

# The Human Interface Technology Laboratory New Zealand (HIT Lab NZ)

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*Abstract*—The Human Interface Technology Laboratory New Zealand (HIT Lab NZ) is the leading research laboratory in New Zealand for Augmented Reality (AR) and advanced user interface research, and one of the largest AR research groups in the world. This paper provides an introduction to the HIT Lab NZ, an overview of its history and a review of past and current and future research projects.

*Keywords:* HIT Lab NZ, Augmented Reality, Virtual Reality, Interaction Design, 3D User Interfaces.

## I. INTRODUCTION

The Human Interface Technology Laboratory (HIT Lab NZ) at the University of Canterbury was founded in 2002 with the ambitious goal of “Unlocking the power of Human Intelligence”. Since that time it has grown to become one of the largest Augmented Reality research groups in the world while also conducting research in other areas of emerging technology. In this paper we provide an introduction to the history and structure of the HIT Lab NZ, the past and current research projects, and directions for future work. More information about the HIT Lab NZ can be found here [1].

## II. HISTORY AND STRUCTURE

### A. History and Mission

The HIT Lab NZ was founded in 2002 at the University of Canterbury, but the beginnings of the research institute occurred several years before. The University of Canterbury is located in Christchurch, New Zealand, which is one of the sister cities of Seattle, Washington. In 2000 a delegation from Christchurch city visited Seattle to explore areas for collaboration. While at the University of Washington they visited the Human Interface Technology Laboratory (HITL) [2], a leading research center for virtual reality and 3D user interfaces founded in 1989.

From that initial meeting the Canterbury regional development agency determined that a similar research institute could be established at the University of Canterbury. The university has one of the top engineering schools in New Zealand, while Christchurch is home to almost half of the software and hardware companies in New Zealand. This combination of strong academic and commercial institutions provided the ideal environment for a spin-out from the HITL at

the University of Washington. So in 2002, Dr Mark Billingham, a New Zealand PhD graduate from the HITL, left Seattle to found the HIT Lab NZ with the support of Christchurch city and the University of Canterbury.

The HIT Lab NZ was established as a research institute with a three-fold mission; (1) To teach students about human interface technology, (2) To conduct world-class interface research, (3) To commercialize research and build the local and national economy. These three areas of Teaching, Research and Commercialization are closely related in that students learn about interface technology, can then do great research and finally become involved in commercialization.

### B. The HIT Lab NZ Structure

Since 2002 the HIT Lab NZ has grown from a small group of three staff and two students to more than fifty staff and students. Over 200 people have spent time conducting research in the HIT Lab NZ, including eight students who have completed Masters Thesis work, and twelve PhD graduates.

Currently there are five core academic and research staff in the HIT Lab NZ, with another five administration and engineering support staff. In addition there are typically thirty students, mostly Master and PhD graduate researchers, plus around ten interns and other visitors. The staff and students come from a very diverse range of academic background and also a wide variety of countries. This is important because innovative interface research emerges from the boundary of different disciplines and cultures.

The HIT Lab NZ is treated as its own department within the University of Canterbury, but until recently did not have any of its own academic programs. So students needed to enroll in one of the other academic departments, but could sit and conduct their research in the HIT Lab NZ, often under the co-supervision of a HIT Lab NZ staff member. However, in 2010 the HIT Lab NZ established its own PhD program, designed for students interested in multidisciplinary research, and in 2012 a Masters degree in Human Interface Technology (MHIT) should begin.

Currently over 70% of the HIT Lab NZ income comes from government and industry competitive research grants and consulting. The remaining income is split between student tuition and performance based strategic research funding.

### III. RESEARCH DIRECTIONS

Interface technology is a very broad area for research, so the HIT Lab NZ focuses on the following topics; (1) Augmented Reality, (2) Visualization, (3) Human Robot Interaction, and (4) Interaction Design. In this section research in these areas is discussed in more details.

#### A. Augmented Reality

Augmented Reality is a technology that allows virtual imagery to be seamlessly blended with the real world in real time. Staff and students at the HIT Lab NZ have been conducting research in this area since 2002, and is one of the few organizations that conducts low-level research on AR tracking and displays, through to authoring tools, high level applications and user experiences.

HIT Lab NZ researchers were the first in the world to develop collaborative AR applications for mobile phones [3] (see figure 1), have produced the popular BuildAR AR scene-building tool [4], researched AR books, and usability methods for evaluating AR experiences [5]. Currently AR research is focused on mobile AR, gesture interaction with AR applications, and using AR for education.



Figure 1. AR Tennis: Shared AR Experience on Mobile Phone

#### B. Visualization

The HIT Lab NZ has a three-screen stereo projection immersive theatre (see figure 2), VisionSpace, which is used in a variety of visualization research. Psychologists have used the facility to study how people navigate through the real world, or interact with virtual characters. Computer scientists have studied audio interfaces for phone use while driving, and geographers have used it for environmental visualization. Currently the system is being used to explore how full-bodied interaction can be used to manipulation immersive 3D graphics, and to support urban redesign.

#### C. Human Robot Interaction

Robots are becoming increasingly important members in our society. Researchers at the HIT Lab NZ are exploring

hardware and software solutions for robots that enable them to act socially. This includes models of human behavior, emotions, anthropomorphism and animacy. The effects that robot have on their users is of particular interest. One of the active research projects is the development of the ROILA language, an artificial language that allows humans to easily communicate with robots [6].



Figure 2. VisionSpace Immersive Theatre

#### D. Interaction Design

The HIT Lab NZ engages in many applied Interaction Design research projects in collaboration with local and international companies. The projects typically involve working with the companies in a user centered design process to improve the user experience with their products, or develop new interface ideas. In the past this has included developing user interfaces for low vision reading aids [7], elevator control panels, mobile games, and exploring how AR can be used to improve outdoor surveying, among other projects.

### IV. CONCLUSION

The HIT Lab NZ is a unique research institute exploring next generation interface technology such as Augmented Reality, Human Robot Interaction and Immersive Visualization. It has a three-fold mission focusing on teaching, research and commercialization. Since it is a truly multidisciplinary environment, there are opportunities for students from any background to become part of the HIT Lab NZ, and for collaboration with external academic and industry researchers.

### REFERENCES

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