IMI RESEARCH SEMINAR

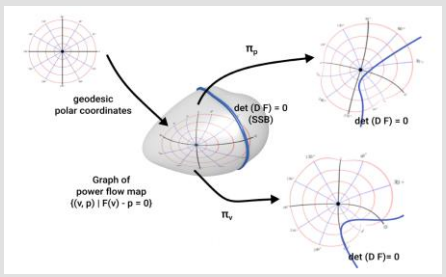
DATE: 8 June 2018, Friday
TIME: *11:00 am – 1:00 pm+
VENUE: IMI Seminar Room, Research Techno Plaza, XFrontiers Block, Level 03-01, 50 Nanyang Drive, Singapore 637553

*** Attendance is on first-come first-served basis due to limited seating.** **+ Lunch will be served**

11:00 – 11.40am

30 mins presentation, 10 mins Q&A

Foundations for a Differential Geometric Analysis of Power Flow computing



Prof Franz-Erich Wolter

Crucial aspects of power grid computing can be understood as finding specific solutions of non - linear systems of power flow equations. The latter describe a quadratic mapping (power flow map) from voltage space to power space. Appropriate solutions of that non-linear system are located close to the solution space boundary (SSB). However, it is essential that those solutions stay away from SSB in order to ensure stability of the power grid operations. SSB being defined as singular set of the power flow map is zero set of the determinant of the Jacobian of the power flow map. Therefore, points in SSB are solutions of a high degree multi variable polynomial being difficult to compute stably and precisely even for fairly small systems of dimension eg. 20 thus involving here multivariate polynomials e.g. of degree 20 in 20 unknowns. All this has traditionally caused problems for generations of power engineers and has been a major obstacle against obtaining deeper insights into the geometrical and topological SSB structure and has complicated searching admissible and optimal solutions of power flow equations. We present an overview on our work in progress reflecting recent efforts for transferring our older established works in the area of computational Riemannian geometry into the field of power flow computing. We focus here on discussions and computational methods relevant wrt. analyzing the geometric structure of SSB and or more general sub-manifolds in voltage and power space defined by non-linear constraints typically caused by engineering requirements.

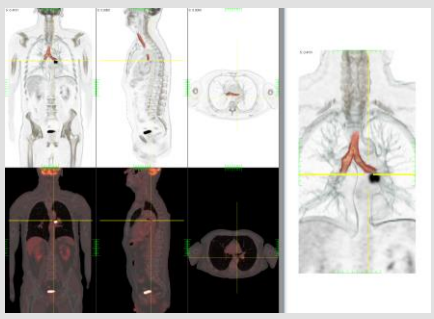
About Prof Franz-Erich Wolter – Leibniz University Hannover

Franz-Erich Wolter has been Full Professor of Computer Science at Leibniz University Hannover since 1994 directing the Division of Computer Graphics Welfenlab. He held faculty positions at University of Hamburg (1994), MIT (1989–1994) and Purdue University USA (1987–1989). Dr. Wolter obtained his Ph.D. (1985) in mathematics, TU Berlin, Germany in Riemannian geometry, Diploma (1980), FU Berlin, mathematics and theoretical physics. At MIT he co-developed the geometric modelling system Praxiteles for the US Navy and published papers that broke new ground applying concepts from differential geometry and topology on problems in geometric modeling. He extended the latter pioneering Riemannian spectral geometric computation for developing (owning the main patent share of) “Shape DNA” popular for biomedical shape classification. He has been pioneering varies computations w.r.t. geodesics in 2- and 3-manifolds including global geodesic joins, Voronoi diagrams, medial set and geodesic focal sets. He used this for computing singularities of high dimensional dynamical systems modeling jumps of non-linear electrical circuits, and varies physical and biologicals system and is now applying all this work on new concepts for power flow computing solving notoriously difficult problems caused by non-linear and singular constraints. Dr .Wolter is research affiliate of MIT.

11.40am – 12.20pm

30 mins presentation, 10 mins Q&A

Machine learning for biomedical image visualization



A/Prof Kim Jinman

The next generation of medical imaging scanners are introducing new diagnostic capabilities that improve patient care. These medical images are multi-dimensional (3D), multi-modality (fusion of PET and MRI for example) and also time varying (that is, 3D volumes taken over multiple time points and functional MRI). It is becoming ever more important to have advanced visualization and computer graphics algorithms to present and interact with the imaging data that is not only rendered beautifully but also practical and efficient for the end users (clinicians). To achieve this, it is important to ‘pre-process’ the images, via machine learning and image processing, to derive meaningful semantic data that can aid in setting up the parameters for volume rendering. In this talk, I will discuss the state-of-the-art research that aims to couples volume rendering algorithms with machine learning/image processing algorithms to render useful 3D volumes of the human body.

