Annual Report

2006 - 2007

Professor Gregory Dudek
Director

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DIRECTOR'S COMMENTS

I am pleased to report that the Centre for Intelligent Machines (CIM) continued on a positive trajectory in the year 2006-07. We experienced increases on all fronts — greater industrial interaction, increased revenue from grants and industry, higher visibility in the scientific community, continued contact with our alumni, additional academic members and more students studying at CIM.

This is an important juncture for our research domain, since it appears that robotics and intelligent systems are crossing a threshold in terms of practical relevance, feasibility and social impact. Many indicators point to this -- ranging from a Scientific American cover story by Bill Gates supporting robotics, the widespread adoption of robotics technologies in the field by the US military, the sale of millions of autonomous robot vacuum cleaners to the adoption of full automated vehicle parking systems in several upscale automobile models. These developments are just the leading edge of a trend that should continue to develop momentum over the next decade.

Biomedical applications of intelligent systems also continue to both emerge and mature. Haptics, neuroscience and human-machine tele-medicine are well represented within CIM through our collaborations with the Montreal Neurological Institute and the Canadian National Institute for the Blind.

Industrial liaisons increased this year. CIM hosted several technical meetings with existing and prospective corporate partnerships. McDonald Detweiller & Assoc., Motorola, Research in Motion (RIM), Immersion and Nokia formed stronger ties with our members. Existing collaborators such as CAE and the Canadian Space Agency continue to support our Centre through graduate student scholarships and contracts.

Our numbers remain strong. Currently CIM researchers are involved in research initiatives valued over $24M and CIM members generate over $3 million dollars annually in research grants and contracts.

We have taken action to tangibly increase our involvement in research and industrial collaborations within Québec. Our strategic partnership with the Regroupement Stratégique Centre REPARTI has already yielded positive results in its first year of operation. Eleven of our CIM members participate in this infrastructure program. This alliance provides the CIM operation with increased exposure to industrial contacts, greater interaction with researchers from 5 other institutions within Québec and of course, more opportunity to involve our graduate students in scientific initiatives and research programs.

Academically, our members proudly lead in scientific discovery. This tradition was established many years ago by founding members such as the late Professor George Zames, who was an elected Fellow of the Royal Society of Canada and also a recipient of the I. Walton Killam Prize for Engineering in 1995, in recognition of his pioneering work in systems and control theory, the "father of H Infinity control".

Among the recognition accorded CIM members, we have:

- 2 Fellows of the Royal Society of Canada
- 2 James McGill Professors
- 3 Sir William Dawson Scholars
- 1 Fellow of the Institute of Electrical and Electronic Engineers (IEEE)
- 1 NSERC University Faculty Award holder
- 1 Canada Research Chair

In addition, this year our members continued to be recognized within the university:

• Professor Meyer Nahon was elected Fellow of the Canadian Aeronautics and Space Institute
• Professor Kaleem Siddiqi won the Carrie M. Derick Award for Excellence in Graduate Student Teaching and Supervision at McGill University
• Professors Gregory Dudek and Kaleem Siddiqi were promoted to the rank of Full Professor.
• Professor Michael Langer was promoted to Associate Professor

Conference organization and locality played a significant role in raising our Centre's scientific profile in 2006-2007. Most of our members played important administrative roles in their professional associations and editorial boards. One notable example was the combined Artificial Intelligence, Graphics Interface, Computer and Robot Vision and Intelligent Systems Conference, which was held in Montreal May 27-30, 2007. We attribute the success of this enormous event in large part to the leadership of one of CIM's members, Professor Tal Arbel, who acted as General Chair.

This conference generated significant amounts of interest in McGill, and helped to showcase the quality of our graduate students, particularly those from Electrical and Computer Engineering and the School of Computer Science. Over 400 participants from Canada, the United States and Europe attended this conference, and approximately 200 of these participants visited CIM on May 28, 2007 as part of an Open House.

Media coverage reached blockbuster proportions in 2006-2007, building on the momentum that began with the CIM 20th Anniversary Celebration and Symposium last year. This year, the Centre and its research initiatives were featured in over 20 media outlets. Among the most prominent: the *Haptics Laboratory* featured in the *Economist Technology Quarterly*, March 10, 2007 edition; and *the AQUA project* of the *Mobile Robotics* and *Mechatronic Locomotion Laboratory* featured in *IEEE Spectrum* June 2006 edition.

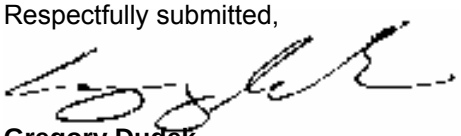
In May 2007, two major McGill benefactors/alumni visited CIM, and were given tours and demos by several of our graduate students in various labs.

Our Centre is now over 20 years old, yet it remains an exception for its level of, and activity in, multidisciplinary research. As a mechanism to potentiate inter-departmental and inter-faculty collaboration, our Centre has few equals. This is a source of great pride to us as a community. CIM was formed in 1985 to transcend traditional departmental and faculty boundaries and to push forward scientific discovery and graduate student teaching in an environment that still, to this day, fosters intellectual freedom and academic debate.

I am gratified by the level of international recognition bestowed upon our members and our Centre. CIM has become one of only a small number of internationally prominent research venues for inter-disciplinary research in intelligent systems. Few other universities can deliver on the critical mass and intellectual depth in this important sector that McGill University, through our Centre, does so effectively.

Congratulations to the students, researchers and staff of the Centre for Intelligent Machines for an extremely productive and successful year!

Respectfully submitted,



Gregory Dudek
Director

Marlene Gray
Manager

BACKGR0UND SUMMARY

Mission
The Centre for Intelligent Machines (CIM) supports graduate research, teaching and applications of intelligent systems. This dynamic community of scientists, engineers and designers seek to bridge science and innovation. Their novel ideas bring solutions to some of the most challenging problems of the 21st century.

Established in 1985
CIM was formed in 1985 as the McGill Research Centre for Intelligent Machines (McRCIM). At that time, it reported to the Dean of the Faculty of Engineering and the Vice-Principal Graduate Studies and Research. Members from the Department of Electrical Engineering, the Department of Mechanical Engineering, the Department of Biodmedical Engineering, the Department of Mining and Materials Engineering and the School of Computer Science contributed to the Centre's early formation.

As of 2007
Today, the Centre is comprised of 24 faculty members and associate members, about 130 graduate and honors-undergraduate students, post-doctoral fellows and visitors and 13 topical laboratories. The Centre for Intelligent Machines (CIM) currently spans 2 faculties with members from the Departments of Electrical and Computer Engineering, Mechanical Engineering and the School of Computer Science. It also has associate members and collaborators in related disciplines, such as the Montreal Neurological Institute, and other universities both within Québec and Canada.

Research Objectives
Our fundamental research objectives and philosophy have remained the same for over 20 years – to push forward the boundaries of intelligent systems through scientific discovery and to educate new generations of students to apply this knowledge to the development of technologies that address the complex needs of modern society.

Research Themes
The main research themes within the Centre are:

- Artificial perception
- Robotics
- Systems and control
- Human-Machine interfaces

Interactive Environment
The operation of the Centre is driven by our collective needs with an eye towards synergy and economies of scale. Resources are fully shared among all users in the CIM community. This open, collaborative environment encourages academic debate and the free exchange of ideas.

Academic Recruitment
CIM's global reputation as a dynamic and multidisciplinary research environment has attracted the interest of many top scientists. Over the past decade, 12 academic hires in the Faculties of Science and Engineering accepted positions at McGill largely because of the presence of the Centre and the opportunity to interact with CIM members.

Funding Diversity
We have been successful over the years in attracting funding from numerous sources: NSERC, NCE, CFI, FQRNT, DRES, DARPA, Canadian, U.S. and foreign industries. We have used this funding, in part, to support the acquisition of state of the art research facilities.

Physical Resources
The physical resources of CIM comprise about 14,000 sq. ft. in the McConnell Engineering Building on McGill's main campus. This represents a nearly contiguous collection of offices, laboratories, a small meeting room and space dedicated to house an extensive information system. This proximity creates a working community where we naturally and regularly meet and interact with each other.

Laboratories
Our diverse research culture is home to 13 interdisciplinary laboratories specializing in the areas of:

- Robotics
- Mechatronics
- Aerospace
- Systems and Control
- Haptics
- Vision
- Medical Imaging
- Shared Reality

RESEARCH HIGHLIGHTS

I am pleased to announce that two new assistant professors have become full members of CIM over the past year:

Professor Shie Mannor: Intelligent Networks Lab

Professor Mannor's research program considers a practical approach for intelligent systems that improve their policy by learning from experience. In order to deal with the complexity of such systems and especially with the excessive amount of information, Professor Mannor and his group consider a statistical approach to determine which information is most significant for the purpose of decision making. The research program further addresses adaptation and learning in environments that contain multiple agents who react to each other as well as to the changing environment. Large heterogeneous communication networks that include multiple computers and network elements motivate this research and will be used for validating the developed approach. Professor Mannor is currently a holder of the Canada Research Chair in Machine Learning. He is also a recipient of a CFI New Opportunities Grant. This group's research program is supported by a high performance dedicated cluster with 32 nodes plus workstations.

Professor Jozsef Kovecses: Dynamic Systems Laboratory

Professor Jozsef Kovecses' main research interests are in the areas dynamics and control, and their applications. His current projects include: contact dynamics in mechanical systems; dynamics and control of variable topology systems; dynamics identification of multibody systems; modeling and simulation of complex multibody systems for space robotic applications; dynamics modeling of aerospace structures for fixture design in high-speed machining; dynamics of musculoskeletal models and walking, minimally invasive devices for spine and heart surgeries. His work has been supported by NSERC, FQRNT, the Canadian Space Agency, CFI, Quanser, McGill University, and the Hungarian-Canadian Science and Technology Cooperation Programme. He obtained a CFI New Opportunities grant to establish a laboratory environment in Dynamic Systems. Laboratory equipment acquired includes a test-bed based on two six degree-of-freedom devices to support a variety of research activities in dynamics and control. His research group is currently composed of five doctoral students, one postdoctoral researcher, and one master's level student. He is also the coordinator of the Robotic Mechanical Systems Seminar Series at CIM.

