Unlocking the power of human intelligence

The Human Interface Technology Lab (HIT Lab NZ), is a level three virtual reality research and development centre hosted at the University of Canterbury.

The Lab, a partner of the HIT Lab US based at the University of Washington, is developing new interfaces to revolutionize the way we interact with computers. The new technology will enable people to interact with machines in a similar way to which we interact with each other.

The HIT lab’s International Director, Professor Tom Furness says the mission of the lab is to empower people through the invention, development, transition and commercialization of technologies that unlock the power of human intelligence and link minds globally.

“What we’re really trying to do is break the glass between the human and the machine. By developing new interfaces we are creating a paradigm shift so humans will be on the inside looking out instead of on the outside looking in,” says Professor Furness.

HIT Lab NZ’s mandate is to develop and transition to industry, leading-edge human-computer interfaces, to promote economic development in New Zealand.

The lab has evolved out of a unique partnership between the University of Canterbury, the University of Washington and Canterbury Development Corporation Ltd.

During the lab’s start-up phase it is focusing on two key areas of human-computer interaction, ‘greenspace,’ and ‘supermedia’.

Greenspace concentrates on bridging the gaps ‘between brains,’ by creating a virtual environment that enable participants, despite being geographically separated, to see, hear and touch one another.

Supermedia focuses on the implementation of a pathway to enable information to travel from the computer to the brain. It utilise three-dimensional (3D) interactive virtual reality displays, which supersede existing interfaces such as monitors, mouse, and keyboards.

Some of the technologies being developed in the lab include 3D panoramic displays, virtual and augmented reality, voice and behaviour recognition and intuitive aural and tactile feedback. These advancements can assist anyone using a computer, but particular areas of benefit include: immersive learning environments that have been proven to accelerate learning, enhanced visualisation of many forms of information and the potential to improve the lives of people with disabilities.

The lab takes on an inter-disciplinary approach to learning, engaging students and staff from the various departments within the University to work on student and industry-driven projects.

“ ‘We follow the philosophy in the lab that ‘staff are guides on the side instead of sage on the stage’ in other words staff act as mentors rather than direct students, because we’ve found in the past that you get great results from students when they come up with projects and ideas they’re passionate about,” says Professor Furness.

Staff and students from a diversity of departments, have expressed widespread interest in working with the HIT Lab and are in favour of collaborating with industry on projects.

Professor Furness says it has been encouraging to have the backing of so many people within the University. He says this positive feedback...
represents a step towards closing the gap between industry and the University. “In New Zealand the barrier between universities and companies is generally a lot larger than it is in the US. There’s a real need to improve these relations because there’s a lot of fantastic technology being created in the universities, so we need to work with industry to further develop this technology so we can then bring it out into the market place.”

HIT Lab NZ intends to work closely with its partner lab in Seattle. Student and staff exchanges will operate between the two labs, providing New Zealanders with an opportunity to interact with some of the world’s top minds in the field of human interface technology.

The establishment of the HIT Lab NZ provides an incredible opportunity to connect to United States research and commercial networks, attract overseas research funding, create new companies and jobs, and train highly skilled graduates. All of which adds to New Zealand’s goal of creating a knowledge economy.

In 12 years, the US HIT Lab’s huge success has led to substantial social and economic benefits for the state of Washington. It has been responsible for spinning off 21 new companies (two of which are currently trading on NASDAQ) and created numerous patents and raised over US$25 million in grants, contracts and gifts.

The Seattle-based lab has produced many world-leading human computer interfaces such as the Virtual Retinal Display (VRD) and the Magic Book technology.

The VRD, invented by Professor Furness, scans images directly onto the retina of the eye, doing away with the need to have a monitor or a display screen. It can help people with some forms of blindness to see and can also help alleviate pain for burn victims.

The Magic Book technology, developed by New Zealander and HIT Lab NZ director, Dr Mark Billinghurst, is an animated children’s book that comes to life when viewed through a lightweight handheld display (HHD). Three-dimensional images leap off the pages of the book, allowing the reader to interact with the characters. At the flick of a switch on the HHD, readers can fly inside the pages, experiencing the story as an immersive virtual environment. By simply turning a page in the book, the reader is transported to a new virtual scene.