About A/Prof Kim Jinman – School of Information Technologies, The University of Sydney

A/Prof Jinman Kim received his PhD in Computer Science from the University of Sydney in 2006. He was an ARC Postdoctoral Research Fellow at Sydney and then a Marie Curie Senior Research Fellow at the University of Geneva, prior to joining the University of Sydney in 2013 as a Faculty member. Dr Kim is an A/Director of the Biomedical and Multimedia Information Technology (BMIT) Research Group responsible for the external engagement and research commercialisation. He is also the theme leader for the Australian Research Council’s Training Centre in Innovative Bioengineering, with primary focus on Musculoskeletal regeneration. He is the Research coordinator for the institute of biomedical engineering and technology (BMET) at the University of Sydney, and in the joint research alliance with the Shanghai Jia Tong University. As part of his research translational activities, he is a research consultant to the Nepean hospital. Dr Kim has produced a number of impact publications in the field of medical image processing and visualisation, and received multiple competitive grants. Dr Kim is actively involved in the imaging and visualisation communities where he is the V/P of computer graphics society (CGS) and also the co-chair of the Computer Graphics International (CGI) 2018.

12.20pm – 12.40pm

15 mins presentation, 5 mins Q&A

An EEG-based evaluation for comparing the sense of presence between virtual and physical environments

Is Virtual Reality itself able to activate specific brain areas, influencing behavioural, cognitive or motor functions? Our main purpose is to identify possible differences in perception between the virtual and the real world in terms of the effect on brain activity, capturing it using Electroencephalography (EEG). Moreover, we examine the role of the graphics content and nature of such an environment in the user’s experience. In order to determine the characteristics of an optimal VR training application, the optimum duration of exposure in a virtual environment is also assessed by measuring the time that the brain needs to perceive and be adapted to the new state.

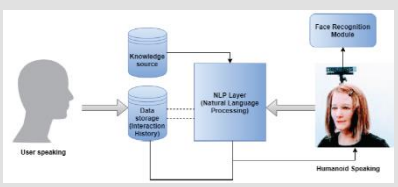
About Eva Baka – PhD Student & Research Assistant, University of Geneva

Eva is currently a Ph.D. Student and a research assistant at MIRALab, at the University of Geneva. Her first degree was on Applied Mathematics and Physical Sciences of the National Technical University of Athens (MSc equivalent). In the meantime, she obtained a professional diploma in Dance and also graduated from the Athenaum Conservatory with distinction, acquiring the degree of professional diploma in Piano performance. Lastly, she obtained her MSc degree in Brain and Mind Sciences from the Medical School of the University of Crete. Her research interests include neuroengineering, virtual environments and emotion recognition.

12.40pm – 1.00pm

15 mins presentation, 5 mins Q&A

Face Recognition Memory with NLP backend for Social Robot



Social robots should possess human-like social interaction skills. It is vital for a social robot to know who is in conversation with and remembers the facts about the human companion. Humans can recognize and distinguish between faces, and thanks to modern science, computers have proven capable of this same ability, as well. It permits the robot to understand who it is talking with and to bring forth an appropriate reply. Another challenge is to understand what a companion is speaking in natural language. Here, we aim to explore the possibility of improving human-robot interaction (HRI) by exploiting natural language resources and using natural language processing (NLP) methods. We understand the issues related to the development of social interaction between robots and human through employing face recognition and NLP backend.

About Nidhi Mishra – Project Officer, Institute for Media Innovation

Nidhi Mishra is currently working as Project Officer at Institute for Media Innovation (IMI), Nanyang Technological University (NTU). She is an undergraduate from Indian Institute of Information Technology (I.I.I.T.) Allahabad. She did her Major in Information Technology. Her research interest spans various subdomains in Natural Language Processing (NLP), Artificial Intelligence (AI), Machine Learning (ML) and Data Mining/Data Analytics. She is also fascinated by the idea of self-mutating systems which can learn about vulnerabilities and patch themselves.