OUTSTANDING SCIENTIFIC CONTRIBUTIONS:
CIM in the MEDIA

The year 2006-2007 was a groundbreaker for positive media exposure to the Centre for Intelligent Machines. Building on the momentum of the CIM 20th Anniversary Celebration and Symposium of May 2006, members of CIM and their research projects brought measurable and significant exposure to the University. The following are a few examples:

The ECONOMIST – Professor Vincent Hayward
How Touching

Professor Vincent Hayward, Director of the Haptics Laboratory of CIM, was featured in the Economist Technology Quarterly, March 10, 2007 edition, in a feature called “How Touching”. Portions of this copyright article are represented below.

> The smooth, touch-screen display on Apple's snazzy new iPhone, unveiled in January and due to go on sale in June, has gadget fans salivating. In place of the usual keypad, the iPhone uses the screen as an input device, displaying different buttons and icons depending on the task at hand. Rival devices from other handset-makers, including LG and Samsung of South Korea, take a similar approach. Replacing physical buttons with virtual ones certainly makes for greater flexibility-but might it make the phone trickier to use? You can tell when you've pressed a real button because you can feel the subtle "click". But typing on the iPhone, in contrast, is said to be rather fiddly, because there is no such tactile feedback with a touch screen.
>
> That is why Samsung's touch-screen phone, despite being less well known than Apple's device, is worth watching. The SCH-W559 handset, which is so far available only in China, fools the user's sense of touch and mimics the feeling of pressing a mechanical button, even though the surface is actually completely flat. It is the latest example of a new breed of "haptic" technologies that do for the sense of touch what lifelike colour displays and hi-fi sound do for eyes and ears.
>
> Haptics is the science of simulating pressure, texture, vibration and other sensations related to touch. The term is derived from a Greek word meaning "able to lay hold of". Devices that exploit haptics have been around for decades: many modern aeroplanes, for example, have haptic control columns that shake or vibrate to warn the pilot of an approaching stall. The technology has also found its way into video-game consoles, where it adds an extra layer of realism. Players can feel when they are veering off course in a driving game, or when they have been hit in a shooting game. Force-feedback technology, another offshoot of haptics, is used in robotic telesurgery and in surgical simulators to enable surgeons to feel resistance as they move their surgical instruments around, just as they would in conventional surgery.
>
> Even the "vibrate" mode on a mobile phone, which discreetly alerts the user to an incoming call or text message, is an example of haptics. But today's technology fails to take full advantage of the sense of touch. It has particular potential in relaying information to people when their other senses are occupied, as when walking or driving, says Karon MacLean, a researcher at the University of British Columbia in Vancouver, Canada.
>
> The new phone goes much further, using very precise actuations of its built-in motors to produce realistic, button-like clicks whenever an onscreen button is pressed. "Using a touch-screen, you normally lose the tactile confirmation you get from pressing a button," says Mr Viegas. But with haptic feedback, on-screen buttons can be made to feel real and are easier to use. "You get the feeling that you have somehow really touched this object on the screen," says Tapani Ryhänen, head of strategic research at Nokia, the world's biggest handset-maker, who has been investigating the idea of adding haptics to Nokia's phones as well.
>
> Most of today's haptic devices rely on motors that either prod or vibrate the skin, but a new technology is emerging that is an even more flexible and effective means of stimulating the sense of touch: skin stretch. By laterally stretching the surface of the skin (without pushing or poking into it) it is possible to mimic the feeling of complex shapes and sensations. This is because the sense of touch seems to depend far more on the way in which the skin is deformed and stretched than it does on the degree of pressure applied. So it should be possible to recreate sensations purely by stretching skin, says ***Vincent Hayward, a researcher who first developed such a device at the Centre for Intelligent Machines at McGill University in Montreal, Canada.***
>
> Exactly what haptic devices will be used for is still unclear, but they seem destined to become more widespread in future. In the short term, one trend in particular will drive adoption, Mr Viegas predicts. "The world is rapidly moving towards having touch screens in most devices," he says. The launch of the iPhone will accelerate this trend, since it is bound to spawn many imitations. "It's going to have a huge impact," says Mr Viegas. Strategy Analytics, a consultancy, predicts that 40% of new mobile phones could have touch screens by 2012-though if haptics takes hold, perhaps "touchy-feely" screens would be a better description. "The ultimate aim of haptics research is to find ways to simulate the feeling of any shape, texture or tactile sensation."

IEEE SPECTRUM – Professor Gregory Dudek
Gone Swimmin"

- THE AQUA PROJECT, led by Professor Gregory Dudek, was featured in the IEEE Spectrum June 2006 edition. This project embodies key research from the areas of robotics, artificial intelligence, mechanical design and computer vision. The result is an amphibious robotic platform that will be used, among other things, to monitor the health of littoral regions (e.g. coral reefs). AQUA has received critical acclaim and considerable media attention, as evidenced in this prestigious IEEE Spectrum article, jointly authored by Gregory Dudek and Michelle Théberge.

  http://www.spectrum.ieee.org/jun06/3641

- The AQUA Project was also featured in IEEE Computer, V 40(1), January 2007, pp. 46-53, and the McGill Reporter February 8, 2007 in a feature entitled "Robot at home on land, sea".

McGILL HEADWAY – Professor Tal Arbel
MRI Ultrasound Combo Helps Brain Surgeons Home in on Target

- Professor Tal Arbel, Director of the Medical Imaging Laboratory of CIM, was featured in McGill Headway, Research, Discovery and Innovation at McGill University, Vol. 2, No. 1, Fall 2006. In collaboration with Professor Louis Collins, Director of the Image Guided Neurosurgery Research Lab of the Montreal Neurological Institute, Professor Arbel uses a new combination of ultrasound and magnetic resonance imaging (MRI) to guide surgeons through complex procedures.

  http://www.mcgill.ca/headway/fall2006/networks1/

MIT TECHNOLOGY REVIEW - Professor Vincent Hayward
The Cutting Edge of Haptics

- Professor Vincent Hayward, Director of the Haptics Laboratory at CIM was featured in the MIT Technology Review of August 25, 2006. Along with his colleague, and former Postdoctoral Fellow, Dr. Gabriel De-La-Torres, Professor Hayward has found a way to trick the body's senses into thinking a flat surface is actually sharp or pointed.

  This research was presented at the IEEE International Symposium on Robot and Human Interactive Communication in Haptfield, England in the Fall of 2006.

  http://www.technologyreview.com/Biotech/17363/

RESEARCH INNOVATION

The following projects are a small sample of the diversity of research activities within CIM during 2006-2007.

- The Mobile Robotics Group and the Artificial Perception Group, under the leadership of Professors Gregory Dudek and Frank Ferrie respectively, joined forces to work on this NSERC Strategic project called *Distributed Range Mobile Sensors*. This project deals with the integration and use of sensor data collected by an ensemble of sensors distributed in an environment. Two key issues are highlighted: the construction of geometric models of the environment, and the construction of maps of where the sensors are deployed. This work includes both an embodiment using real sensors such as cameras and laser range finders, as well as algorithmic techniques that demonstrate how probabilistic error models that explain sensor data can be estimated. This project receives strong industry support - both CAE Inc. and Neptec Inc. are collaborators.

- Professor Meyer Nahon and a multidisciplinary group of researchers in the Mobile Mechatronics Laboratory lead the development of the quadrupedal PAW and the amphibious AQUA platforms. In the case of PAW, simulation work is under way to design intelligent controllers for this quadruped to allow it to tune its gait in response to changes in the terrain and to also overcome obstacles. In the case of the AQUA underwater robot, the experimental and simulation-based research addresses the development of stability augmentation systems and high-level controllers to control the robot's motion.

- In the Aerospace Mechatronics Laboratory, under Director Inna Sharf, the latest developments include the installation of the new 6-camera Motion Capture system from Vicon and a recent addition to the existing airships in the lab: the ALTAV vehicle developed by Quanser. The Vicon system will be used to determine the pose of the fully-actuated spherical airship which is used in the laboratory for experiments on autonomous robotic grasping of objects in space (the airship serves the function of an uncooperative satellite).

  The ALTAV airship is an airship that relies on marginal stability and lift and high thrust-to-mass ratio to give it high maneuverability and outdoor capability in a relatively small package. Research is focused on modeling the airship's dynamics and developing controllers, both low-and high-level.

- The Probabilistic Vision Group has a number of projects underway. *Matthew Toews, PhD candidate* supervised by Professor Tal Arbel, has developed a general probabilistic model of image appearance, which can be automatically learned from a large database of example images. The model is applied to detecting faces from arbitrary viewpoints, analyzing brain imagery, and determining image features reflective of characteristics such as gender and age.

  To date, this work has resulted in:

  - ❖ Two publications in the International Conference of Pattern Recognition (a top pattern recognition conference, 2006);
  - ❖ A journal article in the IEEE Transactions on Medical Imaging (the premier medical imaging journal, 2007);
  - ❖ A chapter in the book "Computational Intelligence in Medical Imaging: Techniques and Applications", to be published in 2008.

- Professor Michael Langer, Director of the Appearance Modelling Laboratory of CIM, and his group are continuing its investigation of the visual properties of 3D cluttered scenes. In the recent past, they addressed scenes containing foliage (plants, forests) and falling snow. They have now begun to consider scenes whose objects are composed of fine particles, such as fog, smoke, clouds, medical images (CT), and underwater debris.

  The main questions addressed are:

  How can the 3D geometry be estimated?
  How can the motion of the robot or person be estimated?

  Professor Langer and his student *Vincent Couture* were able to show how and why classical motion estimation methods could be used for estimating motion parallax in 3D cluttered scenes. This was a surprising result since such methods are designed for sparse scenes with smooth surfaces. The research was awarded the Best Vision Paper award at CRV:
  "Can Lucas-Kanade be used to estimate motion parallax in cluttered 3D scenes?"
  V. Couture, M.S. Langer, 4th Canadian Conference on Computer and Robot Vision, Montreal, CA May 2007.