Since the Magic Book technology allows users to move seamlessly from the physical world to the virtual world, the technology can be applied to numerous settings, ranging from entertainment to education. The Magic Book has the potential to become a powerful teaching tool. Anatomic students could explore parts of the body using immersive three-dimensional techniques, flying into various organs to explore their functions.

Dr Billinghurst intends to build upon the core technology and to create new technology to facilitate the commercialisation of the Magic Book concept at the HIT Lab NZ premises.

Lab secures Govt support

The Government has pledged their support for the HIT Lab NZ by providing over $333,000 in funding to help with the establishment of the lab.

An official announcement of the grant was made by the Minister of Economic Development Jim Anderton at an event held at the University of Canterbury on Friday May 31 2002.

Mr Anderton says the HIT Lab NZ development ties in strongly with government policies aimed at promoting world-class innovation, strengthening New Zealand’s global links and boosting our capabilities in Information and Communications Technology (ICT) and creative industries.

Professor Furness says the government grant, facilitated by Industry New Zealand, represents a vote of confidence and a shared vision that HIT Lab NZ will become a premier centre of excellence.

“The eventual outcome will be a more viable New Zealand industry and the huge economic impact will lift New Zealand into the global marketplace.”

The government funding consists of $50,000 for a feasibility study and $281,250 from the Sector Initiative Fund.

Industry New Zealand Chief Executive Neil Mackay says the HIT Lab NZ is a flagship for collaboration between universities, local and central government and the private sector.

Mr Mackay refers to the HIT Lab NZ initiative as a ground-breaking exercise involving a unique partnership.

“On the local government side there’s the Canterbury Development Corporation which had the initial vision to get the HIT Lab to Christchurch,” he says.

“On the academic side there’s the University of Canterbury where the HIT Lab will also be located and where its academic staff and students will work and learn; there’s also the University of Washington, the home of the first HIT Lab, which has strongly backed the move down under.

“And from the central government, Industry New Zealand has worked alongside all the partners to help make sure HIT Lab NZ happened.”

Cont. pg3

Photo:  Duncan Shaw-Brown
The Minister of Economic Development Jim Anderton tests out Dr Billinghurst’s Magic Book technology.
A word from the International Director

Welcome to the HIT Lab NZ and to the inaugural issue of the Lab’s quarterly newsletter, ‘Interface’.

These are exciting times for the University of Canterbury, Christchurch and New Zealand. We have begun a new journey that we believe will bring a better life to people in the world. We want to accelerate our ability to learn, to create, to communicate across vast distances that separate us from the rest of the world and to recapture lost world citizens who have physical and cognitive disabilities.

We want to change the way people think about computers and think with them, by building ways to make the computer more natural, intuitive and easy to use.

Our goals are to:

1. Build a world centre of excellence in human interface technology.
2. Provide project-based learning experiences for students at the University.
3. Provide an avenue for commercialisation of technologies development to promote the economic growth of the region and New Zealand as a whole.

While these are lofty goals, we have a great partner to help us do it - the Human Interface Technology Laboratory in Seattle. The HIT Lab US was established in 1989 at the University of Washington with a similar mission in mind to ours.

In its 12 years, the lab has spun off numerous companies and now there are over 550 people employed in the State of Washington alone, resulting from the work of students and academic staff at the University. Most of these companies were started by the students themselves!

Part of the HIT Lab US success comes from a consortium of 48 companies that help support the Lab and give it an entrepreneurial and industrial flavour. Students enjoy working in a climate where projects can result in real commercial products.

The introduction of the HIT Lab to Christchurch has resulted due to Christchurch being a sister city of Seattle. The University of Canterbury and the Canterbury Development Corporation spearheaded the effort to bring an annex of the HIT Lab US to New Zealand in a partnership with the University of Washington. The New Zealand government has endorsed this plan and has awarded the HIT Lab NZ with some initial funding.

