2011	Ghost removal for HDR image-based environments	Development Engineer, Alcatel-Lucent, Ottawa
Oliver Walzer	Master's (Completed)	Supervised 2007 - 2011	Filter. of seg. hier. for impr. region-to-region matching	CTO, sploomy AG, Hünenberg, Switzerland
Jamal Saboune	Postdoctoral (Completed)	Co-supervised 2009 - 2010	High-quality acquisition of image-based virtual environments	Research Associate, University of Ottawa
Ting Yu	Master's (Completed)	Supervised 2007 - 2010	Stereo-based 3D model acquisition and motion detection	Software Quality Engineer. Adobe, Ottawa
Vijaya L. Guruswamy	Master's (Completed)	Co-supervised 2008 - 2009	Measurement and modelling of haptic textures	VRE developer, Robertson Library, UPEI
Thomas Byczkowski	Master's (Completed)	Supervised 2006 - 2009	Stereo-based system with inertial navigation for 3D scanning	Instrumentation and Electronics Specialist, NRC, Ottawa

Highly Qualified Personnel (HQP)

Provide personal data about the HQP that you currently, or over the past six years, have supervised or co-supervised.

			Personal identification no. (PIN) Valid 206301	Family name Lang
Name	Type of HQP Training and Status	Years Supervised or Co-supervised	Title of Project or Thesis	Present Position
Yi Zhang	Doctoral (Completed)	Co-supervised 2007 - 2008	Real-time object shape acquisition	Researcher, Tianjin University, China
Mac Donald, Darren	Master's (Completed)	Supervised 2005 - 2008	Hierarchical image segments for analysis and visualization	Graphics Services Developer, IBM
Guimond, Sylvain	Undergraduate (Completed)	Supervised 2007 - 2007	Keyboard accelerometers for a game user interface	unknown
Kolhatkar, Shanat	Undergraduate (Completed)	Supervised 2007 - 2007	Real-time BRDF rendering based on measurements	Independent Game Developer at Freelance
Mothe, Purnima	Master's (Not Completed)	Supervised 2006 - 2007	Consumer haptics	unknown
Andrews, Sheldon	Master's (Completed)	Co-supervised 2005 - 2007	Meas.-b. modeling of contact forces & textures for haptic r.	Ph.D. student, McGill University

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Personal information collected on this form and appendices will be stored in the Personal Information Bank for the appropriate program.

Version française disponible

Canada

PROTECTED WHEN COMPLETED

I. Most Significant Contributions to Research and/or to Practical Applications

1. Interactive Acquisition of Haptic Textures and Surface Compliance

We developed an interactive scanning approach for the acquisition of physical surface textures. This is our first step in making physical capture more general and inexpensive. The method uses a hand-held force-sensing pen and camera system for tracking the user interaction with an object's surface. The acquired texture model is based on scanned surface profiles but also includes an estimation of the compliance of the surface. Preliminary results were reported for the acquisition in [II.17] and the rendering in [II.18] but the major contribution is the compliance acquisition method reported in [II.3] along with various other improvements. I have conducted this work with my (former) student Sheldon Andrews.

Subsequently, I have extended the work by modelling the surface texture as acceleration textures. The textures are represented with Infinite Impulse Response Filters placed over the surface of a rendered object. This representation models more directly the measured response during user interaction with the surface and results in high fidelity rendering of the haptic texture. The method has been reported in [II.4] with experimental work contributed by the former co-supervised Master's student Vijaya Guruswamy. Our work has been cited by leading researchers in the field.

(Funding: NSERC Discovery and some initial funding from ORDC ORNEC)

2. Auto-digitization

Many applications can benefit from the semi-automatic parsing of image content, vectorization and hierarchical organization of shapes. We have worked on this topic in the context of embroidery design and in the context of haptic image exploration, but many more applications exist. The automated translation process of an artist's design, the artwork, to a stitch pattern, the embroidery design, is referred to in the embroidery industry as auto-digitization. Currently, there is no automated process capable of producing embroidery designs with equivalent quality to hand digitization.

We have made progress on analyzing shapes [II.2] and the auto break-up process (proprietary algorithm; currently unpublished). These two contributions have been developed in the context of a NSERC CRD grant in close cooperation with a Canadian embroidery software maker. This project also provided the framework for the undergraduate thesis of Corey Edmunds, which received the IBM Cognos Prize for the best undergraduate thesis project in the Winter term 2012. We have worked as well on the actual image analysis and developed a semi-automatic hierarchical image vectorization for haptic image exploration [II.9]. Even though these two applications seem unrelated, the underlying key technology is the ability to organize image content with respect to objects in the scene and then translate them into a different display modality: stitch pattern or haptic display. We prefer a hierarchical representation in order to be able to represent objects at varying scale and subobjects as part of larger objects. The immediate impact of this very recent work is through the collaboration with a Canadian SME.