- The Shape Analysis Group, under Director Professor Kaleem Siddiqi's supervision, developed a new differential geometric characterization of 3D streamline flow patterns which occur in computer vision, graphics and medical imaging. These developments were applied to the analysis and modeling of white matter fiber tracts from Diffusion MRI data. In joint work with the Appearance Modelling Group, lead by Professor Michael Langer, new algorithms for depth from defocus and the removal of partial occlusion effects from single images were also developed.

- Director of the Shared Reality Laboratory, Professor Jeremy Cooperstock, and his research group have been working closely with colleagues at the Societé des Arts Technologiques (SAT) to develop a rich, multisensory, immersive environment that includes support for physical modeling and processing of audio sources, graphical representations of sound objects, and live video of distributed participants. This "AudioScape" project is now expanding to support multiple users in a single location, each of whom must be tracked in real-time and provided with an appropriate audio mix based on position and orientation. With colleagues in Music Technology, experiments are underway on the synthesis and perception of different ground surfaces for interactive walking; dubbed "haptic snow", the team has already simulated the haptic and auditory experience of walking on snow.

- The Robotic Mechanical Systems Laboratory of CIM, led by Professor Jorge Angeles, has been working in various fronts: 1) the Schoenflies Motion Generator is a parallel system for the production of motions proper of what is known in the market as SCARA (Selective Compliance Assembly Robot Arm) systems, the intention being to beat the current industrial cycle time of 500 ms boasted by Adept for their serial systems; 2) QUASIMORO is a two-wheeled mobile robot carrying a payload, the challenge here being to accomplish three independent functions with only three motors, which is being done thanks to a clever nonlinear feedback control algorithm devised by *former PhD student Alessio Salerno*, the applications being multiple, e.g., a waiter for the mobility-challenged, a highly mobile exploring device, and entertainment; and 3) PLATO, a series of multi-axis accelerometers with simplicial architectures (simplicial derives from "simplex," a well-known term in mathematical programming) for accelerometer strapdowns intended for the twist and pose estimation of free-floating bodies.

- Professor Vincent Hayward, Director of the Haptics Laboratory, was on sabbatical visiting the Laboratoire de Robotique de Paris as a Professeur Invité of the University Pierre et Marie Curie, and continued working with the members of his group in Montreal. In the past year, a new type of hybrid force feedback device was designed and implemented whereby the force experienced by the user result both from the activation of electric motors and from newly developed eddy current brakes bringing the simulation fidelity to unprecedented levels. Using this new hardware a theory and method for synthesizing haptics textures were developed. New types of perceptual interactions were discovered, for instance the weight of a vibration object such as a telephone has an effect on the perceived vibrations. Progress was made on the artificial production of tactile sensations both in the rendering of Braille and of tactile graphics. In the past year also several more theoretical results were attained regarding the contributions of the skin mechanics to tactile perception, the discovery of several invariants which seem responsible for the perception of haptic shape.

- Projects in the Systems and Control Group of CIM are focused on learning, adaptation, cooperation, competition and robustness in complex uncertain control systems.

  The work of Professor Benoit Boulet, Director of the Industrial Automation Laboratory of CIM, and his group have advanced the theory of tuned robust controllers for multivariable systems with significant parameter uncertainty together with applications to the automotive and thermo-forming industries. One of the areas of work led by Professor Peter Caines and associates is the study of large populations of competing agents (such as cell phone users in a crowded environment) using stochastic control and game theory concepts to find social equilibria. Other work is focused on the control of hybrid systems where discrete (computer based) and continuous (physics based) phenomena intrinsically intertwined (as for vehicle dynamics and chemical engineering processes). Among other topics, Professor Shie Mannor and his research group are studying adaptive multi-agent network formation, for example as occurs in Internet and ad hoc market applications. This research uses methods from probability theory, game theory, and computer science, as does his work on decision making by sets of agents in environments where they have little or no prior information. Professor Hannah Michalska is working on several projects. In joint robust control studies with other group members, Professor Hannah Michalska is applying large scale stochastic estimation and data fusion methods to problems that arise in detection, security and marine applications.

- The activities of the Fluid Flow Control Group, under the leadership of Professor Luca Cortelezzi, are focused on modeling, optimization and control of unsteady fluid flows with applications to drag reduction, lift enhancement, heat and mass transfer optimization, mixing enhancement and noise inhibition. Particular emphasis is put on the design of reduced-order controllers and the development of realistic sensors and actuators. The final goal is to optimize and redesign currently used devices and develop novel devices for industrial and aeronautical applications.

- The Content-Based Retrieval Group, directed by Professor Martin Levine, studies automated systems for viewing videos or actual time varying 3D scenes and interpreting them to identify certain specific behaviors or objects. Research in this area is classified under the rubrics of object motion detection, object tracking, and object behavior recognition. These aspects cannot be treated independently and this research application deals with a program aimed at addressing all three topics. To date, the automated surveillance literature has dealt largely with outdoor environments where people are being viewed at a significant distance. By contrast, this group concentrates on relatively confined indoor spaces where perhaps there are a few people in a complex environment, even containing moving objects. The scenes contain people (“objects”) performing activities, as well as inanimate objects of interest that must be detected and recorded.

NEW INITIATIVES - and More Media

The official unveiling of the CIM Interactive Video Information Kiosk took place in McConnell Engineering Building, CIM lobby, on January 8, 2007. This event garnered the largest assembly of media participants in over a decade and resulted in extensive local and national coverage. The ceremony was sponsored jointly by CIM and Precarn Inc., the organization responsible for the funding of this project. Notably, Denis Thérien, Vice-Principal (Research and International Relations) of McGill, and Vice-President of Precarn Inc.,Graham Taylor, were interviewed one-on-one by Radio-Canada. Media attendees included:

- The Montreal Gazette with a reporter and photographer
- TQS-TV with a reporter and a cameraman
- Channel-12 (CTV) with a cameraman
- Global TV with a cameraman
- Radio-Canada (French-language radio) sent a reporter
- The La Presse technology reporter visited the centre on Feb. 08/07
- IT Business interviewed four CIM professors and one PhD student, Vincent Levesque, in the Haptics Lab concerning the day's event and their research projects
- IT World Canada
- McGill Reporter

Some of the features included – TQS-TV, Jan. 08/07;Channel 12-CTV, Jan. 08/07; Montreal Gazette, Jan. 09/07; IT Business Jan. 09/07; IT World, Jan. 09/07; McGill Reporter, Jan. 11/07; and La Presse, Feb. 09/07.

DEGREES of SEPARATION - Women Dominate at Universities

Sunday, February 4, 2007

The media exposure provided during the unveiling of the CIM Interactive Information Video Kiosk of January 2007 spawned fresh articles in the Montreal Gazette on Women in Engineering and Science. This feature was carried across Canada, appearing, among others, in the Saskatoon Sun Pheonix on Feb. 10, 2007.

We are very pleased that two of CIM's graduate students, *Carmen Au, PhD* candidate in the Motor-Vision Laboratory (Professor James Clark) and *Olivia Chiu, MEng* candidate (Professor Meyer Nahon) in the Mechatronics Locomotion Laboratory, were featured.

Some excerpts from this 5-day series on DEGREES of SEPARATION by Peggy Curran are outlined below:

> …Olivia Chiu, a master's student in robotics, is just home from a research trip to McGill's marine research lab in Barbados, where she's trying to teach a flipper-powered underwater robot to navigate through coral reefs without a human directing its every paddle.
>
> Chiu became fascinated with robotics in high school when she heard about NASA's Exploration Rovers, robots which ramble across Mars in search of geological features conducive to sustaining life. She earned her bachelor's degree at Queen's in engineering and physics before switching to McGill, where she's working on the AQUA underwater robot project. Trawling the sea on six yellow flippers, the robot has been rigged with

computerized vision, using three cameras to achieve 3-D perspective on the ocean landscape. Eventually, researchers would like the machine to function without being guided every step of the way…

…In a computer lab at McGill University's McConnell Engineering building, doctoral student Carmen Au patches digital images together to create a panoramic mosaic from a random smattering of snapshots.

For her master's project, she worked with her professor on autonomous video-surveillance, techniques designed to back up and relieve the pressure on bored security guards in a post-Sept. 11 world. The aim was trying to "teach" a surveillance camera to recognize and red-flag only those things that were out of the ordinary - the new face in the corridor, or a regular person doing something that's odd or out-of-character…

SCIENTIFIC AND FINANCIAL OUTPUT

The Centre for Intelligent Machines is comprised of 19 full time members, 5 associate members and 1 emeritus member. During the year 2006-2007, CIM members Vincent Hayward, Kaleem Siddiqi, Michael Langer and Frank Ferrie, and associate member Doina Precup, were on sabbatical.

A summary of our membership, student enrolment and scientific output appears below.

- MEMBERSHIP

	Full	Associate	
ECE	**9**	**0**	
ME	**7**	**2**	
SOCS	**3**	**3**	
Total	**19**	**5**	**24**

- STUDENTS

Masters	**41**
PhD	**52**
Foreign Visiting	**8**
Undergrad Honors	**22**
Total	**123**

- SCIENTIFIC OUTPUT

Internationally, CIM's presence in the community of researchers in areas related to intelligent systems is prominent. The publication output for 2006-2007 for CIM full members and associate members is indicated below:

	Full	Associate	Total
Refereed articles/journals	**51**	**26**	**76**
Refereed conference proceedings	**97**	**29**	**126**
Books	**1**	**0**	**1**
Chapters	**5**	**1**	**6**
Grand Total	**154**	**56**	**209**

❖ *A list of publications for CIM full members for the past year Is located in the appendices.*

- TECHNOLOGY TRANSFER

Patents	**7**	**1**	**8**
Spin-Offs	**1**	**0**	**1**

Professor Gregory Dudek filed two families of patents this year. One of these is suitable for dissemination: Canadian patent 2,555,148 Amphibious Robotic Device US Patent 11/497,302.

