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IMI Vision

"...This research institute is dedicated to creating an environment where technology and creativity can coexist and develop."

Professor Bertil ANDERSSON
NTU President and IMI Founding Chairman

IMI Missions

- To develop cutting-edge new media research within IMI.
- To lead the international collaboration BeingThere Centre on 3D Telepresence at NTU.
- To create synergy and interactions with NTU schools to empower New Media interdisciplinary research through integrated projects and joint PhD supervisions.
- To promote and develop industrial applications in Singapore and elsewhere in the world.
Director’s Message

The Institute for Media Innovation (IMI) is an international interdisciplinary research institute on digital media. More than 30 PhD students coming from different NTU schools are working in the IMI premises on various interdisciplinary projects. The monthly PhD seminar is very popular and gives the opportunity to all IMI PhD students and their supervisors to exchange innovative ideas and latest development together. The IMI distinguished lecture series brings top researchers from all over the world to address key issues in the interactive digital media domain.

The International Centre, BeingThere, on 3D Telepresence has been established since December 2010 at IMI with an overall funding of 23 Million Singapore dollars. It groups together key international partners - Swiss Federal Institute of Technology (ETH) at Zurich in Switzerland, the University of North Carolina (UNC) at Chapel Hill in the United States, and Nanyang Technological University (NTU) in Singapore. In this project, over 15 faculties in NTU have focused their research on various aspects of the Telepresence research and in particular, on virtual humans and social robots who can act as substitutes or additional human resources.

The IMI immersive room built in 2011 allows to have a truly experience in immersive virtual worlds. It is the only one in the world to have a 320 degree seamlessly rounded screen allowing a natural immersion. It has become a visualization tool to assist more and more NTU researchers and faculties in their research work. Plenty of demos developed by IMI researchers and NTU professors are shown to visitors coming from different parts of the world. This exceptional immersive equipment is made available for all NTU researchers. IMI also welcomes any interested parties to collaborate and develop new applications using the immersive 3D room.

IMI has created several interdisciplinary research teams across campus in different domains such as autonomous virtual humans, social robots, immersive technology to interact with virtual pink dolphins, crowds and groups simulation for future cities, 3D medical physiological humans and modeling 3D clothes for fashion shows to cite just a few. Some of these projects are supported by IMI seed grants to help researchers proving concepts and developing prototypes for further external funding.

Every year, IMI organizes summer schools, workshops and international conferences in many interdisciplinary fields of digital media attracting a lot of visitors. IMI has reached a truly international standard for research and collaboration.

Professor Nadia MAGNENAT-THALMANN
Director, Institute for Media Innovation
Corporate Profile
About IMI

IMI is an incubator of multidisciplinary, cutting-edge and media-related research ideas. It is directed by Professor Nadia Magnenat-Thalmann who is a world pioneer in Interactive Digital Media (IDM) research, particularly in all aspects of Virtual Humans simulation. IMI strives to build a strong reputation as a global leading IDM hub. In response to Singapore’s national priority to develop IDM as a strategic R&D area, IMI aspires to facilitate and promote cross-disciplinary collaboration in media research at NTU. At the same time, it also seeks to provide a one-stop interface to the outside community by forging partnerships with the Singapore government, industry players, and other international entities. Another important role of IMI is to enrich the educational experience of students by exposing them to the multifaceted field of IDM.

The Institute is dedicated to create an environment where technology and creativity can coexist and develop. The general objective of IMI core research is to create true synergies between the real and the virtual worlds and to develop interactions between real people and virtual or artificial creatures like virtual humans, virtual animals and robots in a way of creating a real social relationship.

IMI attracts talent researchers from over 15 countries working in this young organization.
Steering Committee

Prof BOEY Yin Chiang, Freddy
Deputy President and Provost
President’s Office

Chair of Steering Committee
Prof Stephen Kevin SMITH
Vice President (Research)
President’s Office
Members

Prof Peter Rainer PREISER
Associate Provost (Graduate Education), President's Office

Prof KHOR Khiam Aik
Director (RSO and Bibliometrics Analysis), President's Office

Prof Janie FOUKE
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Prof YEO Hian Heng, Gillian
Interim Dean, NBS

Prof Martyn R PARTRIDGE
Senior Vice Dean, LKC Medicine

Prof LING San
Dean, COS

Prof CHAN Kam Leung, Alan
Dean, COHASS

Prof HUNG Wei Loong, David
Associate Dean, NIE

Prof YUE Chee Yoon
Acting Dean, IGS

Assoc Prof Benjamin Hill DETENBER
Chair, WKWSCI

Prof CHAN Bee Eng, Mary
Acting Chair, SCBE

Assoc Prof CHEE Yeow Meng
Chair, SPMS

Prof CHENG Tee Hiang
Acting Chair, EEE

Prof CHUA Chee Kai
Chair, MAE

Prof Mark FEATHERSTONE
Chair, SBS

Prof LIU Hong
Chair, HSS

Prof SOH Chee Kiong
Acting Chair, CEE

Prof Dorrit Vibeke SORENSEN
Chair, ADM

Prof Thambipillai SRIKANTHAN
Chair, SCE
Professors Associated to IMI

IMI collaborates with 45 professors among various NTU schools. The collaboration is either Seed Interdisciplinary Projects or supervision of PhD students.
Professors Associated to IMI

Asst Prof Ina Conradi CHAVEZ, ADM
Asst Prof Mark Joseph CHAVEZ, ADM
Asst Prof CONG Gao, SCE
Asst Prof Martin CONSTABLE, ADM
Asst Prof Justin DAUWELS, EEE

Asst Prof FU Chi Wing, SCE
Asst Prof HU Guoqiang, EEE
Asst Prof JUNG Younbo, WKWSCI
Asst Prof Andy KHONG Wai Hoong, EEE
Asst Prof OLGA Sourina, EEE

Asst Prof Michael Donald PATTERSON, HSS
Asst Prof WU Jianxin, SCE
Asst Prof YUAN Junsong, EEE
Asst Prof ZHANG Jie, SCE
Asst Prof ZHANG Wei, SCE
Researchers and PhD Students at IMI

"IMI is a vibrant and dynamic environment for research on new media. Researchers of various nationalities, coming from different scientific backgrounds, collaborate on interdisciplinary projects, sharing their knowledge and learning from each other. It is highly stimulating to work in this international and open-minded atmosphere, which characterizes the best research labs around the planet."

Dr Sebastien DALIBARD
Research Fellow
Research
Core Research Areas

The general objective of IMI Core Research framework is to create true synergies between the real and the virtual worlds. This means the development of a true interaction between real people and virtual or artificial creatures like virtual humans, virtual animals and robots in a way of creating a real social relationship. IMI core research areas include 3D Telepresence, Virtual Humans and Social Robots, 3D Serious Games, 3D Crowd Simulation, 3D Immersion, 3D Medical Simulation and 3D Fashion.

3D Telepresence

The BeingThere Centre at IMI is taking lead in advanced and sophisticated forms of interactive real-time 3D communication, known as “Telepresence” and “Telecollaboration”. BeingThere Centre is an International Research Centre for 3D Telepresence funded by Media Development Authority of Singapore with the joint effort between ETH Zurich, UNC Chapel Hill and NTU Singapore. The main objective of the BeingThere Centre is to make major technological and systems-level advances leading to a credible, 3D experience of Telepresence in a fitted room using a mobile platform. The result will be a breakthrough in the quality of interpersonal communication at a distance allowing for eye contact and proper motion parallax among a group of participants.
Virtual Humans and Social Robots

Virtual humans are social agents in the virtual world, while social robots belong to the real, physical world. They are meant to interact with each other as well as with real humans. In order to create believable and long-lasting relationships, they must be empowered with personality and memory, and be able to express artificial emotions and moods. To achieve autonomous behaviour, they must be aware of their social environment, understand what is going on around them, who is doing what, what are the relationships between people, and how humans feel.

