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Bridging Knowledge and the Economy

Vector

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The Kind of Problem You Want

A Virtual Reality System Attracts Major Sports Clubs

What researcher wouldn't like to have Jocelyn Faubert's problem? So many companies and organisations are after his perception-cognition improvement system that he doesn't know which to choose.

Dr. Faubert, Associate Professor of Optometry at Université de Montréal and NSERC-Essilor Chair of Visual Function, has spent years developing computer simulation systems capable of improving the integration of complex information coming from the environment. His work began with the study of perceptual problems in the elderly. As people age, their perception of events happening in their environment is reduced. A typical example would be an elderly person driving his car; his perceptions become increasingly "tunnelized" with age, causing him to miss a road sign on his right or a pedestrian starting to cross the street on his left.

Dr. Faubert can correct perceptual "tunnelization" using computer software tools. For example, in a virtual environment in which ten objects are moving in a test subject's visual field, the subject is asked to follow a maximum of four objects simultaneously. After one or two minutes, the subject is asked to identify the positions where the four objects end up. After each correct response, the speed at which the objects move is increased.

"This task improves a person's perceptual and cognitive ability," says Jocelyn Faubert, whose Vision and Perception Laboratory includes thirty researchers and students. "Through a series of training exercises, we can increase the performance level of an elderly person to that of an untrained young adult."

High performance

From this research work, a question naturally emerged: could it be successfully applied to elite athletes? Most certainly. "We can improve the performance of an athlete by up to 50%," states Faubert. Athletes tell us that our system improves their performance, and coaches tell us that they see a clear improvement."

Dr. Faubert uses a virtual reality simulation headset, but his most sophisticated tool is what he calls "the CAVE", a virtual immersion space in which the three walls and floor interact with the subject. This represents a considerable technological challenge since it attempts to simulate reality using a 3D stereoscopic environment.

This invention has excited the interest of many companies specializing in virtual simulation as well as major sports clubs. "We have been approached by the largest sports clubs in the world," says Faubert.

Jocelyn Faubert in his virtual immersion room.

With these results, it is not surprising that Dr. Faubert has received many enquiries. There are multiple commercial possibilities. The largest market in the long term will undoubtedly be that of elderly people, especially if one considers all the baby-boomers who would like to delay the inevitable as long as possible.

However, the most immediately accessible and lucrative market is the sports sector. "We needed a strong champion who could back our technology and give it visibility, and we have identified one."

With all the opportunities flooding in, Univalor understands that it is necessary to act quickly– but not hastily. "We are evaluating everything that is being offered and we are trying to identify the most interesting business model that will allow us to optimally exploit the technology in all its forms," states Louis Provencher, Manager, Business Development, Life Sciences, at Univalor.

Should a company be setup? Should we go ahead with a few licenses? How many? Should we sign with a development group? All these possibilities are being studied and represent Faubert's "splendid challenge". And he just loves it.

"We can improve the performance of an athlete by up to 50%."

Lab TRIP

TRIP technology opens up new fields in biomedical research.

Marie Kmita

Researchers did not know until recently how to delete a specific population of growing cells in a living organism. TRIP technology invented by Dr. Marie Kmita can do this, and without any toxic molecule.

Dr. Kmita, working with Dr. Damien Grégoire at the Institut de recherches cliniques de Montréal (IRCM), is expanding the ability of researchers to explore the role of particular classes of cells in a variety of contexts, including diseases.

Gene Bomb

TRIP technology (*Targeted Recombination between Inverted loxP*), like an explosive, requires both a bomb and a detonator. It is in the "bomb" part that lies the essential TRIP breakthrough.

The technology takes advantage of the well known *loxP/Cre* system, which is used to silent a gene in an organism, for example, the CD4 gene in T lymphocytes. To do this, the researcher generates a mouse in which two small sequences of *loxP* DNA are inserted at each end of the target gene, making sure that these have the same orientation relative to each other. This is the "bomb".

We now need a detonator to make it explode. This is present in another mouse, in which a gene for recombinase *Cre* has been inserted with a promoter which turns on the expression of *Cre* in the target cell population, in this case, T-cells expressing CD4.

Photo : Hélène Lambin, Ph.D., IRCM

Breed the two types of mice, one containing the *loxP* "bomb" and the other the *Cre* "detonator", and Bingo! the mouse progeny have the CD4 gene eliminated from their T lymphocytes.

During her research work, Dr. Kmita used the *loxP* sequences with their positions reversed and obtained a completely unexpected result. A super-bomb!

Serendipity

She discovered that using the *loxP/Cre* system in this configuration made it possible to eliminate an entire cell population. She had invented a tool that allows researchers at pharmaceutical companies and universities to selectively eliminate a targeted population of proliferating cells within a living organism.