Spin-Off: Professor Benoit Boulet's spin-off company, MAGI Control Inc., was recognized as 1 of 6 successful NRC high-tech spin-offs in Canada in 2006. MAGI Control Inc. produces controllers for thermoforming machines developed at the Industrial Automation Laboratory of CIM.

Over the past decade, over 25 spin-off companies have been formed, typically through our students, in the exploitation of technologies associated with our research programs. In addition to MAGI Control, other examples include SimActive, AutoVu Technologies, RealContact and ART Advanced Technologies Inc. Approximately 22 inventions have been commercialized by CIM members since 1998.

- REVENUE BREAKDOWN:

For the year 2006-2007:

Total value of grants and contracts: **$ 24M**

Total annual value of revenue from grant/contracts: **$ 3.5M**

Total annual value of CRC **$ 400K**
Total annual value of CFI's **$ 500K**
Total annual value of FQRNT **$ 250K**

The CIM/REPARTI regroupement stratégique, combined with matching funds from the University and the CIM membership, contributed to the Centre's operations to the amount of approx. $250,000 in the year 2006-2007.

Regroupement stratégique pour l'étude des environnements partagés intelligents répartis

reparti

A Strategic Team for the Study of Distributed Intelligent Shared Environments

REPARTI

http://reparti.gel.ulaval.ca/en/REPARTI/index.chtml

Centre REPARTI is an inter-institutional, interdisciplinary collaborative venture between McGill University, represented by the Centre for Intelligent Machines (CIM), and members from Université Laval, Université de Sherbrooke, Ēcole Polytechnique, Université de Montréal and Université du Québec en Outaouais.

REPARTI

http://reparti.gel.ulaval.ca/en/REPARTI/index.chtml

BACKGROUND

Supported by the Quebec government's *Fonds québécois de la recherche sur la nature et les technologies (FQRNT),* this regroupement stratégique builds on several unique historical precedents:

1. The evolution of the FQRNT Network Réseau québécois de recherche en réalité artificielle distribuée (QERRAnet) under the McGill domain (2002-2006) into a research centre in 2006 hosted by Université Laval.
2. The historical and concrete partnership that has developed over a period of 20 years between prominent researchers in this centre as a result of the NSERC National Centres of Excellence program, and the interuniversity-industrial consortium IRIS-Precarn.
3. The long and productive relationship established between the Centre for Intelligent Machines (CIM) and the Quebec government through the former FCAR Centre de recherche programme.

The lead institution in this enterprise is Université Laval under the Directorship of Professor Denis Laurendeau. The McGill node is comprised of 11 members by virtue of their membership in the Centre for Intelligent Machines.

RESEARCH PROGRAM

The research program of REPARTI is composed of three main themes:

- Perception
- Modeling – assessment – learning
- Interaction

OBJECTIVES

The objectives of REPARTI are to: i) conduct advanced research on intelligent environments, ii) improve the quality of life of individuals by reducing the effects of their geographic disparities iii) train highly qualified personnel iv) create opportunities for technology transfer and economic development and v) promote and enhance Quebec's leadership and role in this key technological sector.

2006 – 2007 REPARTI HIGHLIGHTS

REPARTI COLLOQUIUM MAY 31, 2007

The official launch of Centre REPARTI was held on May 31, 2007 at McGill University.

Introductory comments were provided by:

Sylvie Dillard, présidente-directrice générale du Fonds québécois de la recherche sur la nature et les technologies
Denis Thérien, Vice-Principal (Research and International Relations), McGill University
André Roy, Vice-doyen à la recherche - Faculté des arts et des sciences, Université de Montréal
Denis Laurendeau, Director REPARTI, Université Laval
Frank Ferrie, Associate Director REPARTI, McGill University

Over 130 researchers, students and invited guests attended the colloquium, which was held in Trottier Building of McGill University. The program included oral talks, poster presentations, and invited talks by Dr. Martial Hébert from the School of Computer Science of Carnegie-Mellon University (Pittsburgh, USA) and Dr. Jean Côté from the Robotics Division, Hydro-Québec Research Institute (Varennes, Canada).

The REPARTI Governance Board met during the REPARTI Colloquium to discuss scientific and strategic planning.

REPARTI GOVERNANCE, SCIENTIFIC OUTPUT, FUNDING

During the fall of 2006, Professor Frank Ferrie, Associate Director of REPARTI, spent his sabbatical as a visiting scholar at Université Laval. His primary objective was to discuss, with Professor Denis Laurendeau, Director of REPARTI, key issues surrounding the start up of REPARTI – for example, the establishment of a Board of Governance, strategic research planning and membership issues

In the first year of operation, scientific output within the McGill node of REPARTI resulted in 39 contributions to leading international journals, 80 contributions to peer-reviewed conference proceedings as well as contributions to 9 books.

The Centre REPARTI is comprised of about 185 students, with the breakdown as --63 PhD students, 31 Master's students and 15 undergraduate honours students. Approximately 60 graduate students within McGill are currently associated with the Centre REPARTI.

The Centre REPARTI receives funding from the provincial government's Regroupement stratégique program of the FQRNT. The McGill node receives approximately $100K per annum to support key operations and graduate student support. This funding is scrupulously appropriated between activities to support the mandate of the Centre REPARTI and value-added contributions to the primary organization, the McGill Centre for Intelligent Machines (CIM).

SOME REPARTI RESEARCH PROJECTS UNDERWAY AT McGILL UNIVERSITY

Distributed Intelligent Shared Environments

- Research in the Artificial Perception Lab of CIM addresses three fundamental problems that are at the heart of REPARTI: i) how to build representations of complex, large-scale environments, ii) how to determine the state of such environments using a distributed sensor network, and iii) how to recognize and act on particular events taking place. Towards these ends, we are pursuing a novel strategy that links research in artificial perception to modeling and simulation.

  Recent breakthroughs in the latter have made it possible to build highly articulated representations of very complex environments - a problem that has long challenged researchers in artificial intelligence (AI). By linking such models to their real-world counterparts via distributed sensors, it then becomes possible to build systems that can predict and react in far more complex ways.

  For example, in a PRECARN-funded project with CAE Inc., Actenum Inc., McGill, Simon Fraser University and the Ottawa Paramedic Services, we are investigating ambulances can be optimally positioned in real-time to guarantee legally mandated response times. The system incorporates a virtual model of the Ottawa traffic system, and input from TV cameras and traffic sensors. Our role is to automatically infer traffic conditions from a distributed camera network. Ultimately we are looking to larger scale infrastructure management problems. The Ottawa project is essentially a first step in what we hope will be a long-term research collaboration.

  One of the challenges in building such systems is in acquiring complex, detailed models that relate not only the physical appearance of the environment, but its physical and behavioral properties as well. Our collaboration with Terrapoint Inc. stems from their expertise in large scale LIDAR measurement (they currently have one of the best technologies on the planet), an essential ingredient in the kinds of large scale moldes we are investigating. Working with colleague Professor Claire Samson (Carleton), the goal of our research is to improve the dynamic accuracy of LIDAR measurement through data fusion techniques (which figure prominently in our scientific research). As with CAE, we intend to build on our collaboration with TERRApoint over the longer term, as part of REPARTI-related projects and our participation in the NCE GEOIDE program.

- *Catherine Laporte, PhD* candidate with Professor Tal Arbel, provides the following commentary: My thesis research is in ultrasound image processing. My research aims at the development of a system capable of recovering the 3D positions of 2D ultrasound images acquired using the freehand technique using a standard clinical ultrasound machine without access to a position tracking device. To this end, I have studied the effect of the logarithmic dynamic range compression (which clinical ultrasound machines internally apply to ultrasound signals) on the accuracy of 3D reconstruction algorithms based on speckle decorrelation. I also developed a ground truth validation platform based on simulation for sensorless 3D ultrasound which allows algorithms to be tested on a variety of tissue types with controlled statistical characteristics, which was presented at the REPARTI colloquium of May 31, 2007. Finally, I developed a new method for representing and using the uncertainty associated with correlation measurements in the context of 3D reconstruction based on speckle decorrelation.

- Catherine's study of the logarithmic compression process with respect to 3D ultrasound was accepted for an oral presentation and published in the proceedings of the 2006 conference on Medical Image Understanding and Analysis which took place in Manchester, U.K., in July 2006. The same work was also awarded the 2nd prize at the Centre for Intelligent Machines student poster session in May 2006. The tissue model which underlies my ground truth validation platform was also accepted for an oral presentation and published in the proceedings of the 2007 International Symposium on Biomedical Imaging, which took place in Washington, D.C., in April 2007. The new probabilistic methodology for sensorless 3D ultrasound was submitted for publication in the proceedings of the 2007 International Conference on Medical Image Computing and Computer Assisted Intervention. It has since been accepted for publication (May 2007) and will be presented in Brisbane, Australia, in October 2007.

