Computational Mechanics Technical Seminar jointly organized by Association for Computational Mechanics (Singapore) and Theoretical and Applied Mechanics Society (Singapore)

You are cordially invited to attend Seminar on

The Cutting Edge Research and Industry Application of Computational Mechanics

Date: Friday 04 November 2011
Time: 16:00pm-18:30 pm
Venue: Infuse Theatre Level 14 (Connexis South Tower), Fusionopolis

In this seminar, a few experts who come from university, A-Star institute and industry will present their recent work on the Research and Industry Application of Computational Mechanics. This seminar aims to provide an international forum for researchers to share information on their latest investigations both in academic research areas and industrial sectors.

PROGRAM

Keynote Speaker 1:

Speaker:

Prof C.W. Lim
Department of Building and Construction, City University of Hong Kong,

Title:
A Discussion on the Strange Behaviour of Young's Modulus for A Nanorod or a Nanotube based on Nonlocal Elasticity Theory

Abstract:
It has been a known fact in classical mechanics of materials that Young's modulus is an indicator

of material stiffness and materials with higher Young's modulus are stiffer. At the nanoscale, within the scope and under specific circumstances described here, however, a nanorod (or a nanotube) with a smaller Young's modulus (smaller stress-strain rate) is stiffer. In such a scenario, Young's modulus is no longer a stiffness indicator for nanostructures. Furthermore, the nonlocal stress-strain rate is dependent on types of load, boundary conditions and location. This is likely to be one of the many possible reasons why numerous experiments in the past obtained significantly varying values of Young's modulus for a seemingly identical nanotube, i.e. because the types of loading and/or boundary conditions in the experiments were different, as well as at which point and how the property was measured. Based on the nonlocal elasticity theory and within the scope of material and geometric linearity, it is reported here for the first time the strange and hitherto unrealized effect that a nanorod (or a nanotube) with lower Young's modulus (smaller stress-strain rate) indicates smaller extension in tensile analysis. Similarly, it is also predicted that a nanorod (or a nanotube) with lower Young's modulus results in smaller bending deflection, higher critical buckling load, higher free vibration frequency and higher wave propagation velocity, which are at all consequences of a stiffer nanostructure.

Speaker Brief Bio

Currently an associate professor and a registered professional engineer (RPE), Ir Dr Lim received a first degree from Univ. of Technology of Malaysia, a Master's Degree and PhD from National Univ. of Singapore and Nanyang Technological Univ., respectively. Prior to joining CityU, he was a post-doctoral research fellow at Department of Civil Engineering, The University of Queensland and Department of Mechanical Engineering, The University of Hong Kong. Dr. Lim has expertise in vibration of plate and shell structures, dynamics of smart piezoelectric structures, nanomechanics and symplectic elasticity. He is the Associate Editor (Asia-Pacific Region) for Advances in Vibration Eng., Guest Associate Editor for Int. J. of Bifurcation and Chaos, and also on the editorial board of a few other international journals. He has published a best-selling title in Engineering Mechanics entitled "Symplectic Elasticity" and co-authored with W.A. Yao and W.X. Zhong, as recorded in April 2010 by the publisher, World Scientific. He has published more than 180 international journal papers, accumulated more than 1700 independent citations, and one of the papers was granted the IJSS 2004-2008 most cited article award. He was also awarded Top Referees in 2009, Proceedings A, The Royal Society.

Keynote Speaker 2:

Speaker:

Dr. Zheng Guoying
ST Aerospace

Title:
Apply Mechanics in Aerospace Industry – The ST Aerospace Experience

Abstract:
The objective of development and acquisition of technologies and knowledge, as well as skills is to conquer challenges through innovative applications. With "we fly aircraft safely" as mission, structural safety has been one of the primary requirements for all the solutions that ST Aerospace has been offering to customers around world. The spectrum of application of mechanics includes static strength, dynamic loads, fatigue and damage tolerance etc.

In engineering world, there is no problem can be solved in a duplicated manner. Engineers must be equipped with know-how knowledge and skills that enable them to extract the industry issues into solvable problems, and are capable to provide solutions that can be proven and are convincing. Through the share session, a few applications that cover design and optimization, reverse engineering approach, structural certification & test as well as structure damage tolerance management in ensuring continuous airworthiness of airframe, will be presented.

Speaker Brief Bio

Dr. Zheng Guoying is the Deputy Chief Engineer, Senior Program Manger, Engineering Specialist of ST Aerospace. She is also the Chief of Office of Airworthiness, EASA DOA (European Aviation Safety Agency Design Organisation Approval), CVE (Compliance Verification Engineer) for EASA DOA, DS (Design Signatory) for CAAS (Civil Aviation Authority of Singapore) DOA. She is a Charter Structural Engineer, Member of Structure Institute of Engineers (UK), Fellow of IES and Aerospace Interest Group. She has one granted patent and two filed patents by IPOS. She has published 20 papers in professional journals and conferences; and delivered a several speeches in various conferences. Her expertise include structural design, simulation, testing; vibration, dynamics, fatigue and damage tolerance; cabin interior integration design; aircraft airworthiness and certification.