A crucial advantage of the TRIP technology is the large repertoire of *Cre* type transgenic mice. This permits the technology to be applied to a broad variety of cell types, tissues and organs. "Eliminating cell populations using TRIP technology is of great interest for exploring the role of a cell population growing in a living organism," explains Dr. Kmita. "This includes, for example, the mechanisms underlying organ development and mechanisms of tissue homeostasis."

Dominique Bergeron, technology transfer officer at IRCM, says: "TRIP Technology is of interest to a large part of the scientific community for exploring different areas, such as tissue regeneration. We have a technology which can be used to completely eliminate particular classes of cells, so that their function can be studied in any context."

This type of scientific advance is particularly attractive to researchers working in academia. It is even more attractive in the field of pharmaceutical R&D where the TRIP technology could be used to develop new animal models of human diseases and to further develop this technology.

"Contacts are starting to be made, but are still at a preliminary stage," states Anne-Marie Larose, Manager, Business Development, Life Sciences, at Univalor. "Dr. Kmita has already initiated discussions with certain pharmaceutical companies, and all were extremely interested." Considering the "explosive" potential of TRIP technology, Larose has no doubt that companies will be interested in acquiring the rights to commercialize this technology.

A Helping Hand

A new robotic hand completely changes the market outlook.

Lionel Birglen

In an article published in 2007 in the *Scientific American* magazine, Bill Gates predicted that in the future, robots will replace computers. Just as personal computers have made their way into all of our homes, the same destiny is foreseen for robots.

The numbers support the statement by the most famous entrepreneur in the world. According to the *Japan Robotics Association* (JARA), robot sales will be over $1.8B US in 2010, $3.1B US in 2015, and will double to $6.2B US in 2025.

Dr. Lionel Birglen's research work is very timely for this explosively growing market. Dr. Birglen is Assistant Professor in Mechanical Engineering and Director of the Robotics Laboratory at École Polytechnique de Montréal. He designed an adaptive robotic hand with three major advances: greatly reduced technological complexity, wide applicability, and markedly reduced manufacturing cost.

That's not all. In a world where we can count in one hand the number of existing models, Dr. Birglen has developed a method which makes it possible to generate up to 3000 new hand designs. In order to identify which model will best address the specifications of a customer or an application, Louis-Alain Larouche, a Masters student supervised by Dr. Birglen, created a hand design software based on this method, opening the way to a number of new applications.

Simplify, simplify, simplify…

There are two major families of robotic hands, the researcher explains. In the first group, we find the very simple mechanical grippers which are attached to industrial robots used in factories. These grippers are interchangeable according to the parts being handled. In the other group, we have anthropomorphic hands being developed in laboratories, where we try to imitate the extremely varied movements of the human hand.

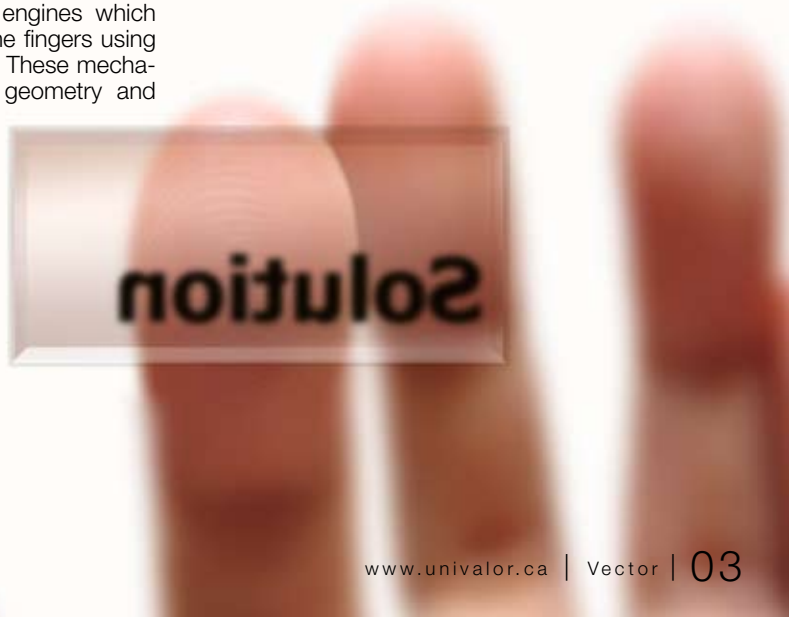
According to Dr. Birglen, "the problem is when we try to reproduce the human hand in terms of effort and movement with the technologies that are currently available. The multiplicity of motors and miniaturized sensors required for these hands makes the costs prohibitive, from $100,000 to $200,000."