APPENDICES

FACULTY MEMBERS

Name	Email @cim.mcgill.ca	Phone (514) 398-	Department
Angeles, Jorge	angeles	6315	Mechanical Engineering
Arbel, Tal	arbel	8204	Electrical and Computer Engineering
Boulet, Benoit	boulet	1478	Electrical and Computer Engineering
Caines, Peter	peterc	7129	Electrical and Computer Engineering
Clark, James	clark	2654	Electrical and Computer Engineering
Cooperstock, Jeremy	jer	5992	Electrical and Computer Engineering
Cortelezzi, Luca	crtlz	6299	Mechanical Engineering
Dudek, Gregory	dudek	4325	School of Computer Science
Ferrie, Frank	ferrie	6042	Electrical and Computer Engineering
Hayward, Vincent	hayward	5006	Electrical and Computer Engineering
Kovecses, Jozsef	kovecses	6302	Mechanical Engineering
Langer, Michael	langer	3740	School of Computer Science
Levine, Martin	levine	7115	Electrical and Computer Engineering
Mannor, Shie	shie	1467	Electrical and Computer Engineering
Michalska, Hannah	michalsk	3053	Electrical and Computer Engineering
Nahon, Meyer	mnahon	2383	Mechanical Engineering
Sharf, Inna	isharf	1711	Mechanical Engineering
Siddiqi, Kaleem	siddiqi	3371	School of Computer Science
Zsombor-Murray, Paul	paul	6311	Mechanical Engineering

ASSOCIATE MEMBERS

Name	Email	Phone (514) 398-	Department
Misra, Arun	misra@cim.mcgill.ca	6288	Mechanical Engineering
Mongrain, Rosaire	rosaire.mongrain@mcgill.ca	1576	Mechanical Engineering
Panangaden, Prakash	prakash@cs.mcgill.ca	7074	School of Computer Science
Pineau, Joelle	jpineau@cs.mcgill.ca	5432	School of Computer Science
Precup, Doina	dprecup@cs.mcgill.ca	6443	School of Computer Science

CIM MEMBERSHIP:
HONOURS, AWARDS AND RECOGNITIONS
2006 - 2007

Name	Year	Award	Organization
Jorge Angeles	2006	Elected Fellow	Royal Society of Canada
		Elected Fellow	Institute of Electrical and Electronic Engineers (IEEE)
		James McGill Professor	McGill University
		Design Engineering Chair	Natural Sciences and Engineering Research Council of Canada (NSERC
Tal Arbel	2006	Faculty Award	Natural Sciences and Engineering Research Council of Canada (NSERC)
Benoit Boulet	2006	Sir William Dawson Scholar	McGill University
Peter Caines	2006	Elected Fellow	Royal Society of Canada
		James McGill Professor	McGill University
		Macdonald Chair	Department of Electrical and Computer Engineering
Gregory Dudek	2006-2007	Sir William Dawson Scholar	McGill University
		Full Professor - April 2007	McGill University
Vincent Hayward	2006-2007	Best Paper Award for Haptic Application: *Braille Display by Lateral Skin Deformation with the STReSS2 Tactile Transducer" by* Vincent Levesque, Jerome Pasquero, and **Vincent Hayward.**	World Haptics Conference, Tsukuba, Japan, March 22-24, 07.
		Keynote Speaker: *Haptic Synthesis*	8th International IFAC (International Federation of Automatic Control) Symposium on Robot Control SYROCO, Bologna, Italy, Sep 6-8, 2006
		Best Hands-On Demonstration Award: Yao, H.-Y. and **Hayward, V**. 2006. *An Experiment on Length Perception with a Virtual Rolling Stone*.	Eurohaptics, Paris, July 3 – 6, 2006
		Opening Lecture: *Four new haptic devices from the McGill University Haptics Laboratory*	2nd ENACTIVE (Centre for Interdisciplinary Research in Music Media and Technology) Montréal Canada, May 25-27, 2007
Shie Mannor	2006-2007	Canada Research Chair in Machine Learning	McGill University
		Plenary Speaker	2nd Workshop on Mathematical Foundations of Learning Theory
Arun K. Misra	2006-2007	Professor of the Year	McGill Engineering Undergraduate Student Society (MAME)

Name	Year	Award	Organization
Meyer Nahon	2006-2007	Elected Fellow	Canadian Aeronautics and Space Institute
Kaleem Siddiqi	2006-2007	Carrie M. Derick Award For Excellence in Graduate Supervision and Teaching	McGill University
		Full Professor - April 2007	McGill University
		Sir William Dawson Scholar	McGill University

CIM STUDENTS:
HONOURS, AWARDS AND RECOGNITIONS
2006 – 2007

Year	Name	Award	Organisation
2006	Martin Barczyk	Paper presented: **Martin Barczyk,** Alan Francis Lynch, *Flatness-based Closed-loop Control of a Rotating Euler-Bernoulli Beam: Experimental Results*	2006 American Control Conference (ACC 2006), June 14 - June 16, 2006, Minneapolis, Minnesota, USA
2006-2007	Matthew Garden	PGS D Scholarship	National Science and Engineering Research Council
2006	Frank Rudzicz	Dean's Honours List - M.Eng Papers presented: **Rudzicz, F**., *Clavius: Bi-Directional Parsing of Multimodal Semantic Structures* Rudzicz, F., *Clavius: Bi-Directional Parsing for Generic Multimodal Interaction*	McGill University AAAI-06 Twenty-First National Conference on Artificial Intelligence, July 16- 20, 2006, Boston, Massachusetts, USA COLING.ACL 2006 International Committee on Computational Linguistics/Association for Computational Linguistics, July 17 – 23, 2006, Sydney, Australia
2006	Carmen Au	Best Poster Award: Paper presented: **Carmen E. Au,** Sandra Skaff, James J. Clark, *"Anomaly Detection for Video Surveillance Applications."*	Precarn Inc Proceedings of the 18th IEEE International Conference on Pattern Recognition/, Vol. 4, p.p. 888-891, Hong Kong, Aug. 20-24, 2006.
2006	Michèle Faragalli	Scholars Award	Precarn Inc.
2006	Stéphane Pelletier	Scholars Award	Precarn Inc.
2006	Peter Savadjiev	Scholars Award Paper published: **P. Savadjiev**, J. S. W. Campbell, G. B. Pike & K. Siddiqi. *3D Curve Inference for Diffusion MRI Regularization and Fibre Tractography.*	Precarn Inc. *Medical Image Analysis*, Vol. 10, Issue 5, pages 799-813, Oct. 2006.
2006	Abdul Razzak Selman	Scholars Award	Precarn Inc.
2006	Sandra Skaff	Paper presented: Au, C., **Skaff, S.**, and Clark, J.J., *Anomaly Detection for Video Surveillance Applications*	Proceedings of the 18th IEEE International Conference on Pattern Recognition/, Vol. 4, p.p. 888-891, Hong Kong, Aug. 20-24, 2006.
2006-2009 2006-2008	Ruisheng Wang	Dean's Doctoral Student Research Recruitment Award	McGill University Natural Sciences and Engineering Research Council, CANADA

Year	Name	Award	Organisation
Summer 2006	Ruisheng Wang	Doctoral Scholarship Skills Development Fund	York University, Toronto, CANADA
Sept. 2006	Gurman Singh Gill	Paper presented: **G.S. Gill** and M.D. Levine, A Single Classifier for View-Invariant Multiple Object Class Recognition	Proc. British Machine Vision Conference, Edinburg, Sept. 2006 Vol. 1, pp 257-266.
2006 -2007	Hsin-Yun Yao	Industrial Postgraduate Scholarship	Natural Sciences and Engineering Research Council, CANADA
		Paper presented: **Yao, H.-Y.** and Hayward, V. 2006. *An Experiment on Length Perception with a Virtual Rolling Stone*.	Proc. Eurohaptics 2006. pp. 325-330. (Best Hands-on Demo Award)
		Best Paper Award: **Yao,H.-Y**.; Hayward, V.; Cruz, M., Grant, D. 2007 *The Effect of Weight on the Perception of Vibrotactile Intensity with Handheld Devices.*	Proc. World Haptics 2007, In Press.
2006	Svetlana Stolpner	Paper presented: **S. Stolpner**, K. Siddiqi. Revealing Significant Medial Structure in Meshes	Third International Symposium on 3D Data Processing Visualization and Transmission, Univ. of North Carolina, Chapel Hill, NC, USA June 14 –16, 2006
Oct2006		Dean's Honour List – MSc	McGill University
2006	Catherine Laporte	Paper presented: Evaluation of required and available ultrasound image decompression accuracy for decorrelation based distance estimation, **Catherine Laporte** and Tal Arbel	Medical Image Understanding and Analysis Conference (MIUA 2006) in Manchester, U.K., July 2006.
		Paper published: *Efficient discriminant viewpoint selection for active Bayesian recognition,* **Catherine Laporte** and Tal Arbel	International Journal of Computer Vision, vol. 68, no. 3, pp. 267-287, July 2006
		Paper presented: *A fractal multi-dimensional ultrasound scatterer distribution model,* **Catherine Laporte,** James J. Clark and Tal Arbel	International Symposium on Biomedical Imaging (ISBI 2007) in Washington, D.C., April 2007.
2006	Scott McCloskey	Paper presented: *The Reverse Projection Correlation Principle for Depth from Defocus,* **Scott McCloskey,** Michael Langer, Kaleem Siddiqi	Proceedings of the 3rd International Symposium on 3D Data Processing, Visualization and Transmission, 2006.
		Paper presented: *Seeing Around Occluded Objects,* **Scott McCloskey,** Michael Langer, Kaleem Siddiqi	Proceedings of the 18th International Conference on Pattern Recognition, Hong Kong, Aug. 20- 24, 2006.

Year	Name	Award	Organisation
2006	Samuel Audet	Post Graduate Scholarship Masters	National Science and Engineering Research Council
2006 - 2007	Matthew Toews	Papers presented: *Detection Over Viewpoint via the Object Class Invariant,* **Toews, Matthew** and Arbel, Tal	Proceedings of the 18th IEEE International Conference on Pattern Recognition, Hong Kong, Aug. 20-24, 2006.
		A Statistical Parts-based Appearance Model of Inter-subject Variability, **Toews, Matthew** and Collins, Louis D. and Arbel, Tal.	Proceedings of the 9th International Conference on Medical Image Computing and Computer Assisted Intervention, 2006, Copenhagen, 1 – 6 October 2006, Denmark
		Fundamental Matrix Estimation via TIP - Transfer of Invariant Parameters, Riggi, Frank and T**oews, Matthew** and Arbel, T.	Proceedings of the 18th IEEE International Conference on Pattern Recognition, Hong Kong, Aug. 20-24, 2006.
		Paper accepted: A Statistical Parts-based Appearance Model of Anatomical Variability, **Toews, Matthew** and Arbel, Tal.	IEEE Transactions on Medical Imaging, Special Issue on Computational Neuro-anatomy,
2006	Yuwen Li	Papers Presented: **Li, Y.** and Nahon M., *Simulation of Airship Dynamics*	AIAA Modeling an Simulation Technologies Conference and Exhibit, Keystone, Colorado USA, August 21-24, 2006
		Li, Y., Nahon M. and Sharf I., *Dynamics Modeling of Flexible Airships*	48th AIAA/ASME/ASCE/AHS/ASC Structure, Structural Dynamics and Materials Conference, Honolulu, Hawaii, USA, April 23-26, 2007
2006	Liazhen Luo	Papers presented: **Luo, L.**, and Nahon, M., *Determination of the Interference Geometry Between Two Convex Objects*,"	Proceedings of ASME International Design Engineering Technical Conferences& Computers and Information in Engineering Conference, Philadelphia, PA. USA. September 10-13,2006
		Luo, L., and Nahon, M., Development and validation of generalized compliant contact models for 3-dimensional objects.	The Second International Conference on Dynamics, Vibration and Control. Beijing, China. August 23-26,2006
2006	Stéphane Pelletier	Papers presented: **Pelletier, S.** and Cooperstock, J.R. (2006). *Preconditioning for Temporal Video Superresolution.*	Proceedings: British Machine Vision Conference (BMVC), Edinburgh, Sept. 4-7, 2006
2007	Dimitri Marinakis	*Topological Mapping through Distributed, Passive Sensors* **Dimitri Marinakis**, Gregory Dudek	*In Proceedings of the International Joint Conference on Artificial Intelligence*, Hyderabad, India, January, 2007.