3D Serious Games

We develop educational games for learning and training purpose with the aid of virtual tutors or virtual trainers. This research is cross-school and interdisciplinary with inputs from School of Mechanical & Aerospace Engineering, School of Computer Engineering, National Institute of Education, School of Art, Design and Media. The research program also partners with local companies including Underwater World Singapore, PEC Ltd and AWWA Special School. Part of the projects under the program received funding support from industry.
Crowd simulation is the process of simulating the movement of a large number of virtual humans or characters. Virtual cities have become common in video games and other virtual applications. However, most of them are uninhabited or with only a few people. Benefiting from crowd simulation technology, it becomes possible that large-scale virtual environments are populated with up to tens of thousands of virtual humans. Research in crowd simulation has been widely explored in a number of fields such as computer graphics, civil engineering, sociology and robotics. Crowds have wide applications for both real-time and non-real-time simulations. Virtual crowds are used to simulate epic battles in the movie industry. Crowds are exploited to populate virtual worlds in computer games. In safety training, trainees can participate in the evacuation scenarios to practice controlling crowds in emergency situations like earthquake, fire, flood, etc.

The research of crowd simulation in IMI focuses on the interaction and immersion of the virtual crowds. The immersive 3D display system has been successfully built, which has great potential for the training and evaluation of emergency evacuation and other real-time applications of crowd simulation with interaction. IMI is working also with colleagues from ETH in the Future Cities Laboratory projects.

3D Immersion

IMI is carrying out research in developing interactions for various immersive applications such as new future buildings, simulation of traffic, virtual dolphins interaction, etc. IMI is also working together with local and international institutions and industry partners to visualize their applications and develop the research needed for them.
Core Research Areas

3D Medical Simulation

With the collaboration of the new Lee Kong Chian School of Medicine, IMI is working on modelling the musculoskeletal system of any individual. With the aging population, it is important to be able to see the body parts as they are in reality in motion and be able to predict what is happening. Musculoskeletal disorders are common causes of different pathologies and physical disability, affecting many people across the world. IMI is making research on 3D visualisation of subject-specific from MRI images in order medical doctors can see the motion of the articulation in 3D of each particular patient and make a more precise diagnosis. This study is very interdisciplinary as it implies medicine, biology, biomechanics and visualisation techniques. New Media is essential to this research as it allows visualizing anybody in motion as if we could walk through the body at different levels and see what happens.

3D Fashion

IMI is working together with MIRALab at the University of Geneva on a Virtual Try On application which combines virtual models, virtual fashion and garment simulation technologies into a single interactive application. Research has been led on fast physics based simulation models and interactive intuitive interface. In the application, the user has the possibility to dress a virtual mannequin by choosing a garment from a selection of clothes. The garment will automatically adapt to the 3D mannequin shape by means of a physical simulation. Through an easy to use touch-screen manipulation, the user can interactively change the fabric colour, fabric types, modify the design and select other options which will be immediately visualized. Once the mannequin has been dressed, the user can see her walk around in the garments he/she selected. Knowing that the creation of a real dress needs one week, this rapid prototyping technology will dramatically shorten the time to design clothes according to the customers’ taste.
Awards

Humboldt Research Award from Alexander von Humboldt Foundation, Germany, 2012

Professor Nadia Magnenat-Thalmann received the prestigious Humboldt Research Award in Germany given to “academics whose fundamental discoveries, new theories, or insights have had a significant impact on their own discipline and who are expected to continue producing cutting-edge achievements in the future”.

The 2012 Achievement Award from the Canadian Human Computer Communications Society, Canada

The 2012 CHCCS/SCDHM Achievement Award of the Canadian Human Computer Communications Society was presented jointly to Professor Daniel Thalmann and Professor Nadia Magnenat-Thalmann in recognition of their pioneering work in the development of lifelike, synthetic human models for computer animation.
Awards

**NetExplo Top 100 Innovations 2012 for Mobile Avatar for Virtual Engagement by NTU (MAVEN)**

*Netexplo* is a unique setup for detecting, analysing and putting into perspective future mainstream practices in digital society.

**Google Anita Borg Memorial Scholarship Asia 2012 & DragonVentrue NTU Scholarship, 2011**

*Fang Hui, IMI PhD student* received the Google Anita Borg Memorial Scholarship Asia 2012 and the DragonVentrue NTU Scholarship in 2011 given to Masters and PhD students with outstanding academic achievements, entrepreneurial or leadership potential in NTU.
With 45% increment compared to last year’s publications, IMI has totally 71 publications in the Year 2012, including 24 journal papers, 44 conferences, workshops & posters, 3 books & book chapters.
Seed Interdisciplinary Projects

Robust and Accurate Face Segmentation and Expression Transfer for Autonomous Avatars

PI: Assoc Prof HE Ying (SCE)

We will be using a completely new paradigm for 3D facial expression acquisition and retargeting. It envisions a suite of new algorithms and tools that allow users to acquire analyze process and visualize 3D facial expressions more easily and effectively than conventional methods. It will provide high resolution facial motion data without requiring the subject to wear cumbersome suits or tracking devices and markers and different expressions of the same subject can be mapped to the same canonical 2D domains. As a result, the captured data are stored in Geometry Video, a highly compact representation that can be easily visualized and steamed. Therefore, the captured data can be widely applied, with the potential to revolutionize a variety of real-world applications in the entertainment industry, biomechanics, mass communication, medical applications, etc.

Monitoring of Group Discussions: A Socio-engineering Approach

PI: Asst Prof Justin DAUWELS (EEE)
Co-PIs: Prof Nadia MAGNENAT-THALMANN (IMI)
        Prof Daniel THALMANN (IMI)
        Asst Prof Martin CONSTABLE (ADM)

Human group interaction is very complex and rich. Monitoring any group can be done using non-verbal (facial expressions, body languages, gestures, etc.) or verbal (voice tone, voice pitch,...etc) signals. Despite the impressive advancements in video-audio signal processing, analyzing different aspects of human interaction as empathy, hostility, (dis-)agreement, flirting, dominance, superiority, inferiority, etc. remains very challenging. Investigating these aspects is crucial for building intelligent robots that can participate in conversations in a natural way, or to fulfill certain social responsibilities in our life. As our ultimate goal is to improve the current computer systems and social robots that suffer from a lack of social skills, we will explore the social signals and social behaviors, including social interactions (like turn taking and backchannelling), social attitude (like alliance), and social relations/roles to build more socially intelligent model for robots.
An Immersive Virtual Endomicroscopic Environment: Towards Innovation in Photodynamic Therapy for Mucosal Cancer

PI: Assoc Prof LIN Feng (SCE)
Co-PIs: Assoc Prof Valerie LIN Chunling (SBS)
Asst Prof Mark Joseph CHAVEZ (ADM)
Asst Prof QIAN Kemao (SCE)

This project is aimed at innovation in photodynamic therapy (PDT) for mucosal cancer via microstructure-level simulation of the complex therapeutic procedures. In a joint research project on in vivo cellular fluorescence imaging with National Cancer Centre Singapore, cancerous cells in superficial tissues of live animal models are detected with a confocal laser scanning fluorescence endomicroscope and a real-time computer visualization system. The study shows great potential of extending such a diagnostic system to a therapeutic tool. The key is for the radiochemists and endomicroscope based surgeons to well understand the fluorescence images and thus can assess the therapeutic margins online. An immersive environment which facilitates simulation based training is looked for.

The Birds Singing Club

PI: Assoc Prof Louis-Philippe DEMERS (ADM)

The Canary Birds were still deployed up to the late 20th century as indicators to warn miners against dangerous gases, hearing their joyful songs as long as there was enough fresh air. Not the safety aspects but indeed their singing skills have lead to the domestication, breeding and distribution of oscine birds all over the world.

For this artistic participatory installation, the living birds are transformed into “Canary Devices” which are mobile audio devices. The “Canary Devices” are to create a social platform between the owners themselves and the listeners (audience) in a real public space: the “Birds Singing Club.”

The “Birds Singing Club” is (an analogy of) a common birds exhibition place, which can be found in backyard areas such as Ang Mo Kio in Singapore. Posts are deployed where the birdcages can be hoisted up high like flags. The owners are staying alongside the field listening and discussing the skills of their “fosterlings.” To the audience, the bird cages act as icons to listen.
Seed Interdisciplinary Projects

**Unframed**

PI: Asst Prof Ina Conradi CHAVEZ (ADM)
Co-PI: Asst Prof Mark Joseph CHAVEZ (ADM)

The project goal is to use IMI extraordinary creative platform (The Immersive Room) as a space to author new media art experimentation. The works will explore surreal, abstract and realistic way of painting using medium of 3D stereo animation.