(Funding: NSERC CRD and NSERC NCE)

3. Visual Surface Tracking of Deformable Objects

Visual surface tracking of deformable objects is a long-standing problem in computer vision with practical application in, e.g., visual inspection, computational medicine and computer animation. Different approaches have been proposed including extending optical flow to 3D range flow, fitting deformable models to 2D or 3D image data and deformable registration methods. We have investigated two alternative approaches, both based on an isometry constraint on the surface. In our first approach (with former Master's student Ting Yu), we developed a range-flow technique using simple window-based matching, however, we incorporated a novel isometry constraint. Based on seed points from KLT (Kanade-Lucas-Tomasi) feature tracking, we used the novel constraint to find a dense set of matches on the surface of deformable object in a time sequence of 3D pointclouds obtained with a stereo-vision camera. We also demonstrated the robustness of the constraint if the surface deformation violates the assumption of isometry. Our paper received the best student paper award at the Canadian Conference on Computer and Robot Vision in 2010. More recently we (with collaborators Drs. Wuhrer and Shu) have developed a surface registration technique that uses a state-of-the-art energy optimization including a smoothness term based on Euclidean and geodesic matching distance. This method is able to register a time sequence of surface pointclouds of a deformable object. However, our main contribution is a technique to track a complete object with an elastic model solved with finite elements with a pointcloud captured from a single viewpoint. This makes our method very practical as we demonstrated by tracking objects with pointclouds obtained by a commercial stereo-vision system and alternatively, with a consumer-grade structured light scanner (Microsoft Kinect) and I expect the work to be adapted because of it.
(Funding: NSERC Discovery and NSERC NCE)

II. Research Contributions and Practical Applications

Papers in refereed journals:

1. **M. Vines**, B. Houston, J. Lang and W. Lee, Vortical inviscid flows with two-way solid-fluid coupling, *IEEE Trans. on Visualization and Computer Graphics*, 14 pages, accepted, June 2013. (Funding: Mitacs, OMRI iPoP)
2. **D. Lareau** and J. Lang, An instrument for haptic image exploration, *IEEE Trans. on Instrumentation and Measurement*, 10 pages, accepted May 2013. (Funding: NSERC NCE GRAND)
3. **S. Silk** and J. Lang, High dynamic range image deghosting by fast approximate background modeling, *Computers and Graphics*, 36(8), 2012. (Funding: NSERC SPG)
4. **A.S. Montero** and J. Lang, Skeleton pruning by contour approximation and the integer medial axis transform, *Computers and Graphics (Special Issue on SMI)*, 36(5), pp. 477-487, 2012. (Funding: NSERC CRD)
5. J. Lang and **S. Andrews**, Measurement-based modeling of contact forces and textures for haptic rendering, *IEEE Trans. on Visualization and Computer Graphics*, 17(3), pp. 380-391, 2011. (Funding: NSERC Discovery)

6. **V.L. Guruswamy**, J. Lang and W.-S. Lee, IIR-filter models of haptic vibration textures, *IEEE Trans. on Instrumentation and Measurement*, 60(1), pp. 93-103, 2011. (Funding: NSERC Discovery)
7. **A. Brunton**, J. Lang and E. Dubois, Spherical harmonic transforms and convolutions on the GPU, *Journal of Graphics, GPU, and Game Tools*, 15(1), pp. 13-27, 2010 (Funding: NSERC SPG)

Papers in refereed conference and workshop proceedings:

8. **A. Brunton**, J. Lang and E. Dubois, Time- and space-efficient multi-scale stereo of high-resolution planar and spherical images, in Proc. *3DimPVT*, 8 pp., Zurich, Switzerland, Oct. 2012. (Funding: NSERC Discovery)
9. S. Wuhler, J. Lang and C. Shu, Tracking complete deformable objects with finite elements, in Proc. *3DimPVT*, 8 pp., Zurich, Switzerland, Oct. 2012. (Funding: NSERC Discovery and NCE GRAND)
10. **D. Lareau** and J. Lang, Haptic rendering of photographs, in Proc. *Int. Symposium on Haptic Audio Visual Environments and Games - HAVE 2012*, 6 pp., Munich, Germany, Oct. 2012. (Funding: NSERC NCE GRAND)
11. **S. Silk** and J. Lang, Fast High Dynamic Range Image Deghosting for arbitrary scene motion, in Proc. *Graphics Interface*, Toronto, Canada, May 2012. (Funding: NSERC SPG and Discovery)
12. **A.S. Montero**, H. Sekkati, J. Lang, R. Laganire and J. James, Framework for natural landmark-based robot localization, in Proc. *Computer and Robot Vision '12*, pp. 131-138, Toronto, Canada, May, 2012 (Funding: NSERC Engage)
13. **A. Brunton**, C. Shu, J. Lang and E. Dubois, Wavelet Model-based Stereo for Fast, Robust face reconstruction, in Proc. *Computer and Robot Vision '11*, pp. 347-354, St.-John's, NL, Canada, May 2011. (Funding: NSERC SPG)
14. **T. Yu** and J. Lang, Window-based range flow with an isometry constraint, in Proc. *Computer and Robot Vision '10*, pp. 331-338, Ottawa, Canada, May 2010. (Funding: NSERC Discovery)
This paper was the co-winner of the best student paper award at CRV 2010.
15. **V.L. Guruswamy**, J. Lang and W.S. Lee, Modelling of haptic vibration textures with infinite-impulse-response filters, in Proc. *8th IEEE Int. Workshop on Haptic Audio Visual Environments and Games - HAVE 2009*, pp. 105-110, (Funding: NSERC Discovery)
16. **T. Byczkowski** and J. Lang, A stereo-based system with inertial navigation for outdoor 3D scanning, in Proc. *Computer and Robot Vision '09*, pp. 221-228, Kelowna, Canada, May, 2009. (Funding: NSERC Discovery)
17. **D. MacDonald** and J. Lang, Bitmap to vector conversion for multi-level analysis and visualization, in Proc. *6th International Conference on Scalable Vector Graphics*, Nuremberg, Germany, August, 2008. (Funding: NSERC Discovery)
18. **S. Andrews** and J. Lang, Haptic texturing based on real-world Samples, in Proc. *IEEE Int. Workshop on Haptic Audio Visual Environments and their Applications – HAVE*, pp. 142-147, Ottawa, Canada, October 2007. (Funding: NSERC Discovery, ORDC ORNEC; see description in [I.2])

19. **S. Andrews** and J. Lang, Interactive scanning of haptic textures and surface compliance, in Proc. 6th International Conference on 3-D Digital Imaging and Modeling (3DIM07), IEEE, pp. 99-106, Montréal, August, 2007. (Funding: NSERC Discovery, ORDC ORNEC; see description in [I.2])

Non-Refereed Contributions:

20. **D. Lareau** and J. Lang, Haptic image exploration, *GRAND Annual Conference*, Poster Presentation, Vancouver, Canada, May, 2011. (Funding: NSERC NCE)
21. **D. Lareau** and J. Lang, Interactive exploration of images with ambient haptic context, *GRAND Annual Conference*, Poster Presentation. Ottawa, Canada, May, 2010. (Funding: NSERC NCE)

Contributions to Practical Applications of Knowledge

We contributed computer vision technology consisting of tracking planar targets for localization (Contr. [II.11]). The successful transfer of the technology to the industrial partner in this NSERC Engage project led to a follow-up project funded through the FedDev SME4SME program. We developed shape analysis and shape segmentation software in the framework of the NSERC CRD project “Auto-Digitization with Artistic Style for Embroidery Design” (see also [I.2]).

III. Other Evidence of Impact and Contributions:

Member, Program Committee, British Machine Vision Conference, since 2011.
 (Senior) Member, Program Committee, Computer Graphics International, 2011, 2012.
 Member, Review Committee, Int. Conf. on Multimedia and Expo, since 2011.
 (Quality Reviewer *Award*, 2011)
 Member, Program Committee, 3DV, 2013.
 Member, Program Committee, IEEE Multimedia and Signal Proc., 2013
 Member, Program Committee, 3DIMPVT, 2011, 2012.
 Member, Program Committee, Canadian Conf. on Comp. and Robot Vision, 2012, 2013.
 Member, Review Committee, IEEE Virtual Reality, 2011.
 Registration Chair, AI/GI/CRV 2010
 Member, Program Committee, Short Papers, Eurographics 2010
 Member, Program Committee, Int. Fall Workshop on Vision, Modeling, and Visualization, 2007-2009.
 Member, Program Committee, Int. Workshop/Conf. on 3-D Digital Imaging and Modeling, IEEE, 2007, 2009.
 Member, Program Committee, Future Play, 2007-2010.
 Member, Program Committee, IEEE HAVE, since 2006.
 Member, Program Committee, IEEE ROSE, since 2008.
 Member, Editorial Board, International Journal of Advanced Media and Communication, since 2006.