An important component of the new lab is its own Virtual Worlds Consortium. New Zealand companies are invited to join with the HIT Lab in promoting the development and commercialization of a new generation of interface technology.

So this is just the beginning of some exciting times ahead! Stay tuned to this newsletter for the latest developments as we build this new enterprise.

Tom Furness
Professor and Director
HIT Lab International
Foundations for building a bridge between the University of Canterbury and industry were put in place, at a roundtable meeting held in April to discuss the establishment of the HIT Lab’s Virtual Worlds Consortium.

The meeting turned out to be a historic event, marking the first time in the history of the University that representatives from industry, Government agencies and academia have met under the University’s roof.

“There is widespread concern amongst industry and academia about the widening gap between industry and the University so one of the main objectives behind establishing the consortium is to help improve these relations,” says Professor Tom Furness.

Attendees at the meeting included representatives from Industry New Zealand, Trimble, Pulse Data, Allied Telesyn Research Ltd, Orion, ARANZ, Tait Electronics, Design Industry, Canterbury Development Corporation and academic staff.

Overall, the meeting was a huge success and the feedback received since the meeting has been extremely positive. Several companies in attendance at the meeting have since joined the lab’s consortium.

The consortium is made up of a diversity of companies from a range of sectors. The links established through the consortium enable collaborations between industry and academia to elucidate short and long-term technical problems in the area of human-computer interfaces. Consortium members have first access to technology developed in the lab.

Semi-annual consortium meetings will be held to showcase technology and students, providing a conduit for members to keep up with latest developments, identify possible future employees and liaise with Universities.

Member-companies are also encouraged to sponsor industrial fellows to work at the HIT Lab NZ. This allows industry to gain a greater insight into the University’s needs and vice versa.

Members of the New Zealand Virtual Worlds Consortium obtain automatic membership to the US equivalent, which provides an unparalleled opportunity to gain access to US business and academic networks. The US consortium consists of 48 companies, which include many large multinational corporations such as Microsoft, Nike, Eastman Kodak, Chevron and Boeing.

“Companies, which you thought would’ve had nothing in common, have begun working together on projects after meeting at the US Virtual Worlds Consortium conferences. The consortium meetings provide an opportunity for companies to have discussions in a friendly atmosphere,” says Professor Tom Furness.

New Zealand Consortium members are invited to attend the US Virtual Worlds Consortium meeting to be held in Seattle in October 2002.

The HIT Lab uses feedback from consortium members to evaluate its research programmes and help inform future research directions.

Currently HIT Lab NZ is collaborating with consortium partners to identify projects they can begin work on.

The first meeting of the New Zealand consortium is planned to coincide with the HIT Lab’s official opening in February 2003.
If you ask someone to draw a computer they will probably sketch a monitor, keyboard and a mouse connected to a box. The monitor, keyboard and mouse are the first things that jump to mind, yet this wasn’t always the case.

A few weeks ago I was standing in the Smithsonian museum of American History looking at the first digital computers ever made. One wall of the museum was taken up with pieces of ENIAC, the 1946 grandfather of the computer that sits in your office. There was no keyboard, mouse or monitor, just rows of vacuum tubes, switches, dials and cables that needed to be plugged between memory units to program mathematical functions.

Twenty years after ENIAC, Doug Engelbart demonstrated the first mouse, but it was the unveiling of the Apple Macintosh in 1984 that made it widely available. In the twenty years since what has changed? When people think of computers today they think of the beige boxes that sit by their desks with the same interface devices as that first Macintosh.

This need not be the case. Just as the mouse was a revolutionary departure from the switches and dials of ENIAC, we need revolutionary interfaces to interact with the computers of tomorrow. When ENIAC shrinks to the size of a cellphone or smaller, then we can no longer use traditional devices to interact with it.

As the computer becomes invisible and ubiquitous, it will be the interface that determines its usability and the market acceptance. Just as consumers buy wristwatches based on their form rather than function, the computers of tomorrow will be purchased based on how they look and feel. We see this trend happening already. In the late 1990’s Apple rebounded from a long period of financial loss because of the iMac, a machine with a very attractive interface.