**iCAVE: Intelligent Agent-augmented CAVE System**

PI: Assoc Prof MIAO Chun Yan (SCE)
Co-PIs: Dr SHEN Zhiqi (EEE)
Dr KIM Beaumie (NIE)

The objective of our research project is to develop an intelligent agent-augmented CAVE system, namely iCAVE, which overlays a semantic agent layer on top of the current CAVE system to achieve high level semantic analysis and virtual world adaptation with intelligent agents. Moreover, a case study “walking with dinosaurs” will be implemented within iCAVE.

**The Archive of the Indigenous Languages and Cultures of South East Asia (AILCSEA)**

PI: Assoc Prof Francesco CAVALLARO (HSS)
Co-PIs: Prof Luke Kang Kwong KAPATHY (HSS)
Asst Prof TAN Ying Ying (HSS)
Asst Prof GOH Geok Yian (HSS)

Even according to the most optimistic views we will see about 3000 languages disappear by the year 2100. It is imperative that steps are taken to preserve these endangered languages. The project involves setting up a safe long-term digital media repository at NTU that will serve as an archive for multimedia data pertaining to endangered languages and cultures. This will encourage co-operation amongst an international network of researchers to provide advice and collaboration, encourage endangered communities to safeguard their languages and cultural traditions, and allow researchers to access the documentation created for any language on the archive.
Virtual Pink Dolphins – Phase II

PI: Assoc Prof CAI Yiyu (MAE)
Co-PIs: Asst Prof CHIA Kok Hwee (NIE)
         Prof Daniel THALMANN (IMI)
         Assoc Prof ZHENG Jianmin (SCE)
         Prof Nadia MAGNENAT-THALMANN (IMI)
         Mr Norman Kiak Nam KEE (NIE)
         Asst Prof Kenneth FEINSTEIN (ADM)

This project is interested to investigate the modeling, simulation and visualization of virtual pink dolphins for the purpose to design serious games to replace the real ones for applications in special education, therapy, and entertainment. Virtual Reality technology will be studied aiming to equip the virtual pink dolphins with multi-sensorial functions (visual, audio, and tactile) for human-dolphin communication. Special efforts are being made to study the virtual pink dolphin assisted therapy (VPDAT) and human-mediated learning for Autism Spectrum Disorder (ASD) children.

A Versatile Simulation-based Virtual Marionette Framework

PI: Prof SEAH Hock Soon (SCE)
Co-PIs: Prof Alfred BRUCKSTEIN (SPMS)
        Prof Martin REISER (ADM)
        Assoc Prof CHEN I-Ming (MAE)
        Asst Prof Peer Mohideen SATHIKH (ADM)

This project aims to build a versatile simulation-based virtual marionette framework that enables users to produce 3D animations by manipulating suitably designed objects connected to sensors, viewed by a camera, or haptic devices such as data-gloves. The system, a Virtual Marionette Theater, enables people to train and learn to manipulate virtual characters or objects, and thereby become skilled animators whose marionettes move realistically, and become actor/avatars in the virtual world. To achieve this, the framework is designed to be immersive, user-friendly, interactive, and intuitive. On the other hand, the motion of the puppet (the output by manipulations and control processes) should be versatile enough. The virtual marionette will also be working together with a robotic marionette system controlled by the same user interface for cross-platform study and performance benchmark.
About BeingThere Centre

BeingThere Centre is an International Research Centre for Telepresence and Telecollaboration mainly based at the Institute for Media Innovation (IMI) in Nanyang Technological University (NTU), Singapore.

It is funded by Media Development Authority of Singapore with joint effort from ETH Zurich (Switzerland), UNC Chapel Hill (USA) and NTU (Singapore). The objective of the BeingThere Centre is to make major technological and systems-level advances leading to a 3D credible experience of Telepresence in a fitted room using a mobile platform. The result will be a breakthrough in the quality of interpersonal communication at a distance allowing for eye contact and proper motion parallax among a group of users.

BeingThere Centre aims to give the illusion that distant participants are all present next to each other in the same room. To achieve that, research will be done in 3D video technology and in 3D autostereoscopic display. As part of the research, an animatronic robot-avatar can be teleoperated by a participant from a distant place and navigate in hospital rooms or in laboratories. An autonomous Virtual Human (VH) or Social Robot will be used in case a participant cannot attend the meeting. This VH will have some capacities as recognizing others’ faces and emotions, memorizing facts and retrieving them according to the dynamic context. Its appearance will be similar to the real user and it will speak, show some emotions and make appropriate gestures according to the situation.

This $23 million centre is set to drive the next evolution in virtual communications with a focus on developing a variety of interdisciplinary and advanced technologies that break down physical barriers and generate real face-to-face conversation.
BeingThere Centre Steering Committee

Prof Freddy BOEY
Deputy President and Provost
NTU, Singapore

Mr Michael YAP
Deputy Chief Executive Officer (International)
Media Development Authority, Singapore

Prof Roland SIEGWART
Vice President, Research and Corporate Relations
ETH Zurich, Switzerland

Prof Anselmo LASTRA
Chair, Department of Computer Science
UNC Chapel Hill, USA
The mission of the BeingThere Centre is to develop the technological framework and platform for the future of Telepresence. Novel 3-dimensional display and capture technologies as well as advanced robotics and avatars will make it possible to convey an unprecedented sense of presence to the user. BeingThere will advance conventional location based services, but we are also devising new metaphors for making Telepresence mobile and more physical. I am very delighted to see the technical progress we have achieved within the first year since its conception.

Due to the globalisation of the world, there is a need for people to interact and work more together, no matter where we are in the world. The projects that we develop at the BeingThere Centre combine many advanced technologies and extend the feeling of face-to-face communication seamlessly over distance, so that people feel as though they are together in a single place, even though they are in different countries. These advancements will take Telepresence to a higher level of immersiveness. I anticipate that they will enable us to better understand each other, work more effectively, and make better informed decisions through the power of these state-of-the-art technologies. I can also foresee many other potential applications, like remote natural learning and even healthcare delivery.

Prof Nadia MAGNENAT-THALMANN  
Co-director  
NTU, Singapore

Prof Henry FUCHS  
Co-director  
UNC Chapel Hill, USA

Prof Markus GROSS  
Co-director  
ETH Zurich, Switzerland

Telepresence technologies may one day be as commonplace as the personal computer and the mobile phone. These immersive meeting rooms, roving 3D displays, animatronic avatars, and autonomous virtual humans may soon be an integral part of our daily lives. They will reduce the time and expense of long-distance travel, enable more compelling long-distance education, training, health care, tourism and entertainment, and bring together families and friends from across the globe. Precisely how these technologies will develop no one can tell, but it's tremendously exciting to be at the forefront of this revolution. The three universities working together, leveraging each others' capabilities, will achieve much more than any one of us can do alone.

The mission of the BeingThere Centre is to develop the technological framework and platform for the future of Telepresence. Novel 3-dimensional display and capture technologies as well as advanced robotics and avatars will make it possible to convey an unprecedented sense of presence to the user. BeingThere will advance conventional location based services, but we are also devising new metaphors for making Telepresence mobile and more physical. I am very delighted to see the technical progress we have achieved within the first year since its conception.
Prototypes

**Prototype 1: Room-based Telepresence System**
A fitted room with a table for the standard group meeting situation. With two people engaged in a conversation experience true eye-contact whereas other participants see them from the side with parallax as in a real meeting room.

**Prototype 2: Mobile, Autostereoscopic 3D Display and Telepresence Platform**
A roving display which brings a 3D representation of a single distant person to a place, controllable by both users. The display is semitransparent and will bring the illusion of the other person being present into a room or a laboratory.

**Prototype 3: Mobile Animatronics Telepresence System**
An animatronic robotic mannequin onto which a faithful representation of the remote user is projected. The robot is remote controlled by the remote user and can navigate laboratories or hospital rooms.