Year	Name	Award	Organisation
2006	Dimitri Marinakis	*Probabilistic Self-Localization for Sensor Networks* **Dimitri Marinakis,** Gregory Dudek	*In Proceedings of the AAAI National Conference on Artificial Intelligence*, Boston, Massachusetts, July, 2006
2006	Rola Harmouche	Paper presented: **R. Harmouche,** D. Arnold, S. Francis, D.L. Collins, T. Arbel, *Bayesian MS* Lesion Classification Modeling Regional and Local Spatial Information	Proceedings of the 18th International Conference on Pattern Recognition, Hong Kong, Aug.20-26, 2006.
		Best poster Award: *Bayesian MS Lesion Classification Modeling Regional and Local Spatial Information.*	Poster presentation, CIM 20th Anniversary Student Poster Session, May 2006,
2006- 2007	Vincent Levesque	B2 Scholarship	FCAR
		Paper presented: **V. Levesque,** J. Pasquero, V. Hayward. *Braille Display by Lateral Skin Deformation with the STReSS2 Tactile Transducer*	World Haptics Conference, Tsukuba, Japan, March 22-24 2007.
		Paper published: J. Pasquero, J. Luk, **V. Levesque,** Q. Wang, V. Hayward, K. E. MacLean. *Haptically Enabled Handheld Information Display with Distributed Tactile Transducer*	IEEE Transactions on Multimedia.
2006	Oleg Gubanov	McGill Graduate Fellowship	McGill University
2007	Qi Wang	**Qi Wang,** Vincent Hayward *In vivo biomechanics of the finger-pad skin under local tangential traction*	Journal of Biomechanics 40(2007) 851-860
2007	Vincent Levesque Jérôme Pasquero	Best Paper Award for Haptic Application (Sponsored by HAPTION) *Braille Display by Lateral Skin Deformation with the STReSS2 Tactile Transducer* **Vincent Levesque, Jerome Pasquero,** Vincent Hayward	The Second Joint EuroHaptics Conference and Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems, Tsukuba, Japan March 22-24, 2007
Oct2006	Daniel Burfoot	Dean's Honour List - MSc	McGill University
2006-2007	Seyed Ali Modarres Najafabadi	Graduate Studies Fellowship Major Fellowship PSGD-3 Doctoral Fellowship	McGill University McGill University NSERC
2006	Bilal Ruzzeh	Dean's Doctoral Student Research Recruitment Award-McGill Engineering Doctoral Award	McGill University
2007	Marta Jensen	CGS Scholarship	Natural Sciences and Engineering Council of Canada

STUDENT RESEARCH TOPICS INFORMATION

Name	Degree	Supervisor	Thesis/Topic
Arshed, Muhammad Sakhar	M.Eng	Boulet	Cabin Noise Reduction by Robust Control
Audet, Samuel	M.Eng	Cooperstock	An Algorithm Using Object-Tracking to Remove Shadows from Front Projectors
Ball, Christopher	M.Eng	Clark	Multi-modal Attention and Interfaces
Benovoy, Mitchel	M.Eng	Cooperstock	Biofeedback Devices Applied to Shared-Reality Environments
Castonguay, Danny	M.Eng	Mannor	Portfolio Management: an Empirical Study of the ANTICOR Algorithm
Chen, Yan	M.Eng	Boulet	Non-linear Modelling and Cycle-to-Cycle Control of the Angioplasty Balloon Process
Chiu, Olivia	M.Eng	Nahon	Feedback Control of Underwater Robots
Desrochers, Simon	M.Eng	Angeles/Pasini	Design and Fabrication of Multi-axis Accelerometers
Eckbo, Ryan	M.Eng	Siddiqi/Cortelezzi	A Level Set Vortex Hybrid Method for Simulating the Motion of Vortex Filaments
El-Fashny, Sawsan	M.Eng	Zsombor-Murray/Bonev	Minimum Point Specification of Quadratic Surfaces for Metrology and Product Inspection
Epstein, Neil	M.Eng	Cortelezzi	Characterization of Mixing Generated by Coherent Vortical Structures
Faragalli, Michele	M.Eng	Sharf	Intelligent /Adaptive Control of PAW Robot
Frenette, Etienne	M.Eng	Nahon	Dynamics and Control of a Novel Tethered Spherical Aerostat
Gauthier, Jean-François	M.Eng	Angeles/Nokleby	Optimization of a Schönflies-Motion Generator
Gosselin, Fredrick	M.Eng	Cortelezzi/Paidoussis	Stability of Elastic Shells with a Co-rotating Axial Viscous Flow
Gravel, Jean-Philippe	M.Eng	Levine	3D Face Recognition Using Correlation Filters
Harmouche, Rola	M.Eng	Arbel	Bayesian Multiple Sclerosis Lesion Classification Modelling Regional and Local Spatial Information
Hao, Yuan	M.Eng	Boulet	Optimization of Sensor Location in Thermoforming
Harmat, Adam	M.Eng	Sharf	Dynamics and Control of PAW Robot
Howard, Alistair	M.Eng	Nahon	Design of a Pitch-Controlled Aerostat
Kaushik, Abhinav	M.Eng	Cortelezzi	Fluid Dynamics
Law, Albert	M.Eng	Ferrie	Limited Survey of Tracking Algorithms in Video Sequences
Maalouf, Wadih	M.Eng	Boulet	Uncertainty Modelling and Robust Control of the Thermoforming Reheat Process
Masciola, Marco	M.Eng	Nahon	Dynamics and Control of Offshore Tension Leg Platforms
McConkey, David	M.Eng	Caines	Systems and Hybrid Control
Menard, Gabriel	M.Eng	Clark	FPGA Implementations of Video Surveillance Algorithms
Meunier, Gabriel	M.Eng	Boulet/Nahon	Control of an Over Actuated Cable-Drive Parallel Manipulator
Meunier, Gabriel	M.Eng	Boulet/Nahon	Control of the Canadian Large Adaptive Radiotelescope

Name	Degree	Supervisor	Thesis/Topic
Olivia Chiu	M.Eng	Nahon	Stability Augmentation for a Hexapod Underwater Vehicle
Parks, Donovan	M.Eng	Levine	Coherency Filtering for Object Localization
Patel, Prakash	M.Eng	Ferrie	Using the Graphics Processor Unit to Speed up Computer Vision Algorithms; Specifically a Markov- Network-Based Super-resolution Algorithm
Phan, Andrew Minh Tri	M.Eng	Ferrie	Optical Flow for Scene Reconstruction, Obstacle Avoidance and Path Planning
Riggi, Frank	M.Eng	Arbel	Robust Invariant Feature Correspondence for Scene Geometry Estimates
Robert, Joel	M.Eng	Sharf	Trajectory Planning to Intercept a Moving Target
Rudzicz, Frank	M.Eng	Cooperstock	CLAVIUS: Understanding Language Understanding in Multimodal Interaction - Multimodal Parsing
Sood, Gaurav	M.Eng	Hayward/Michalska	Linear Quadratic Control of a Model of a Human Body in the Standing Position
Vigeant, Eric	M.Eng	Mannor	An Approximate Dynamic Programming Approach to Resource Allocation in Optical Networks
Wozniewski, Michael	M.Eng	Cooperstock	An Engine for Interactive Audio-visual Performance in a Virtual Environment
Yang, Shuonan	M.Eng	Boulet	Minimization of Heater Temperature Deviations in Thermoforming
Yu, Alexander	M.Eng	Zsombor-Murray	Parallel Manipulators
Yu, Shen	M.Eng	Ferrie	Computer Vision/Behaviour Recognition
Bhatia, Aditya	M.Sc.	Langer	Combining Spectral Snow and a Particle System
Burfoot, Daniel	M.Sc.	Dudek/Pineau	Automated Planning
Di Marco, Paul	M.Sc.	Dudek	Underwater Depth Map Reconstruction
Drouin, Simon	M.Sc.	Dudek	Video Segmentation using Markov Random Fields
Johns, Derek	M.Sc.	Dudek	Skyline Localization in Urban Environments
Masciola, Marco	M.Sc.	Nahon	Mechatronics
Meger, David	M.Sc.	Dudek/Rekleitis	Planning Localization and Mapping for a Mobile Robot in a Camera Network
Mills, Alec	M.Sc.	Dudek	Visual Sensor Nodes for Offline Localizations of an Underwater Robot
Mills, Alec	M.Sc.	Dudek	Robotics
Rivait, Derek	M.Sc.	Langer	Natural Image Statistics
Wahab, Matthew	M.Sc.	Langer	Flow Field Visualization
Abou-Moustafa, Karim	Ph.D	Ferrie	Active Vision for Sensor Networks
Arseneau, Shawn	Ph.D	Cooperstock	Representing Junctions Through Asymmetric Tensor Diffusion
Au, Carmen	Ph.D	Clark	Dynamic Panoramic Image Mosaicing
Azarnoush, Hamed	Ph.D	Boulet	Control of Linear Parameter-Varying Systems