At the Human Interface Technology Laboratory (HIT Lab NZ) at the University of Canterbury, we are going to develop new input devices and interaction metaphors that will enable users to break out of the beige box tradition.

The University of Canterbury has a long tradition of excellence in interface design, from Leslie Kay’s work on Sonic Glasses in the 60’s to the web navigation work being undertaken in the Computer Science Department today. We are eager to draw upon this rich heritage and add the technology and expertise of the parent HIT Lab in Seattle to provide a resource for local and national industry.

I am grateful for the support that the local and national government has already shown us and I am eager to start the work of developing concepts for better interfaces. Please contact me if you have suggestions as to how we can best make this journey together.

Mark Billinghurst
HIT Lab NZ Director

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Lab running to schedule

- An informal opening ceremony of the HIT Lab NZ took place on April 19 2002 at the Lab’s premises.
- HIT Lab staff, in conjunction with Professor John Raine (Pro–Vice Chancellor International) and Canterbury Development staff members, Larry Podmore and Blair Cottam, celebrated the birth of the NZ lab with a ribbon cutting ceremony.
- Currently the HIT Lab has three offices based in the Old Maths Building located at the University of Canterbury campus. In July when more space becomes available, the HIT Lab will begin refurbishing the building to meet the needs of a high-tech world-class laboratory.
- The Lab’s International Director, Professor Tom Furness returned to Seattle on May 15 after spending four months in Christchurch as an Erskine Fellow at the University of Canterbury. Professor Furness will return to New Zealand in January 2003 for three months.
- The HIT Lab NZ Director, Dr Mark Billinghurst commences his appointment from July 1 2002. Students and staff will begin working on Industry and student-initiated projects from July onwards.
- The HIT Lab is in the process of obtaining equipment for the lab. Some of the equipment will be an in-kind donation from the Virtual Worlds Consortium members and the Lab’s sponsors. Equipment will also be brought over from the Seattle lab.
- The official opening of the HIT Lab NZ will take place in February 2003.
### Schedule of Events

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
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<tbody>
<tr>
<td>Informal Start Date of Hit Lab NZ</td>
<td>April 19, 2002</td>
</tr>
<tr>
<td>Director hire</td>
<td>May 2002</td>
</tr>
<tr>
<td>Lab site preparation</td>
<td>June 2002</td>
</tr>
<tr>
<td>Director commences</td>
<td>July 2002</td>
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<tr>
<td>Equipment</td>
<td>September 2002</td>
</tr>
<tr>
<td>Initial Students</td>
<td>Ongoing</td>
</tr>
<tr>
<td>First Consortium Meeting</td>
<td>February 2003</td>
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<tr>
<td>Official opening of Hit Lab NZ</td>
<td>February 2003</td>
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*The HIT Lab crew celebrate the birth of HIT Lab NZ.*
Although a ‘Kiwi’ by origin, Dr Billinghurst has spent the last eight years studying overseas, predominantly in the United States. Dr Billinghurst brings with him a wealth of knowledge and expertise in Human Interface Technology. He has produced over 70 technical publications and his work has been demonstrated at numerous conferences such as SIGGRAPH (Special Interest Group in Graphics).

Although Professor Furness is based at the HIT Lab in Seattle, he intends to spend approximately three months of each year at the HIT Lab NZ.

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Frequently dubbed the ‘grandfather’ of virtual reality, Professor Furness’ outstanding contributions to Human Interface Technology have laid the foundations for virtual reality, as we know it today.

Professor Furness spent 23 years working as a Military Scientist in the United States Air Force at Wright-Patterson Air base, designing visual display systems for the cockpits of fighter aircrafts. In an attempt to find more effective ways to communicate information to fighter pilots, Professor Furness realised that he needed to go back to basics and analyse ways in which humans interact with the world, that being three-dimensionally. His research led him to the forefront of virtual reality with the development of the ‘Super Cockpit.’

After obtaining widespread media attention for his work at Wright-Patterson air base, Professor Furness was inundated with phone calls from surgeons, anaesthetists and parents with sick children, all wanting to find out how his technology could help people. This widespread interest sparked the realisation that Professor Furness’ technology could potentially improve the lives of others.