**Prototype 4: Autonomous Virtual Humans and Social Robots for Telepresence**
An autonomous digital human or social robot will be used in case a real user cannot attend the meeting. This digital human will have capacities as recognizing other faces and users’ emotions, memorizing facts and retrieving them according to the dynamic context. Its appearance will be similar to the real user. It will speak, show some emotions, and make appropriate gestures according to the situation. Our e-companions will be part of our daily life.
Projects

**Novel Scene Acquisition and Display Technologies for a Next-generation Room-based Telepresence System**

**PIs:**
- Assoc Prof CHAM Tat Jen (NTU)
- Prof Henry FUCHS (UNC)

**Team Members:**
- Prof SUN Chengzheng (NTU)
- Assoc Prof CAI Jianfei (NTU)
- Asst Prof Philip FU (NTU)
- Prof Marc POLLEFEYS (ETH)
- Andrei STATE (UNC)

This project is aimed at exploring and developing technical and research methodologies for scene acquisition and display to enable the room-based Telepresence system. The grand vision for the Telepresence system is to simulate a highly realistic experience for users whereby distant remote rooms appear to be separated only by transparent glass walls. This entails that as a user walks about within the local room, her view of the remote room not only appears 3D, but is also geometrically consistent with her positional point of view, and rendered with sufficient perceptual fidelity to make the user believe she is physically there – right next to the remote room.

**Mobile, Autostereoscopic 3D Display and Telepresence Platform**

**PIs:**
- Prof Markus GROSS (ETH)
- Prof Marc POLLEFEYS (ETH)

**Team Members:**
- Dr Luca BALLAN (ETH)
- Dr Silke KONSORSKI-LANG (ETH)
- Dr Tiberiu POPA (ETH)

The project aims to design and build and entirely novel, mobile display platform enabling autostereoscopic display of collaborators at remote locations. The core novelty will be a humanized, transparent OLED display combined with an LCD layer as an adaptive parallax barrier. A set of cameras and time-of-flight depth sensors will capture the three dimensional appearance, head position, and distance of the remote communication partner in real-time. This information will be utilized to control the parallax barrier and to steer the holonomic motion platform.
Animatronic Avatar: Development of a Robotic Avatar for Telepresence Interaction and Communication

PIs: Research Prof Greg WELCH (UNC)  
Assoc Prof SEET Gim Lee, Gerald (NTU)  
Assoc Prof CHEN I-Ming (NTU)  
Team Members: PANG Wee Ching (NTU)  
ZHANG Chao (NTU)  
PHAM Tan Anh Khoa (NTU)  
Prof Markus GROSS (ETH)  
Prof Henry FUCHS (UNC)

The objective of the project is to improve on the state of art technology of deploying Telepresence robots for telecommunication. The plan is to address the need for Telepresence robot technology which provides rich interactivity without requiring the robot’s user to devote significant cognitive activity to the operation of the robot.

Specifically, the intention is to develop a mobile Telepresence robot capable of navigating autonomously or semi-autonomously (directed but not controlled) in a typical office environment while allowing safe and relaxed interaction without the need to be consciously concerned about preventing collisions, and maintaining a comfortable distance and pose with respect to the other humans involved in the interactions.
Autonomous Virtual Humans and Social Robots for Telepresence

PIs: Prof Nadia MAGNENAT-THALMANN (NTU)
    Prof Daniel THALMANN (NTU)
    Asst Prof YUAN Junsong (NTU)

Team Members: Asst Prof Andy W. H. KHONG (NTU)
    Asst Prof HE Ying (NTU)
    Asst Prof Michael Donald PATTERSON (NTU)
    Dr Flavien PICON (NTU)
    REN Jianfeng (NTU)
    Qui C. T. TRAN (NTU)
    Rajan Sobhana RASHOBH (NTU)
    Prof Marc POLLEFEYS (ETH)
    Research Prof Greg WELCH (UNC)

The general objective of this project is to replace a real participant by its virtual counterpart. The virtual participant is supposed to give a partial illusion that the real person is present. This implies that the Virtual Human (VH) should look the same as the real human, speaks with the same intonation, and be somehow aware of the real situation, the real participants, and the task currently performed. The VH should react at the right time based on the perception he/she has from the real participants. It implies to evaluate what each real participant is doing. Perception will be obtained by visual and audio input and recognition. The virtual participant reacts according to the input and its current knowledge. Its reactions encompass animation (body and facial gestures) and speech synthesis.

Advanced Technologies for 3D Capture, Communication, and Display

PIs: Assoc Prof CHAM Tat Jen (NTU)
    Prof Markus GROSS (ETH)
    Prof Henry FUCHS (UNC)

Team Members: Dr Jean-Charles BAZIN (ETH)
    Andrei STATE (UNC)

In this research project, we will conduct broad experimental investigations into advanced hardware and software technologies to support future systems for immersive 3D Telepresence with multiple users per site, unburdened by any head gear, supporting full bidirectional eye contact. We will investigate 3D capture/acquisition, 3D display, as well as the related domain of 3D data encoding and representation in the context of Telepresence.

This project will particularly focus on the feasibility of our approaches for these ambitious and challenging tasks. By focusing on advanced research, rather than complete prototypes, we believe we can reach the next generation of 3D acquisition and display, far beyond the capabilities of existing systems.
Researchers and PhD Students at BeingThere Centre

**NTU Researchers (14)**
- Dr Sebastien DALIBARD
- Dr Flavien Jackie PICON
- Dr XIA Jiazhi
- Ms AGUSTINA
- Mr XU Di
- Mr DENG Teng
- Mr TAN Fuwen
- Ms PANG Wee Ching
- Mr WONG Choon Yue
- Mr BURHAN
- Mr PHAM Tan Anh Khoa
- Mr REN Jianfeng
- Mr TRAN Cong Thien Qui
- Mr Rajan Sobhana RASHOBH

**NTU PhD Students (8)**
- Ms ZHAO Mengyao
- Ms WANG Anran
- Mr LI Bingbing
- Mr GU Yuanlong, William
- Mr ZHANG Juzheng
- Mr HOU Junhui
- Mr LIANG Hui
- Mr WU Kai

**UNC Researchers (4)**
- Mr Andrei STATE
- Dr Adrian ILIE
- Ms Kurtis KELLER
- Mr John THOMAS

**UNC PhD Students (6)**
- Mr Andrew MAIMONE
- Mr Peter LINCOLN
- Mr Ryan SCHUBERT
- Mr Feng ZHEN
- Mr Jinghe ZHANG
- Mr KUN Peng

**ETH Researchers (4)**
- Dr Tiberiu POPA
- Dr Luca BALLAN
- Dr Jean-Charles BAZIN
- Dr Tobias MARTIN

**ETH PhD Students (2)**
- Ms Claudia CLUSTER
- Mr Nicola RANIERI
BeingThere Centre Grand Opening | 9 November 2011

Professor Freddy Boey, NTU’s Deputy President and Provost said, “NTU is proud to be associated with the BeingThere Centre because it marks a truly historic and remarkable collaboration among three world-class universities from Singapore, Switzerland and the USA. By combining our R&D capabilities, we can produce breakthrough applications for these advanced Telepresence systems of the future. NTU strongly advocates multi- and interdisciplinary research throughout our campus, and so we are very excited about this Centre because of the multi-national and multi-disciplinary collaborations it encourages. I am impressed by the Centre’s faculty, researchers and students, who have put in much creativity and insight to a research agenda that is truly interdisciplinary,” he added.