Name	Degree	Supervisor	Thesis/Topic
Bégin, Isabelle	Ph.D	Ferrie	Camera-Independent Learning and Image Quality Assessment for Super-resolution
Boily, David	Ph.D	Michalska	Differential Games with Time Delays
Brooks, Rupert	Ph.D	Arbel	Fast Direct Image Registration without Reconstruction for Image -Guided Surgery
Campion, Gianni	Ph.D	Hayward	Graphics for Surgical Simulation
Cardou, Philippe	Ph.D	Angeles/Pasini	Simplicial Architectures for Multiaxial Accelerometers
Cayouette, François	Ph.D	Cooperstock	Real-time Tracking of Object in Indoor Scenes
Chapdelaine-Couture, Vincent	Ph.D	Langer	3D Reconstruction of Cluttered Scene form Video Sequence
Cowan, David	Ph.D	Sharf	Dynamics Modelling, Simulation and Control of Mars Rover with ADAMS
Danak, Amir	Ph.D	Mannor	Online Learning for Auctions
Duan, Yingxuan	Ph.D	Boulet	Trade-off between Performance and Robustness in Control Design
Ehtiati, Tina	Ph.D	Clark	Strongly Coupled Bayesian Models for Interacting Object and Scene Classification Processes
Fan, Shufei	Ph.D	Ferrie	Stereo Vision
Ganine, Vladislav	Ph.D	Michalska/Pierre	Systems, Control
Garden, Matthew	Ph.D	Dudek	On Accuracy, Efficiency and Understanding in Recommender Systems
Gauthier, Guy	Ph.D	Boulet	Terminal Iterative Learning Control
Giguère, Philippe	Ph.D	Dudek	Perception and Locomotion/Mobile Robots
Gill, Gurman Singh	Ph.D	Levine	Single Classifier for Multiple Object Class Recognition
Gosline, Andrews Havens	Ph.D	Hayward	Haptic Simulation of Biomechanics of Tissues
Gubanov, Oleg	Ph.D	Cortelezzi	Characterization and Enhancement of Mixing Generated by the Interaction of Coherent Vortical Structures
Hadzagic, Melita	Ph.D	Michalska/Grenier	Data Fusion Algorithms for Multiple Target Tracking
Harrison, John	Ph.D	Ferrie	Artificial Perception of Cluttered Scenes
Huan, Xu	Ph.D	Mannor	Robustness-Performance Tradeoffs in Control and Decision Making
Jia, Peng	Ph.D	Caines	Stochastic and Hybrid Control of Large-Scale Systems: Dynamical System Analysis of Progressive Second Price Auctions
Jie, Li	Ph.D	Clark	Dynamic Model of Attention
Jin, Ming	Ph.D	Kövecses/Lange	High-Fidelity Modelling and Parameter Identification for Hardware-in-the-Loop Simulations
Kersten, Marta	Ph.D	Langer	Enhancing Depth Perception in Medical Images
Khan, Waseem Ahmad	Ph.D	Angeles/Pasini	Formulation of the Preliminary Design Phase Using Complexity-Based Rules
Kiriy, Evgeni	Ph.D	Michalska	Particle Filters and Active Control for Robotic Localization

Name	Degree	Supervisor	Thesis/Topic
Lala, Prasun	Ph.D	Ferrie	Characterizing Video Using Psychophysical Correlates
Lambert, Casey Marcel	Ph.D	Nahon	Dynamics and Control of a Multi-Tethered Aerostat Positioning System
Laporte, Catherine	Ph.D	Arbel	3D Freehand Ultrasound Image Reconstruction
Lévesque, Vincent	Ph.D	Hayward	Tactile Synthesis by Lateral Skin Deformation
Li, Yuwen	Ph.D	Nahon/Sharf	Dynamics of Flexible Airships
Lu, Mu-Chiao	Ph.D	Michalska	Robust Receding Horizon Control of Differential Difference Systems
Luo, Lianzhen	Ph.D	Nahon	Contact-Force Modelling and Contact Geometry for Space Robotic Systems
Ma. Zhongjing	Ph.D	Caines/Malhame	Call Admission Control and Routing Control for Stochastic Loss
Marinakis, Dimitri	Ph.D	Dudek	Topology Inference for Sensor Networks
McCloskey, Scott	Ph.D	Langer	Investigating Blur in the Framework of Reverse Projection
Modarres Najafabadi, Seyed Ali	Ph.D	Kovecses/Angeles	Dynamics and Control Transitions in Multibody Systems with Time-Varying Topology
Nasrallah, Danielle Sami	Ph.D	Angeles/Michalska	Modelling and Control of Two-Wheeled Mobile Robots on Uneven Terrain
Pasquero, Jérôme	Ph.D	Hayward	Braille/Tactile displays
Pelletier, Stéphane	Ph.D	Cooperstock	High-Resolution Video Synthesis
Phillips, Carlos	Ph.D	Siddiqi	Photographic Transformations and Greyscale Pictures
Plamondon, Nicolas	Ph.D	Nahon	Dynamics and Control of the Aqua Underwater Vehicle
Raissi Dehkordi, Vahid	Ph.D	Boulet	Robust Control and Digital Signal Processing
Ruzzeh, Bilal	Ph.D	Kövecses	Dynamics of Redundantly Actuated and Constrained Biomechanical Systems
Sahambi, Harkirat Singh	Ph.D	Levine	Face Tracking in Crowds
Sattar, Junaed	Ph.D	Dudek	Robotics
Savadjiev, Peter	Ph.D	Siddiqi	3D Curve Inference for Diffusion MRI Regularization and Fibre Tractography
Selman, Abdulrazzak	Ph.D	Michalska/Hayward	Input-output Control and Stabilization of Systems with Unstable Zero Dynamics
Skaff, Sandra	Ph.D	Clark	Spectral Models for Colour Perception
Smith, James Andrew	Ph.D	Sharf	Galloping, Bounding and Wheeled-Leg Modes of Locomotion on Underactuated Quadrupedal Robots
Stolpner, Svetlana	Ph.D	Siddiqi/Whitesides	Revealing Significant Structures in Polyhedral Meshes
Sun, Wei	Ph.D	Cooperstock	Multi-Cam Object Segmentation with Dynamic Textured-Scenes using Disparity Contours
Tabandeh, Shahram	Ph.D	Michalska	Control Systems
Taringoo, Farzin	Ph.D	Caines	Control Systems

Name	Degree	Supervisor	Thesis/Topic
Tilton, Nils	Ph.D	Cortelezzi	Boundary Layer Control using Realistic Actuators
Toews, Matthew	Ph.D	Arbel	Statistical Appearance Modelling over Natural Images
Visell, Yon	Ph.D	Cooperstock	Gesture Learning and Sensory-Motor Interaction Design (Machine Learning/HCI)
Wang, Qi	Ph.D	Hayward	Biomechanically and Perceptually Optimized Tactile Transducer and Tactile Synthesis
Wang, Ruisheng	Ph.D	Ferrie	Camera Localization in Indoor and Outdoor Environment
Yao, Hsin-Yun	Ph.D	Hayward	Tactile Actuator and Perception
Yin, Jianfeng	Ph.D	Cooperstock	View Synthesis from Multiple Video Sequences
Yu, Jia Yuan	Ph.D	Mannor	Semi-Parametric Learning and Control
Zhi, Qi	Ph.D	Cooperstock	Advanced Image Mosaicing of Indoor Environment

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Name	Publication	Organisation
Jorge Angeles	Book Chapters D.S. Nasrallah, **J. Angeles,** and H. Michalska: *The Largest Feedback-Linearizable Subsystem of a Class of Wheeled Robots Moving on an Inclined Plane*	I. Zielinska and C. Zielinski(ed) Robot Design, Dynamics and Control, RoManSy 16, Springer, Vienna pp.205-212
	W.A. Khan, S. Caro, D. Pasini and **J. Angeles**: *Complexity Analysis for the Conceptual Design of Robotic Architecture*	J. Lenarcic and B. Roth (ed) On Advance in Robot Kinematics, Springer, Dordrecht, pp.359-368
	J. Angeles, S. Caro, W.A. Khan and A. Morozov: *The Kinetostatic Design of an Innovative Schönflies-Motion generator*	Proc. Of the Institution of Mechanical Engineers, part C, Journal of Mechanical Engineering Science, Vol. 220, No. 7, pp. 935-943
	G.Figliolini, P. Rea and **J. Angeles:** *The Pure-Rolling Cam-Equivalent of the Geneva Mechanism*	Mechanism and Machine Theory, Vol. 41,pp. 1320--1335
	D. Chablat, and **J. Angeles**: *Stratégies de conception pour optimiser la transmission Slide-o-Cam*	Mécanique et Industries, Vol. 7, pp. 301-309
	D. Chablat, and **J. Angeles**: *The Design of a Novel Prismatic Drive for a Three-dof Parallel-Kinematics machine*	American Society of Mechanical Engineers Journal of Mechanical Design, Vol. 128, No.4 pp. 710-178
	J. Angeles: *Is there a Characteristic Length of a Rigid-Body Displacement?*	Mechanism and Machine Theory, Vol. 41 pp 884-896
	G. Figliolini and **J. Angeles:** *The Synthesis of the Pitch Surfaces on Internal and External Skew-Gears and Their Racks*	American Society of Mechanical Engineers Journal of Mechanical Design, Vol. 128, No. 4. pp 794-802
	S. Hernandez, S.P. Bai and **J. Angeles**: *The Design of a Chain of Spherical Stephenson Mechanism for a Gearless Robotic Pitch-Roll Wrist*	American Society of Mechanical Engineers Journal of Mechanical Design, Vol. 128, pp. 422-429
	P. Zou and **J. Angeles:** *Kinematics of a 4-DOF Bipod Parallel Grinder*	Key Engineering Materials, Vols. 304-305, pp.431-435
	W. A. Khan and **J. Angeles**: *The Kinetostatic Optimization of Robotic Manipulators: The Inverse and the Direct Problems*	American Society of Mechanical Engineers Journal of Mechanical Design, Vol. 128, pp 168-178
	Theingi, I-M Chen, C. Li and **J. Angeles:** *The Dynamic Analysis of a Planar Parallel Manipulator with Joint-Coupling*	Proc. Of 9th International Conference on Control, Automation Robotics and Vision, ISBN 1 4244-0342 1-06 pp. 2227-2232, Singapore, Dec 5-8, 2006
	S. Bai and **J. Angeles**: *Kinematics of Spherical Multi-Lobe-Cams for the Design of a Pitch-Roll Wrist*	Proc. Of 9th International Conference on Control Automation, Robotics and Vision, ISBN 1 4244-0342-1-06, pp1719-1724, Singapore, De. 5-8, 2006
	D. Nasrallah, H. Michalska and **J. Angeles**: *Robust Posture Control of a Mobile Wheeled Pendulum Moving on an Inclined Plane*	Proc. Of INCINO 2006, 3rd International Conference on Informatics in Control, Automation and Robotics, Setubal, Portugal, Aug, 1-5 2006
	G. Figliolini, H. Stachel and **J. Angeles**: *On Martin Disteli's Main Achievements in Spatial Gearing: Disteli's Diagram*	Proc. EuCoMeS, 1st European Conference on Mechanism Science, ISBN3-901249-85-0, Obergurgl, Austria, Feb.21-26, 2006