Keynote Speaker 3:

Speaker:

Dr. Pei Qing Xiang
IHPC A-STAR

Title:
Mechanical Properties of Chemically Functionalized Graphene – A Molecular Dynamics Study

Abstract:
Graphene has superior mechanical and extraordinary electronic properties, and thus has attracted a lot of research interests recently. Chemical functionalization of graphene by attaching certain molecules or radical groups on it can serve as a significant way to modify or manipulate its physical and chemical properties. However, the functionalized graphene may have quite different mechanical properties from its unfunctionalized counterpart. Using molecular dynamics simulations, we study the effect of chemical functionalization on the mechanical properties of

graphene. It is found that functionalization on graphene edges has little or small effect on the mechanical properties of both armchair and zigzag nano-ribbons. In contrast, functionalization on graphene surface may have strong effect on the mechanical properties, depending on the coverage of functional atoms. The elastic modulus shows obvious decrease with the increase of the coverage. The strength and fracture strain show a marked loss even at a small coverage. It is shown that the sp2 to sp3 bonding transition is the main cause for the loss of strength. It is also found that functionalization may result in local stress concentration, which also contributes the fracture of functionalized graphene.

Speaker Brief Bio

Dr. Pei Qing Xiang is the Senior Scientist of Institute of High Performance Computing (IHPC). He obtained his Ph.D in mechanical engineering at Tsinghua University, China. Prior to joining IHPC, he was a post-doctoral research fellow at Delft University of Technology, The Netherlands, and Nanyang Technological University. He has been working in IHPC for more than 10 years and is active in both basic research and industrial applications. He is well experienced in finite element analysis, finite difference analysis and molecular dynamics simulations. He has published more than 40 papers in journals and conferences.

Keynote Speaker 4:

Speaker:

Mr. Clive Ford

Title:
Latest Abaqus Applications in Industry and methods development

Abstract:
Abaqus's general capabilities for non-linear analysis are well known, but recent developments have seen the inclusion of material damage analysis, specialised material models for biomechanical, composites failure and new analysis options including Coupled-Eulerian-Lagrangian (CEL), XFEM, SPH and recently a CFD capability. Taken as a whole these are allowing Abaqus to pioneer new industrial application for commercial FEA programmes, they are also allowing existing established simulation workflows to be further developed with increase accuracy and fidelity. In this presentation we will look at how these techniques are being applied and some of the exciting new areas of analysis in industry.

Speaker Brief Bio

Clive Ford is the Manager of the Advanced Analysis Consultancy group in Singapore, which is part of the international Professional Services company WorleyParsons. The group provides solutions using numerical modelling for simulation and also represents one of the leading finite element analysis software packages, Abaqus, from SIMULIA (the Dassault Systèmes brand for

Realistic Simulation solutions). Clive joined WorleyParsons in 2002 and has been delighted to see and participate in the considerable growth in simulation use in Singapore and the region over this time. Clive has been actively involved in supporting simulation in diverse industries; including biomedical, electronics, aerospace and offshore. This has involved assisting in the development of solution techniques to increase productivity and capability within various R&D teams. Ensuring that simulation is performed at a high standard is also a particular interest and Clive has worked with NAFEMS, an international association promoting best practice in analysis for many years and helped them to host their Practical FEA courses in Singapore and Malaysia. Prior to joining WorleyParsons, Clive worked in a variety of engineering roles at Corus Group in the UK. This included plant condition monitoring, commissioning and latterly the development of a virtual rolling mill based around Abaqus, to facilitate the development of new steel products. Clive holds a Bachelor of Mechanical Engineering from the University of Sheffield and a Masters in IT from the University of Nottingham. He is a member of the local branch committee for the Institution of Mechanical Engineers in Singapore and is active in promoting engineering simulation as an exciting career as well as its benefits to industry.

Organizing Committee

Dr. Zishun Liu, President of Association for Computational Mechanics (Singapore)

A/P Kian Meng Lim, President of Theoretical and Applied Mechanics Society (Singapore)

Dr. Zhengdong Sha, Institute of High Performance Computing (IHPC)

Dr. Fangsen Cui, Institute of High Performance Computing (IHPC)

Dr. Zhuangjian Liu, Institute of High Performance Computing (IHPC)

Dr. Junyan Guo, Institute of High Performance Computing (IHPC)

A/P B C, Vincent Tan, National University of Singapore