Mr Michael Yap, Executive Director of the Interactive Digital Media Programme Office at MDA said, “The essence of interactive digital media is to enhance human communication. Telepresence research is set to revolutionize human interaction across space, by creating the effect of ‘being there’ when one is physically not able to. This has the potential of transforming many sectors including travel and training, and is the type of innovative R&D that MDA is supporting at the BeingThere Centre. Harnessing the brightest minds from Singapore, Switzerland and the United States, BeingThere aims to achieve breakthroughs that will provide a competitive edge for our IDM industry.”
A workshop was held by the BeingThere Centre from 28 Feb - 1 Mar 2012 in Bintan, Indonesia. A total of 42 delegates participated in the workshop from NTU, UNC and ETH as well as invited guests from Cisco (USA), Disney Research Zurich, Technion (Israel), University of Rostock (Germany), and Sejong University (South Korea).
IGS PhD in New Media @ IMI
IGS PhD in New Media @ IMI

“IMI offers doctoral students vibrant multidisciplinary research capabilities. In particular, they will have an opportunity to work in the area of cutting-edge interactive 3D simulation with top equipment as the IMI Immersive Room and real-time motion capture in a multidisciplinary team. Through their personal work, seminars, courses, and interaction with research experts, PhD candidates are prepared for research positions in leading academic institutions as well as private and public organizations.”

Professor Daniel THALMANN
PhD Coordinator

The PhD Program is at the core of IMI’s effort to promote New Media. Playing a crucial part in ensuring the future of New Media in Singapore, IMI aims to educate the next generation of scientists and technologists and encourage them to share and benefit from their knowledge of engineering, art, design, business, educational and behavioral research. The 36 PhD students pursuing their PhD study in IMI come from different NTU schools and are specialized in a wide spectrum of research disciplines.

Distribution of IMI PhD Students jointly supervised with NTU schools
“The IMI PhD special program linked to the Interdisciplinary Graduate School (IGS) is quite unique as it provides a wonderful platform for faculties and students from different disciplinary to study together. Such a multi-disciplinary research environment is essential to create new ideas and solutions for the rapidly growing digital media research and industry. This special PhD program also benefits students by providing opportunities for them to study and solve real-world problems.”

Dr YUAN Junsong
Nanyang Assistant Professor

“The IMI PhD program welcomes the application of perspective students with various research backgrounds and experiences. Our program aims to provide the students with a multi-disciplinary environment, where each of us will be supervised by two professors specialized in different research areas. We have plenty of chances to interact with researchers from various research fields and obtain valuable mentorship from all of our professors and senior researchers. We are also provided with high quality resources, including great facilities, administrative support, monthly PhD seminar, distinguished lectures and so on.”

Ms FANG Hui
IMI PhD student
PhD Interdisciplinary Seminars

August 28, 2012
Presented by
Dr. MARTIN Tobias
ZHANG Wenjing
ZHANG Juzheng

August 14, 2012
Presented by
WANG Qiang
FANG Hui
LIANG Hui

April 24, 2012
Presented by
Dr. Brian Foster ALLEN
YUAN Quan
ZHANG Lining
Jaroslaw Slawomir KOCHANOWICZ
PhD Interdisciplinary Seminars

- **March 6, 2012**
  - Presented by
  - ZHANG Xiaoyan
  - ZHANG Xiaoyan
  - ZHANG Peng

- **February 14, 2012**
  - Presented by
  - Assoc Prof KIM HyungSeok
  - ZHU Hongyuan
  - DONG Lu

- **November 22, 2011**
  - Presented by
  - LIANG Hui
  - ZHANG Yuzhe
  - LAI Danbo

- **October 18, 2011**
  - Presented by
  - ZHANG Wenjing
  - GUO Guibing
  - LIU Cong
Current PhD Projects

Distributed and Constrained Conformal Mapping
Student: ZHANG Minqi
Supervisor: Assoc Prof HE Ying (SCE)
The research is focused on creating efficient conformal mapping algorithm by proposing a distributed and constrained conformal mapping. The distributed feature makes it favorable for the GPU and become very efficient.

Vision Based Optimal Path Formation Control and Obstacle Avoidance for Multiple Mobile Robots
Student: Shakeel AHMAD
Supervisor: Asst Prof HU Guoqiang (EEE)
Co-supervisor: Prof Nadia MAGNENAT-THALMANN (IMI)
The optimal path control and obstacle avoidance problem of vision-guided mobile robot with dynamical and sensing constraints will first be investigated.

Learning Based Interactive Image Segmentation
Student: WANG Anran
Supervisor: Assoc Prof CAI Jianfei (SCE)
Co-supervisor: Asst Prof WU Jianxin (SCE)
The objective of this research is to investigate the existing interactive image segmentation algorithms and then design a better solution. We aim at designing and developing more intuitive and intelligent image segmentation algorithms using learning technology. We are particularly interested in how to combine the interactive image segmentation and learning technology to fast segment a large set of images.

Simulation and Automatic Navigation of an Intravascular System
Student: CHEN Yong
Supervisor: Assoc Prof CAI Yiyu (MAE)
Co-supervisor: Prof Daniel THALMANN (SCE)
To make the vascular surgery easier and more efficient, the project aims to design an automatic navigation system for catheter manipulation. The system consists of catheter control, navigation and simulation. The coordinates of the catheter tip is obtained by an embedded sensor, and the whole system works in real time.
**Study of Nonverbal Communication in Telepresence Robot**

Student: GU Yuanlong William  
Supervisor: Assoc Prof SEET Gim Lee, Gerald (MAE)  
Co-supervisor: Prof Nadia MAGNENAT-THALMANN (IMI)  

The research topic focuses on the use of nonverbal communication to improve the interactive experience in human-robot interaction (HRI). The objective is to improve the interpersonal relation between the system and interactant, by showing emotion, degree of involvement and etc, through the mode of nonverbal communication.

**Three Dimensional Content Processing and Delivery over Communication Network**

Student: HOU Junhui  
Supervisor: Assoc Prof CHAU Lap-Pui (EEE)  
Co-supervisor: Prof Nadia MAGNENAT-THALMANN (IMI)  

This project aims to improve the quality and speed of real-time 3D processing and transmission. The results obtained from this project would be useful for areas requiring interactive 3D visual output, e.g. computer games, and virtual reality.

**The Role of Embodiment and Presence on the Development of Leadership Capabilities in Massively Multiplayer Online Role-playing Games**

Student: EE Changshun Andrew  
Supervisor: Asst Prof JUNG Younbo (WKWSCI)  
Co-supervisor: Prof Nadia MAGNENAT-THALMANN (IMI)  

Given the advent and prevalent use of virtual environments in New Media, such as in social media (e.g. Second Life), users – especially the young and adolescent – may acquire and master skills essential for proficient navigation of these environments. Specifically, I am interested in the role of virtual embodiment and presence on leadership development among users of these virtual environments.

**Developing a Testbed for Evaluating Trust and Reputation Systems in E-commerce Environment**

Student: Athirai Aravazhi IRRISSAPPANE  
Supervisor: Asst Prof ZHANG Jie (SCE)  
Co-supervisor: Prof Nadia MAGNENAT-THALMANN (IMI)  

My research focus is to develop a comprehensive testbed to evaluate the robustness of the Trust and Reputation systems, so that it would be beneficial for the researchers in the field to analyse and compare their trust models with the purpose of improving their performance.
**Current PhD Projects**

**Robotic Enhanced Tele-communication System**
Student: Li Bingbing  
Supervisor: Assoc Prof CHEN I-Ming (MAE)  
Co-supervisor: Prof Nadia MAGNENAT-THALMANN (IMI)  
This project is aimed at developing a robot system which enhances the current telecommunication system in terms of delivering non-verbal information such as body movement and emotional information.

**Quality Assessment in Computer Graphics**
Student: Li Qiaohong  
Supervisor: Assoc Prof LIN Weisi (SCE)  
Co-supervisor: Prof Daniel THALMANN (SCE)  
The research aims to combine human vision system and 3D scene information into the objective quality assessment metrics, enabling automatic detection and elimination of rendered images of unacceptable quality.

**Neuroimaging as a Surrogate Marker to Assess Cognitive Substrates in Cognitive Training Software**
Student: TAN Jiat Chow  
Supervisor: Assoc Prof THENG Yin Leng (WKWSCI)  
Co-supervisor: Assoc Prof Annabel CHEN (HSS)  
Brain training software has experienced rapid growth in recent years. These brain training software make claims of improving cognitive or brain functions and the goal of the proposed work is to evaluate these claims using neuroscience methods, e.g., near infra-red optical imaging (NIRS), electroencephalography (EEG).