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Tal Arbel	Catherine Laporte and **Tal Arbel**: *Efficient Discriminant Viewpoint Selection for Active Bayesian Recognition*	International Journal of Computer Vision, Springer, Netherlands, Vol. 68, No. 3 pp267-287, July 2006
	M. Toews, D. L. Collins, and **T. Arbel**: *A Statistical Parts-based Appearance Model of Inter-subject Variability*	Proc. of the 9th Conference for Medical Image Computing and Computer Assisted Intervention (MICCAI'06) Vol 1. pp. 232-240, Copenhagen DK October, 1-6, 2006
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	C. Laporte and **T. Arbel**: *Evaluation of Required and Available Ultrasound Image Decompression Accuracy for Decorrelation-based Distance Estimation*	Proc. of the Conference on Medical Image Understanding and Analysis, pp. 136-140, Manchester, UK, July 4-5, 2006
Benoit Boulet	Z. Albadawi, **B. Boulet,** R. DiRaddo, P. Girad, A. Rail, and V. Thomson: *Agent-Base Control of Manufacturing Processes*	Int. Journal of Manufacturing Research, Vol. 1, No. 4, pp.466-481, 2006
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	Z. Albadawi, **B. Boulet,** R. DiRaddo, P. Girard, and V. Thomson: *Agent-based Control for Thermoforming Processes*	12th International Federation of Automatic Control Symposium on Information Control Problems in Manufacturing (INCOM06), pp.443-448, St-Etienne, FRANCE, May 17-19, 2006
Peter Caines	I. Romanovski and **P.E. Caines**: *On the Supervisory Control of Multi-Agent Product Systems: Controllability Properties*	Systems and Control Letters, 56, 2, pp. 113-121 Feb, 2007

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Peter Caines	M. Y. Huang, **P.E. Caines** and R.P. Malhame: *Large Population Stochastic Dynamic Games: the Nash Certainty Equivalence Principle and Adaptation*	Forever Ljung in **System Identification** Eds. T. Glad and G. Hendeby, Studentlitteratur, Lund, Sweden pp-35-60, Sweden Oct. 2006
	P.E. Caines and M. S. Shaikh: *Optimality Zone Algorithms for Hybrid Systems: Efficient Algorithms for Optimal Location and Control Computation*	Hybrid Systems: **Computation and Control** LNCS 3927, Proc. Of the 9th International HSCC Workshop, CA, Eds. J.P. Hespanha and A. Tiwari, Springer-Verlag, pp123-137, Berlin, March 2006
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	P.E. Caines F.H. Clarke, X. Lui, and R.B. Vinter: *A Maximum Principle for Hybrid Optimal Control Problems with Path wise State Constraints*	Proc. 45th IEEE conference on Decision and Control, pp. 4821 – 4825, San Diego CA, Dec. 13- 15, 2006
	M. Huang, R.P. Malhame and **P.E. Caines:** *Distributed Multi-Agent Decision-Making with Partial Observations: Asymptotic Nash Equilibria*	Proc. The Mathematical Theory of Networks and Systems Conference, pp.2725-2730, Kyoto, JAPAN, July 24-28, 2006
	M. Huang, P.P. Malhame and **P.E. Caines**: *Nash Certainly Equivalence in Large Population Stochastic Dynamic Games: Connections with the Physics of Interacting Particle Systems*	Proc. 45th IEEE conference on Decision and Control, pp. 4921- 4926, San Diego CA, Dec. 13-15, 2006
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	I. Romanovski and **P.E. Caines**: *Multi-Agent Product Systems: Controllability and Non-blocking Properties*	8th International Workshop on Discrete Event Systems, pp 269-275, Ann Arbor, MI, USA, July 10-12, 2006
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	Z. Ma. **P.E. Caines**, R.P. Malhame: *Optimal Stochastic Control of Network: Call Admission and Routing for Simple Networks*	Ref. Conference CDROM: International Conference on Intelligent Systems and Computing: Theory and Applications, Aiya Napa, Cyprus, July 6-7, 2006
James Joseph Clark	C. Au, S. Skaff and **J. J.Clark:** *Anomaly Detection for Video Surveillance Application*	Proc. of the International Conference on Pattern Recognition (ICPR 2006), pp888 – 891, Hong Kong, CHINA, August 20-24, 2006
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James Joseph Clark	T. Ahmedali, and **J.J. Clark:** *Collaborative Multi-camera Surveillance with Automated Person detection*	Proc. Of the 2006 1st International Workshop on Video Processing for Security, p.39 Québec, QC, CANADA, June 7-9, 2006
Jeremy Cooperstock	W. Sun, and **J. R. Cooperstock:** *Don't Count Your Pixels Until They're Calibrated: An Empirical Evaluation of Factors Influencing Camera Calibration Accuracy*	Machine Vision and Application Journal, 17(1) 51-67, 2006.
	S. Arseneau and **J.R. Cooperstock:** *An Improved Representation of Junctions Through Asymmetric Tensor Diffusion*	International Symposium on Visual Computing, Lake Tahoe, NV, USA, Nov 6-8, 2006
	M. Wozniewski, Z. Settel and **J.R. Cooperstock:** *A Paradigm for Physical Interaction with Sound in 3-D Audio Space*	International Computer Music Conference, New Orleans, LA, USA, Nov 6-11, 2006
	M. Wozniewski, Z. Settel and **J.R. Cooperstock**: *A Spatial Interface for Audio and Music Production*	International Conference on Digital Audio Effects (DAFx) Montreal, QC, CANADA, 18-20, 2006
	S. Pelletier, and **J.R. Cooperstock:** *Preconditioning for Temporal Video Superresolution*	British Machine Vision Conference (BMVC), Edinburgh, UK, Sept. 4-7, 2006
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	Z. Qi and **J.R. Cooperstock**: *Wide-Baseline Image Mosaicing for Indoor Environments*	International Conference on Pattern Recognition (ICPR), Hong Kong, Aug 20-24,
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Luca Cortelezzi	N. Tilton and **L.Cortelezzi:** *The Destabilizing Effects of Wall Permeability in Channel Flows: A Linear Stability Analysis*	Physics of Fluids, Volume 18, Issue 5, pp. 051702-051702-4 (2006)
	N. Tilton and **L. Cortelezzi:** *Linear Stability Analysis of Couette Flow with a Porous Wall*	Bulletin of the American Physical Society 2006 APS Division of Fluid Dynamics 59th Annual Meeting, Vol. 51, No. 9, Tampa FL, Nov. 19-21, 2006
Gregory Dudek	D. Marinakis, and **G. Dudek:** *Occam's Razor Applied to Network Topology Inference*	IEEE Transaction on Robotics, 2007
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	Gregory Dudek, Philippe Giguère, Chris Prahacs, Shane Saunderson, Junaed Sattar, Luz-Abril Torres-Mendez, Michael Jenkin, Andrew German, Andrew Hogue, Arlene Ripsman, Jim Zacher, Evangelos Milios, Hui Liu, Pifu Zhang, Martin Buehler, Christina Georgiades: Aqua: *An Amphibious Autonomous Robot*	IEEE Computer, Vol. 40 (1) Jan. 2007

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Gregory Dudek	G.Y. Chen and **G. Dudek:** *Auto-Correlation Wavelet Support Vector Machines*	Machine Vision and Application, 2007
	Junaed Sattar, Eric Bourque, Philippe Giguère **Gregory Dudek:** *Fourier Tags: Smoothly Degradable Fiducial Markers for use in Human-Robot Interaction*	Proceedings of the Canadian Conference on Computer and Robot Vision (CRV06) Quebec City, Quebec, June 2006, pp 22-29
	Gregory Dudek, Junaed Sattar, Anqi Xi: *A Visual Language for Robot Control and Programming: A Human-Interface Study*	Proceedings of the IEEE International Conference of Robotics and Automation (ICRA) 2007, Rome Italy 2007, Pages 2507-2513
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	Dimitri Marinakis, and **Gregory Dudek:** *Topological Mapping through Distributed, passive Sensor,*	Proceedings of the International Joint Conference on Artificial Intelligence (IJACAI07), Hyderabad, India, Jan. 2007 pp2147 – 2152
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	P.K. Mbonye and **F.P. Ferrie**: *Attentive Visual Servoing in the MPEG Compressed Domain for Un-Calibrated motion Parameter Estimation of Road Traffic*	Proc. 18th International Conference on Pattern Recognition, pp908-911, Hong Kong, China, Aug. 20-24, 2006
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	Samuel Kadoury and **Martin Levine:** *Finding Faces in Gray Scale Images Using Locally Linear Embeddings*	Poster Session - 5th International Conference on Image and Video Retrieval (CIVR2006) Tempe AZ, USA, July 13-15, 2006
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	H. Michalska and M-C. Lu: *Gradient and Generalized Newton Algorithm for Delay Identification in Linear Hereditary systems*	World Scientific and Engineering Academy and Society Trans. Systems, Issue 5, Vol.5, pp 905-912, May 2006
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