Reviewer for the following: Computer Graphics Forum, IEEE Trans. on Visualization & Computer Graphics, IEEE Trans. on Haptics, Int. J. of Robotics Research, IEEE Computer Graphics & Applications, ACM Trans. on Multimedia, Presence, IEEE Trans. on SMC-A, IEEE Trans. on Instrumentation and Measurement (Outstanding Reviewer Award 2011), Image and Vision Computing, Machine Vision and Applications, Medical Image Analysis, Int. J. of Adv. Media and Communication, WorldHaptics, Graphics Interface.

IV. Contributions to the Training of Highly Qualified Personnel (HQP)

In training of HQP, I emphasize familiarity with concepts from applied mathematics paired with implementation skills. This combination is essential for my research focusing on experimental methods for computer graphics and computer haptics based on techniques from computer vision.

I actively seek industrial partners for research collaborations to provide students the opportunity to interact with potential future employers. The direct feedback from industry motivates students to stay on schedule and to focus on the project at hand. I have been working with Cohort System Inc. to develop computer vision modules for registration, tracking and change detection to increase the autonomy of patrolling mobile robot in security applications. This collaboration ties in with the research of doctoral student Andres S. Montero and already led to jointly co-authored publication [II.11]. Recently, I have worked with Pulse Microsystems Inc. to analyze and enhance their auto-digitization process to transform vector and raster image artwork into an embroidery design which three graduate and on undergraduate researcher. My collaboration with Exocortex Technologies Inc. is concerned with a simulator for turbulent flow modelling for computer animation and is helping another doctoral student gain expertise.

I regularly seek co-supervisory arrangements to make sure that students have access to all areas of expertise required for their thesis work. For example, I have co-supervised the Ph.D. student A. Brunton contributing my expertise in visual computing with Dr. Dubois contributing his knowledge about frequency analysis in image processing. Also, I am currently co-supervising the Ph.D. student A.S. Montero, contributing my expertise in virtual environments while Dr. Laganière contributes his research expertise in structure-from-motion. In these and other co-supervisions, I give the co-supervised students the same attention as student in sole supervisions.

I like to foster the appreciation of related work with regular meetings of a discussion group and by working through reading lists with individual students. I give students the opportunity to practice their presentation skills during group meetings and expect students to present their work at scientific venues. I value excellence in student's work at all levels exhibited by an undergraduate student, Corey Edmunds, co-winning the IBM Cognos Prize for the best undergraduate thesis project in the Winter term 2012, a recent Master's student, Ting Yu, winning the best student paper award at Computer and Robot Vision 2010 [II.13], and by another recent Master's student, Simon Silk, receiving a nomination by for the University of Ottawa thesis prize for 2012.

As a result, students who have worked with me in the past, pursue their academic careers further or are employed as software developers in a field corresponding to their thesis work.



**APPENDIX A
Personal Data
(Form 100)**

Complete this appendix (i) if you are an applicant or co-applicant applying for the first time; (ii) if you need to update information submitted with a previous application; or (iii) if you do not hold an appointment at a Canadian postsecondary institution. For updates, include only the revised information in addition to the date, your name and your PIN.

This information will be used by NSERC primarily to contact applicants and award holders. It may also be used to identify prospective reviewers and committee members, and to generate statistics. It will not be seen or used in the adjudication process.