Predicated on this premise, Professor Furness set up the HIT Lab US at the University of Washington in 1989. In 12 years the HIT Lab US has become one of the leading virtual reality research labs in the world.

Professor Furness’ outstanding credentials have won him worldwide recognition. In 1998 Professor Furness won the Discover Magazine Award, an award many regard as equivalent to winning an Oscar for Science and Engineering, for his invention of the Colour Virtual Retinal Display (VRD).

Not surprisingly, Dr Billinghurst has achieved several accolades in recent years for his contribution to Human Interface Technology research. Most notably, he was awarded a Discover Magazine Award in 2001 for Entertainment, for creating the Magic Book.

Professor Furness describes Dr Billinghurst as his ‘best-ever student.’ “Mark oozes intelligence, he is the best graduate student I have ever had in terms of his energy and creativity,” says Professor Furness.

Dr Billinghurst is also a two-time graduate of Waikato University where he completed a Bachelor of Computing and Mathematical Science (1st class honours) in 1990 and a Master of Philosophy (Applied Mathematics & Physics) in 1992.

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Dr Mark Billinghurst
New Zealand Director

Although a ‘Kiwi’ by origin, Dr Billinghurst has spent the last eight years studying overseas, predominantly in the United States. Dr Billinghurst brings with him a wealth of knowledge and expertise in Human Interface Technology. He has produced over 70 technical publications and his work has been demonstrated at numerous conferences such as SIGGRAPH (Special Interest Group in Graphics). Dr Billinghurst has previously worked at ATR Research Labs in Japan, British Telecom and MIT Media Laboratory.

This year, the former Hit Lab US Research Associate completed his PhD in Electrical Engineering, at the University of Washington, under the supervision of Professor Thomas Furness. As part of the research for his thesis titled ‘Shared space: Exploration in Collaborative Augmented Reality,” Dr Billinghurst invented the Magic Book technology.

Eric Woods
Head of Computer & Multimedia Services

Eric is a double first-class honours graduate in Biochemistry and Applied Computing (Graphics). While at Lincoln University, Eric completed a number of award winning short films and developed interests in 3D animation. He furthered these interests by learning interactive graphics programming techniques that are ideal for scientific visualisation and education.

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John is a Professor of Mechanical Engineering and Pro Vice-Chancellor (International) at the University of Canterbury, where he has worked for 24 years. His current responsibilities include International business, Commercial Research, Technology Commercialisation, and Continuing Education.

Professor Raine’s co-founded with Dr Donald Clucas Christchurch company, WhisperTech Ltd, manufacturers of Stirling engine based micro-cogeneration systems. Professor Raine was a co-founder of the Canterbury Innovation Incubator Ltd (Cii) with colleagues from Canterbury Development Corporation, Lincoln University and Orion Corporation. He continues as a Director of Cii and Canterprise, and is a Board member of the Centre for Advanced Engineering and the MacDiarmid Institute. He is also a member of the Ministry of Economic Development Design Industry Task Force.

Professor Raine has worked closely with Canterbury Development Corporation to achieve the successful launch of the HIT Lab NZ. He will continue to assist business development during the start-up phase and will represent the University of Canterbury on the HIT Lab NZ Board of Directors.

Larry is the Science and Technology Development Advisor at the CDC. He is part of the team driving the HIT Lab NZ initiative. The CDC has developed a partnership with government agencies to ensure HIT Lab NZ is developed as a major New Zealand initiative. The CDC will also be instrumental in establishing global connections and leveraging the HIT Lab’s technology portfolios to enhance New Zealand’s economic transformation in High-Technology Industries.

Blair completed a Bachelor of Arts with Honours degree at the University of Canterbury majoring in Geography. After completing his degree Blair began work for the Canterbury Development Corporation in 2000 as a Projects Officer. His work focuses primarily on research science and technology-led economic development. Blair’s skills and services are kindly on loan from the Canterbury Development Corporation to assist HIT Lab NZ during its establishment phase.