**Automated Thyroid Nodule Detection using 2D Ultrasound Images**
Student: Subbarao Nikhil NARAYAN  
Supervisor: Assoc Prof Pina MARZILIANO (EEE)  
Co-supervisor: Prof Nadia MAGNENAT-THALMANN (IMI)  
The main aim of this project is to eliminate the subjectivity involved when measuring the volume of a thyroid gland/nodule and hence reduce the high inter-observer variation during identifying a thyroid nodule. The prognosis for thyroid carcinoma is based on the maximum dimension of the nodule under observation, hence eliminating subjectivity will significantly improve the chances for accurate diagnosis.
Current PhD Projects

**Monitoring of Group Discussions: a Socio-engineering Approach**
Student:  Yasir TAHIR  
Supervisor:  Asst Prof Justin DAUWELS (EEE)  
Co-supervisor:  Prof Daniel THALMANN (SCE)  
The research is focused on developing a real time automated system that can monitor group discussion using audio and video signals, which can provide suggestion in real time to improve group interaction. The ultimate goal is to improve the current computer systems and social robots that suffer from a lack of social skills, we will explore the social signals and social behaviours, including social interactions, social attitude, and social relations/ roles to build more socially intelligent model for robots.

**Acoustic Source Localization in Room Environment**
Student:  WU Kai  
Supervisor:  Asst Prof Andy KHONG W. H. (EEE)  
The knowledge of the acoustic source location is of much importance in several applications including hands-free communication systems, teleconferencing, automatic camera steering, etc. We are currently working on speech source localization in this reverberant and noisy environment.

**Group Structure and Social Behaviour Simulation Based on Implementation of Psychological Models of Emotionality and Motivation**
Student:  Jaroslaw Slawomir KOCHANOWICZ  
Supervisor:  Assoc Prof TAN Ah Hwee (SCE)  
Co-supervisor:  Prof Daniel THALMANN (IMI)  
This specific research aims to identify the certain significant concepts within psychology and sociology, to enable implementation of a generic model of autonomous agents with individualised needs, goals, expression styles, capabilities, group identities, culture, coping strategies, history, world model, private social map and other characteristics.

**Modeling Virtual Human with Episodic Memory**
Student:  ZHANG Juzheng  
Supervisor:  Assoc Prof ZHENG Jianmin (SCE)  
Co-supervisor:  Prof Nadia MAGNENAT-THALMANN (IMI)  
The research goal of this project is to refine the existing methods; episode representation, indexing scheme, matching methods and storage policy , if any, or develop new ones to find a more effective way to encode, store and retrieve episodic memory.
On Developing High-quality Immersive Rendering for Real-time 3D Teleconference
Student: ZHAO Mengyao
Supervisor: Asst Prof FU Chi-Wing (SCE)
Co-supervisor: Assoc Prof CAI Jianfei (SCE)
This project aims to investigate time-critical methods to analyze and model the input image-based information on real-time 3D object reconstruction and rendering from real scenes.

Markerless Motion Capture of Human Based on Monocular Camera
Student: BIAN Zhenpeng
Supervisor: Assoc Prof CHAU Lap Pui (EEE)
Co-supervisor: Prof Nadia MAGNENAT-THALMANN (IMI)
Motion capture of human is a highly active research area due both to the number of potential applications and its inherent complexity. The research focuses on real-time markerless motion capture of human, especially based on monocular camera.

Resolving Data Sparsity and Cold Start in Recommender Systems
Student: GUO Guibing
Supervisor: Asst Prof ZHANG Jie (SCE)
Co-supervisor: Prof Daniel THALMANN (IMI)
The main research problems we desire to address are the two severe issues that original Collaborative filtering inherently suffers from: data sparsity and cold start. Data sparsity arises from the phenomenon that users in general rate only a limited number of items; Cold start refers to the difficulty in bootstrapping the Recommender systems for new users. We aims to solve these issues in both 2D and 3D environments.

Depth Camera Based Hand Gesture Recognition
Student: LIANG Hui
Supervisor: Asst Prof YUAN Junsong (EEE)
Co-Supervisor: Prof Daniel THALMANN (IMI)
The goal of this research is to design and implement algorithms for the recognition of postures and gestures of a user immersed in a Virtual Environment with Virtual Humans. This research will develop novel real-time recognition methods with trade-off between accuracy and speed in order to solve the problem efficiently.
Design of a Reputation Mechanism for 3D E-commerce
Student: FANG Hui
Supervisor: Asst Prof ZHANG Jie (SCE)
Co-supervisor: Prof Nadia MAGNENAT-THALMANN (IMI)
The research attempts to design a feedback-based reputation mechanism to solve the inherited trust problems in 3D e-commerce which is getting more feasible and popular. With 3D technology, the constructing processes such as feedback provision, feedback computation, feedback presentation and user decision making will be changed.

Research on Multimedia Community-based Question Answering
Student: YUAN Quan
Supervisor: Asst Prof CONG Gao (SCE)
Co-supervisor: Prof Nadia MAGNENAT-THALMANN (IMI)
This research focuses on Multimedia Community-based Question Answering (MCQA), a new type of Community-based question-answering (CQA) that enables users to post questions with photos and video. This research involves with question organization, multimedia question retrieval, expert user discovery and recommendation, and QA in 3D virtual space.

User Centered Context Modeling for Interactive Storytelling
Student: XIAO Feng
Supervisor: Assoc Prof THENG Yin Leng (WKWSCI)
Co-supervisor: Prof Nadia MAGNENAT-THALMANN (IMI)
My study will propose a user centered context model for interactive storytelling, based on the relationship between setting and emotion, considering medium particularity, to enhance user experience as well as meaningfulness.

Modeling and Animating 3D Chinese Water Color Paintings
Student: CHENG Peng
Supervisor: Assoc Prof MIAO Chun Yan (SCE)
Co-supervisor: Prof Nadia MAGNENAT-THALMANN (IMI)
The research is focused on simulating the behavior of Chinese ink and analysing various artistic effects of colour ink diffusion. The study also looks how a scheme presents can be simulated automatically for their computer generated simulation.
Current PhD Projects

**Automatic 3D Clothing: from 2D Patterns to Garment**  
Student: ZHANG Yuzhe  
Supervisor: Assoc Prof ZHENG Jianmin (SCE)  
Co-supervisor: Prof Nadia MAGNENAT-THALMANN (IMI)  
This project aims to develop algorithms and solutions for automatic modeling and prepositioning of garment from 2D pattern. And it mainly focuses on the process of converting 2D pattern into 3D garment and its application in virtual try-on.

**Interactive Image Segmentation**  
Student: ZHU Hongyuan  
Supervisor: Assoc Prof CAI Jianfei (SCE)  
Co-supervisor: Prof Nadia MAGNENAT-THALMANN (IMI)  
Image segmentation plays an important role in many fields of Computer Vision and Computer Graphics. Interactive image segmentation is an ad-hoc topic in recent years. The main objective of this research is to improve the segmentation with higher-level semantics provided by user input.

**3D Simulation of Articulation in Physiological Human**  
Student: ZHANG Wenjing  
Supervisor: Assoc Prof ZHENG Jianmin (SCE)  
Co-supervisor: Prof Nadia MAGNENAT-THALMANN (IMI)  
The research is to model the articulation of human to help with the diagnosis and treatment of certain disease. The research is mainly divided into two parts to build an accurate geometry model of human articulation from MRI.

**Perceptually Based Selective Rendering**  
Student: DONG Lu  
Supervisor: Assoc Prof LIN Weisi (SCE)  
Co-supervisor: Assoc Prof ZHU Ce (EEE)  
In this project, a perceptual model is to be exploited for image rendering (especially in illumination and shadow determination). Visual attention, contrast sensitivity and masking will be investigated. Experiments will be conducted to validate the effectiveness of the proposed method.
Current PhD Projects

**Cyber-learning in Cyberworlds**
Student: LAI Danbo  
Supervisor: Assoc Prof Alexei SOURIN (SCE)  
Co-supervisor: Assoc Prof ZHAO Dongsheng (NIE)  
This project proposes to immerse the learners in 3D AI-assisted shared virtual collaborative environments where mathematical formulas are used for immediate interactive definition and multi-sensory rendering of geometry, appearance and physical properties of the shapes.