Date 2013/06/11															
Family name Lang	Given name Jochen	Initial(s) of all given names J	Personal identification no. (PIN) Valid 206301												
Position and complete mailing address if your primary place of employment is not a Canadian postsecondary institution or if your current mailing address is temporary Eberhard-Karls-Universitat Tübingen Informatik, Computergrafik Sand 14 72076 Tübingen GERMANY			If address is temporary, indicate: Starting date 2012/08/01 Leaving date 2013/07/31												
Telephone number 1 (613) 5625800 6317	Facsimile number (613) 5625175	E-mail address jlang@eecs.uottawa.ca													
Telephone number (alternate) <div style="display: flex; align-items: center;"><div style="border-left: 2px solid black; height: 20px; margin-right: 10px;"></div><div>Give an alternate telephone number only if you can be reached at that number during business hours.</div></div>	Gender (completion optional) <input checked="" type="checkbox"/> Male <input type="checkbox"/> Female														
LANGUAGE CAPABILITY															
<table><tr><td>English</td><td>Read <input checked="" type="checkbox"/></td><td>Write <input checked="" type="checkbox"/></td><td>Speak <input checked="" type="checkbox"/></td></tr><tr><td>French</td><td>Read <input checked="" type="checkbox"/></td><td>Write <input type="checkbox"/></td><td>Speak <input type="checkbox"/></td></tr><tr><td colspan="2">I wish to receive my correspondence:</td><td>in English <input checked="" type="checkbox"/></td><td>in French <input type="checkbox"/></td></tr></table>				English	Read <input checked="" type="checkbox"/>	Write <input checked="" type="checkbox"/>	Speak <input checked="" type="checkbox"/>	French	Read <input checked="" type="checkbox"/>	Write <input type="checkbox"/>	Speak <input type="checkbox"/>	I wish to receive my correspondence:		in English <input checked="" type="checkbox"/>	in French <input type="checkbox"/>
English	Read <input checked="" type="checkbox"/>	Write <input checked="" type="checkbox"/>	Speak <input checked="" type="checkbox"/>												
French	Read <input checked="" type="checkbox"/>	Write <input type="checkbox"/>	Speak <input type="checkbox"/>												
I wish to receive my correspondence:		in English <input checked="" type="checkbox"/>	in French <input type="checkbox"/>												
AREA(S) OF EXPERTISE															
Provide a maximum of 10 key words that describe your area(s) of expertise. Use commas to separate them. If you have expertise with particular instruments and techniques, specify which one(s). Computer graphics, Computer vision, Computational photography, Measurement-based modelling, Physics-based modelling, Computer haptics, Light transport, 3D Modelling, Stereo vision			Research subject code(s) Primary 2707												
			Secondary 2716												



Appendix D (Form 100) Consent to Provide Limited Personal Information About Highly Qualified Personnel (HQP) to NSERC

NSERC applicants are required to describe their contributions to the training or supervision of highly qualified personnel (HQP) by providing certain details about the individuals they have trained or supervised during the six years prior to their current application. HQP information must be entered on the Personal Data Form (Form 100). This information includes the trainee's name, type of HQP training (e.g., undergraduate, master's, technical etc.) and status (completed, in-progress, incomplete), years supervised or co-supervised, title of the project or thesis, and the individual's present position.

Based on the federal *Privacy Act* rules governing the collection of personal information, applicants are asked to obtain consent from the individuals they have supervised before providing personal data about them to NSERC. In seeking this consent, the NSERC applicant must inform these individuals what data will be supplied, and assure them that it will only be used by NSERC for the purpose of assessing the applicant's contribution to HQP training. To reduce seeking consent for multiple applications, applicants will only need to seek consent one time for a six-year period. If the trainee provides consent by e-mail, the response must include confirmation that they have read and agree to the text of the consent form.

When consent cannot be obtained, applicants are asked to not provide names, or other combinations of data, that would identify those supervised. However, they may still provide the type of HQP training and status, years supervised or co-supervised, a general description of the project or thesis, and a general indication of the individual's present position if known.

An example of entering HQP information on Form 100 (with and without consent):

Name	Type of HQP Training and Status	Years Supervised or Co-supervised	Title of Project or Thesis	Present Position
Consent Received from Marie Roy				
Roy, Marie	Undergraduate (Completed)	Supervised 1994 - 1997	Isotope geochemistry in petroleum engineering	V-P (Research), Earth Analytics Inc., Calgary, Alberta
Consent Not Obtained from Marie Roy				
(name withheld)	Undergraduate (Completed)	Supervised 1994 - 1997	Isotope geochemistry	research executive in petroleum industry - western Canada

Consent Form

Name of Trainee	
Applicant Information	
Name Lang, Jochen J	
Department Electrical Engineering and Computer Science ,	Postsecondary Institution Ottawa
I hereby allow the above-named applicant to include limited personal data about me in grant applications submitted for consideration to NSERC for the next six years. This limited data will only include my name, type of HQP training and status, years supervised or co-supervised, title of the project or thesis and, to the best of the applicant's knowledge, my position title and company or organization at the time the application is submitted. I understand that NSERC will protect this data in accordance with the <i>Privacy Act</i> , and that it will only be used in processes that assess the applicant's contributions to the training of highly qualified personnel (HQP), including confidential peer review.	
_____ Trainee's signature	_____ Date
Note: This form must be retained by the applicant and made available to NSERC upon request.	