Dr. Birglen has greatly simplified the process of designing a hand in the laboratory "which generally resembles a human hand with fingers, but which retains the simplicity of an industrial gripper. It provides much of the freedom of movement of the human hand, and uses only one or two engines which distribute the effort to the fingers using particular mechanisms." These mechanisms also adjust the geometry and effort of the hand to suit the objects it handles, by mechanical adaptation and not by using a multitude of sensors.

This hand can be considered as a "universal" hand. In industry, it will replace several configurations of grippers - that need to be constantly interchanged - but will cost not much more than a single gripper. Its versatility and adaptability will make it useful for domestic robotics, as well as for health systems and the public sector. All three markets are expected to explode in the next few years, comprising 70% of industry sales, according to JARA.

"We thus have two exceptional inventions to market: the hand design of Dr. Lionel Birglen and the software for generating designs," emphasizes Thomas Martinuzzo, Project Leader, Science and Engineering, at Univalor.

As the patent for this invention was filed at the beginning of April 2009, Univalor is only at the initial steps of commercializing these technologies with potential partners. And interest is not lacking, far from it. "Whether in discussions with a Japanese manufacturing giant or in informal talks with investors, the answers have always been enthusiastic," says Martinuzzo.



THE CROSSROAD FOR BIOTRANSFER
May 5, 2009
Montréal, Canada

Ten Technologies from Univalor Will Shine at BioTransfer

Of the 40 technologies ready for licensing that will be presented at the next BioTransfer conference, 10 are from Univalor's patent portfolio. The event, which takes place in Montreal on May 5, 2009, is organized by the NRC, Excellerator (McGill), and Gestion Univalor, limited partnership supported by Université de Montréal.

BioTransfer 2009 provides an opportunity for biotechnology and pharmaceutical companies to gain access to technologies that could speed up their drug discovery and add value to their portfolio of therapeutic compounds. It also provides one-stop shopping for organizations interested in technology transfer, and brings together under one roof companies, investors and key players in the field of intellectual property creation.

A few of the technologies that will be presented by Univalor at this event are summarized below:

Halting Cancer | Microparticles from T-Lymphocytes stop rapidly proliferating cells from dividing; this discovery of Dr. Pierre Hardy (CHU Sainte-Justine) opens new avenues for cancer treatment.

A New System to Identify and Characterize Molecules Active in Axon Growth and Guidance This innovative system of Dr. Frederic Charron (Institut de recherches cliniques de Montréal) combines imaging microscopy with a novel analysis method, for real time observation and measurement of the effect of a compound on the growth and guidance of individual axons. This system can be used to screen compound libraries in order to discover novel molecules active in the regeneration of nerve fibres.

Treatment of the Dry Form of AMD | Dr. Huy Ong (Université de Montréal) has developed a technology to treat the wet form of Age-Related Macular Degeneration (AMD); it could also lead to the development of a treatment for the dry form of this disorder.

Deoxyribozyme Inhibitor of Hepatitis C Virus | Dr. Carolina Alfieri (CHU Sainte-Justine) and collaborators have developed a compound active against HVC that can significantly reduce the level of viral RNA in infected human cells.

Tools for PD-1 | The discovery of PD-1 inhibitors promises a major therapeutic breakthrough that could have applications for all chronic illnesses in which lymphocyte exhaustion is observed. Dr. Rafick-Pierre Sékaly (Université de Montréal) and his team have developed assays to screen for PD-1 inhibitors and have defined PD-1 gene signature for immunomonitoring.

PCSK9 and Cardiovascular Diseases Tools and assays designed by Dr. Nabil Seidah (Institut de recherches cliniques de Montréal) and his group identify modulators of PCSK9, a validated target involved in the regulation of lipid metabolism and cholesterol homeostasis.

Survival of the Fittest Red Blood Cells | The technology invented by Dr. Edouard Kouassi (Hôpital Maisonneuve-Rosemont) is an improvement for the blood banking industry; the storage life of red blood cells is increased by the addition of a simple chemical compound.

Biological Quantification Using SPR Dr. Jean-François Masson (Université de Montréal) and his collaborators have invented a high resolution and portable surface plasmon resonance instrument. The device competes directly with expensive instruments, such as *Biacore*'s, for dosing biomarkers in complex samples.

Timely Targeted Antigen Delivery Dr. Réjean Lapointe (Université de Montréal) and his team can enhance an immune response by using a protein sequence to target antigen presentation to both Class I and Class II MHCs at the same time.

Transplantation: Selecting the Best Organ Donors | Dr. Claude Perreault, Canada Research Chair in Immunology and a founding member of Université de Montréal's Institute for Research in Immunology and Cancer (IRIC), has identified genes expressed in organ donors that predict whether their organ could trigger graft-versus-host-disease (GVHD) in a transplant recipient. This technology can be used to develop a diagnostic test to help select the best organ donors for transplantation and to modulate immunosuppression of the recipient.

Mission: to commercialize the research results of Univalor's member establishments:

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