**Adolescents’ Information Disclosure on Facebook: Impact of Their Parents and Personality**
Student: LIU Cong  
Supervisor: Assoc Prof ANG Pei-Hui, Rebecca (HSS)  
Co-supervisor: Assoc Prof May Oo LWIN (WKWSCI)  
Personality traits (i.e., narcissism and social anxiety) and parental mediation on adolescents’ information disclosure on Facebook was studied. Parental mediation influences risky online behaviors of their children in both direct and indirect ways. Implications on promoting adolescents’ online safety will be discussed.

**Passive Approaches for Digital Image Forgery Detection**
Student: Pravin KAKAR  
Supervisor: Asst Prof ZHANG Wei (SCE)  
Co-supervisor: Assoc Prof SER Wee (EEE)  
Our research focuses on developing new techniques for passive image forensics, extending existing techniques, designing efficient algorithms and developing benchmarking databases. We have so far developed a technique for detecting splicing in motion blurred images, and are working on a novel technique for detecting region duplication forgeries.

**Quantification of Brain Responses for Neurofeedback Game in 3D Virtual Environments**
Student: WANG Qiang  
Supervisor: Asst Prof OLGA Sourina (EEE)  
Co-supervisor: Assoc Prof Vladimir Vladimirovich KULISH (MAE)  
The main objective of our project is exploiting new algorithms and new features for the brain state recognition for real-time applications with as fewer electrodes as possible.
Current PhD Projects

**Statistical Machine Learning Techniques with Applications to Image Retrieval**
Student: ZHANG Lining  
Supervisor: Assoc Prof WANG Libo (EEE)  
Co-supervisor: Assoc Prof LIN Weisi (SCE)  
In this work, we study several statistical machine learning techniques, e.g., supervised learning, semi-supervised learning, subspace learning and active learning in a synergistic way to maximize the effectiveness of a learning task, and thus enhance the performance of the image retrieval systems.

**Development of Aesthetic Algorithms for Acquired and Generated Digital Image**
Student: ZHANG Xiaoyan  
Supervisor: Assoc Prof Kap Luk CHAN (EEE)  
Co-supervisor: Asst Prof Martin CONSTABLE (ADM)  
This project explores the structural models behind visual appeal and the development of algorithms to apply them to acquired and/or generated digital images. Operations such as post-exposure refocusing, re-rendering of the scene from an alternate viewpoint, single-image based on matting and composition and automatic scene segmentation will be explored.

**Computer-aided Evaluation of Prosody Evaluation for Language Learning**
Student: ZHAO Sixuan  
Supervisor: Prof KOH Soo Ngee (EEE)  
Co-supervisor: Prof K. K. LUKE (HSS)  
In our project, a reference-independent prosody evaluation method using Support Vector Machine (SVM) is proposed to evaluate the learner’s prosody without reference utterances.

**CBAN: An Embedded Patient Monitoring Body Area Network**
Student: Saurabh RASTOGI  
Supervisor: Assoc Prof LIN Feng (SCE)  
Co-supervisor: Asst Prof Mark CHAVEZ (ADM)  
After examining various approaches for this purpose we will describe the design methodology for the proposed Body Area Network (BAN) and explore the configuration space looking for the most effective solution, performance, cost and energy-wise. This BAN solution provides higher levels of user satisfaction as expected from novel healthcare delivery scenarios (e.g., mobility and customization) while the architecture in its heart achieves these targets by complex hardware methods (such as multitasking, parallel processing) and performs beyond the expectations of accurate real time diagnosis, analysis and monitoring of diseases.
“Virtual reality is one of the most important technologies of the future. It will produce a great leap forward in many fields, like communication, entertainment, engineering and even healthcare. The new Immersive Room is an important new facility that will enable our researchers to test-bed cutting-edge instructional and research applications within an immersive virtual 3-D environment with interactive elements, enabled by new media tools. This system will bring us to the next level of 21st century interactive digital media (IDM) technologies.”

Prof Bertil ANDERSSON
NTU President and IMI Founding Chairman

During the New Media Village @ IMI on 11 October 2011, the Immersive Room, the latest star attraction at IMI, was opened by Dr Tan Chin Nam, former Permanent Secretary of the Ministry of Information, Communications and the Arts, and Chairman of the Media Development Authority (MDA), and current Chairman of the MDA’s International Advisory Panel.

The NTU President Professor Bertil Andersson (4th from the left) and Dr Tan Chin Nam (5th from the left) at the Opening of New Media Village @ IMI
The Institute for Media Innovation (IMI) and the College of Engineering (CoE) successfully organized the CoE-IMI 3D Interactive Digital Media workshop held on 12-13 March, 2012 at the Nanyang Technopreneurship Center in NTU.

The purpose of this workshop is to develop a network of top researchers around the globe and to give the opportunity to Singapore professors and researchers to be well aware on what are the leading topics of research in the broad area of IDM.
The 25th International Conference on Computer Animation and Social Agents (CASA 2012) was organized by IMI. This is the first time that the conference was held in Singapore.

About 200 leading minds from Asia, Europe and across the globe converged at Nanyang Technological University (NTU) to discuss and exchange ideas for advancing research in computer animation, social robots and virtual humans.

The three-day conference features more than 50 speakers who presented their most current research findings in the areas of computer animation, autonomous social robots and virtual humans, and how these technologies can be leveraged to advance related areas such as personalized healthcare, serious game design and elderly care.
Professor Nadia Magnenat-Thalmann, the chair of the SIGGRAPH ASIA 2012 Computer Animation Festival (CAF) and her international committee reviewed 147 shortlisted works. The SIGGRAPH Asia conference at its Computer Animation Festival attracts the most respected technical and creative people from all over the world. The SIGGRAPH Asia community includes people everywhere who are excited by research, science, art, animation, gaming, interactivity, education, and the web.

CAF Jury:
Nadia Magnenat-Thalmann (Chair), IMI, Nanyang Technological University, Singapore
Isaac Kerlow, ADM, Nanyang Technological University, Singapore
John McIntosch, SVA Computer Art, USA
Christian Mueller, Film Akademie Baden-Wuerttemberg, Germany
Jean Segura, Freelance Journalist for 3D Productions, France
Shuzo John Shiota, Polygon Pictures, Japan
Daniel Thalmann, IMI, Nanyang Technological University, Singapore
IMI collaborated with the annual Open House, one of the major events organized by NTU. Oriented toward public it is an important time for the university to demonstrate its know-how and key achievements. During one day, visitors were welcomed to enquire about the research undergone at IMI and to experience two of our demonstrations. First, the virtual Try-On (left) is a physically-based simulation where visitors can see virtual clothes on themselves. Second, our autonomous Virtual Human (right) is a 3D lady character that recognizes people and reacts to their actions. Mainly dedicated to potential applicants and their families, the Open House gives the opportunity to interact with students and fellow researchers.
Ms Grace FU Hai Yien, Minister, Prime Minister's Office and Second Minister for the Environment and Water Resources and Second Minister for Foreign Affairs, Singapore visited IMI booth at CommunicAsia 2012.

Mr CHAN Chun Sing, Acting Minister for Community Development, Youth and Sports and Senior Minister of State, Ministry of Defence, Singapore visited IMI booth at CommunicAsia 2012.
IMI – School Joint Seminars

EEE-IMI Joint Forum
Prof Nadia MAGNENAT-THALMANN, Prof CHENG Tee Hiang and Assoc Prof GUAN Yong Liang, Nanyang Technological University, Singapore
16 August 2012
This forum was jointly organized by EEE and IMI

Simulation For Understanding
Dr Bruce Donald CAMPBELL, Rhode Island College of Design, USA
14 March 2012
This seminar was jointly organized by MAE and IMI

IMI-Singapore HCI Society Seminar
Prof Nadia MAGNENAT-THALMANN, Assoc Prof Gerald SEET and Assoc Prof CHAM Tat Jen, Nanyang Technological University, Singapore
30 November 2011
This seminar was jointly organized by IMI, SCE and Singapore HCI Society
Distinguished Lectures

**Computer Graphics Highlight**
**Prof Don GREENBERG**, Cornell University, United States
29 November 2011

**Meshless Simulation of Anisotropic Tearing in Elastic Solids**
**Assoc Prof Chris JOSLIN**, Carleton University, Ottawa, Canada
12 July 2012

**Example-based Graphics**
**Assoc Prof WonSook LEE**, University of Ottawa, Canada
12 July 2012

**Data-driven On-line Character Control: Philosophy and Promise**
**Prof SUNG Yong Shin**, Korea Advanced Institute of Science and Technology, Korea
9 January 2012

Visiting Professors and Researchers

**Prof Franz-Erich WOLTER**
Welfenlab, Leibniz University of Hanover, Germany

**Assoc Prof HyungSeok KIM**
Konkuk University, Korea

**Maher Ben MOUSSA**
MIRALab, University of Geneva, Switzerland

**Asst Prof Arjan EGGES**
Utrecht University, Netherlands
Visitors to IMI

During the period of October 2011 to September 2012, IMI accommodated 41 visits (497 visitors from more than 14 countries).

Mr. Umirzak Shukeyev, Deputy Prime Minister of the Republic of Kazakhstan

Delegates from Prince Mohammad bin Fahd University, Saudi Arabia

Professor Tim McIntyre-Bhatt, Deputy Vice-Chancellor of Bournemouth University

Professor Ralph Eichler, President of ETH
Industrial Collaboration
AWWA School is a school for pupils with multiple disabilities and autism from 7 to 18 years. It provides a holistic and nurturing environment for education. There are two daily programmes and both cover five domain areas for e.g. Language & Communication, Motor Skills, Self Help Skills, Cognition and Social Skills.

IMI partnered with Alioscopy to demonstrate the cutting-edge research works by IMI during CommunicAsia 2012, the Asia’s largest integrated info communication technology event from 19 – 22 June 2012. The exhibitions by IMI were well attended by two Singapore ministerial level VIPs and thousands of international visitors.

Alioscopy is the worldwide technology leader in the field of 3D displays.

“Athe collaboration with IMI has benefited both my ASD and Multiple Disabilities students. It is amazing to see them interacting with the 3D dolphins through the use of hand signals. Best of all, they were able to transfer that learning, out of the Immersive Room into their classroom.”

Mrs Ruby SEAH
Principal, AWWA School
Underwater World Singapore

Underwater World Singapore, situated on Sentosa Island of Singapore, is a unique and well-known oceanarium showcasing some 2500 marine life from 250 species from around the regions.

IMI has worked very closely with Underwater World Singapore to develop virtual pink dolphins for potential entertainment applications.

PEC Ltd Singapore

PEC Ltd is a specialist engineering group servicing the oil and gas, petrochemical, oil and chemical terminal, and pharmaceutical industries. Their two core business activities are project works and maintenance services in the region.

IMI and PEC Ltd tied up to develop simulation technology for engineering applications.
N. Magnenat-Thalmann, "Modelling and Simulating Our Own Avatars to be Part of Virtual Groups and Crowds", Current Trends in Information Technology, CITT Conference, Dubai, United Emirates, October 26-27, 2011


N. Magnenat-Thalmann, "Virtual Humans and Social Robots: Our Upcoming Partners", 13th Annual Frontiers in Research Lectures, University of Ottawa, Canada, November 15, 2011

N. Magnenat-Thalmann, "Next Generation of Virtual Humans and Social Robots", University of North Carolina, Chapel Hill, United States, November 18, 2011

N. Magnenat-Thalmann, "Video Capturing for Medical Applications", International Symposium Human Body Motion Analysis with Motion Capture, Ritsumeikan University, Japan, January 21, 2012


N. Magnenat-Thalmann, "Defining Personality, Mood and Emotions for Social Robots", CoE Seminar Series on New Media, Nanyang Technological University, Singapore, May 22, 2012
Selected IMI Publications

Books & Book Chapters


Journal Papers

Brian F. Allen, N. Magnenat-Thalmann and D. Thalmann, *Politeness Improves Interactivity in Dense Crowds*, Computer Animation and Virtual Worlds, Published Online, June 29, 2012


P. Chiang, J. M. Zheng, K. H. Mak and Y. Y. Cai, **A B-spline Approach to Phase Unwrapping in Tagged Cardiac MRI for Motion Tracking**, Magnetic Resonance in Medicine, June 2012


H. Fang, J. Zhang, M. Sensoy and N. Magnenat-Thalmann, **A Subjectivity Alignment Approach for Effective Reputation Computation**, 15th International Workshop on Trust in Agent Societies (TRUST12), Spain, Valencia, June 5, 2012


A. A. Irissappane, S. Jiang and J. Zhang, **Towards a Comprehensive Testbed to Evaluate the Robustness of Reputation Systems against Unfair Rating Attacks**, Workshop on Trust, Reputation and User Modelling (TRUM) 2012, Montreal, Canada, July 16, 2012


D. Lai and A. Sourin, **Interactive Visualization of Mathematics in 3D Web**, 2012 International Conference on Cyberworlds, Darmstadt, Germany, September 25-27, 2012

C. Liu, R. P. Ang and M. O. Lwin, **Parental Mediation as A Moderator of Narcissism and Adolescents' Risky Online Behaviors**, Association for Psychological Science Annual Convention, Chicago, USA, May 26, 2012


Futuristic NTU

Avatars, virtual humans and 3D communication technology may seem a thing of the distant future but with the launch of NTU's BeingThere Centre, the realities of these may be closer to us than we can imagine. NTU LiNK speaks to its Co-Director, Professor Nadia Magnenat-Thalmann, to find out more about the Centre's research in the area of telepresence systems.

Imagine being miles away from home, from your loved ones and friends. Would it not be nice to be able to break down physical and geographical barriers for a face-to-face communication that makes you feel that they were really right beside you, in the opposite room? Perhaps you could even visualize the scenes in the room as they unfold through real time through an 'invisible' glance.

Maybe there is an important meeting you wish to attend, but are unable to do so. Why not create an animatronic avatar which represents you to communicate with the others at the meeting?

You may think of the above as technologies that can only exist in movies, or perhaps in the very distant future. With NTU's BeingThere Centre, however, these technologies may become available sooner than you think.

Exciting prototypes of advanced 3-D communication technologies set to advance the industry of virtual communication are being developed at the Centre, under the guidance of its Co-Director, Professor Nadia Magnenat Thalmann.
Like Real

Try on clothes as fast as you can browse them. Attend conferences and meetings without actually being there. Play with pink dolphins without getting wet. Lester Kok finds out how you can enter this virtual realm of possibilities at NTU’s Institute for Media Innovation.

Immersive Room (iRoom)

This state-of-the-art room lets you interact with your virtual environment in a truly life-like fashion. For example, here you can enter a watery world with pink dolphins as part of a game that teaches social skills. You can also experience what it is like to coordinate an evacuation from a disaster zone. These highly realistic interactions are made possible with the help of a motion capture system that records your real-time position. You’ll feel like you’re right in the thick of the action, thanks to the room’s 300-degree seamless rounded screen that blurs the line between virtual and reality.

Chloe

The next time you walk into NTU, you may be greeted by Chloe, our very own virtual receptionist. A virtual human with facial expressions like the rest of us, she recognizes faces and gestures, remembers past conversations and can even chat with you. She is also able to monitor and analyse your habits and store the data in her memory.

About the Institute for Media Innovation

This international centre at NTU conducts advanced research in the multidisciplinary field of interactive digital media. Based here is the BeingThere Centre, where prototypes of advanced 3D-communication technologies are being developed by researchers from NTU, the Swiss Federal Institute of Technology Zurich in Switzerland and the University of North Carolina at Chapel Hill. Such ‘presence” and “telepresence” systems create the effect of ‘being there’ when one is actually not. The work done could revolutionize human interaction across space in sectors such as travel, training and healthcare.

Talk of the Future

Every modern telecommunication system is the future. That’s what the BeingThere System, a research team dedicated to developing advanced telecommunication systems, is reporting. Migration systems from the 1970s delta out the scandalous fact that the system was set up in 1982 as an experiment and that the migration systems have since made significant progress.
Institute for Media Innovation

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