Vrije Universiteit Brussel
Pleinlaan 2 I Brussels

Building D & E
28-29 May 2009

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NCTAM 2009

8th National Congress on Theoretical and Applied Mechanics

PROGRAM BOOKLET

8th National Congress on Theoretical and Applied Mechanics
28-29 May 2009 I Building D & E I Vrije Universiteit Brussel I Pleinlaan 2 I Brussels

Organised by the National Committee for Theoretical and Applied Mechanics
with the financial support of the Research Foundation - Flanders (FWO)

PREFACE

In 1986 the National Committee for Theoretical and Applied Mechanics decided to recurrently organise a National Congress devoted to the subject, with the aim of fostering the exchange between specialists of various branches within mechanics.
In addition, the congress would also offer a forum to young researchers in the field to present their work.

The first congress took place in Brussels on May 21-22, 1987. The number of participants (132) and papers (68) of this first edition really showed the need for such an event in the Belgian Mechanical scientific community.

Subsequent congresses were organised at different universities in Belgium with an ever growing participation. This year the 8th edition takes place at the Vrije Universiteit Brussel on May 28-29. As in the past, the congress has a very tight program with 111 papers of which 6 invited.

The organization of this congress would not have been possible without the help of many people, whom I would like to thank sincerely for their efforts. On behalf of the National Committee for Theoretical and Applied Mechanics I would also like to express our gratitude to the FWO for its financial support.

On behalf of the Scientific Committee and the local Organizing Committee I wish a fruitful and successful congress to all the participants.

Chris Lacor
Conference Chairman

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Friday May 29th, 2009

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Plenary 1
Thursday May 28th, 2009
09.00 – 09.35

The iCub Humanoid – Design, Development and Operation

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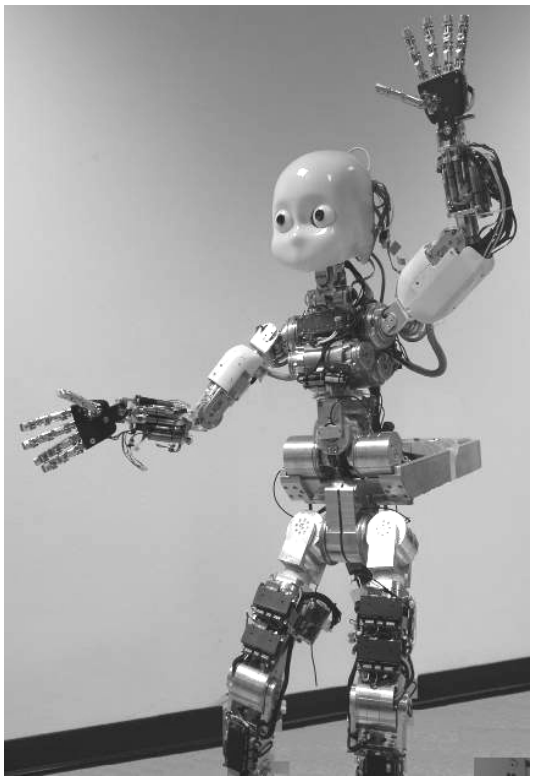
Abstract
The development of greater understanding of human cognition is currently an active area of research within both
i). neuroscience, where the goal is to develop greater understanding of the mechanisms of the human brain, and
ii). robotics where the aim is to develop robots with human-like cognitive capacities.

The EU funded "RobotCub" project hypothesises that cognitive development requires physical embodiment – without the capacity to interact with the world, intelligence will at best be abstract and disconnected from the world. To test this concept, "Robotcub" has developed a child-like humanoid robot – the iCub.

The iCub aims to replicate both the physical and cognitive abilities of an 18 month to 3 ½ year old child. To ensure that this interaction is as accurate as possible the robot must be a faithful representation of the infant inspiration. As a result the 'baby' robot, stands 100cm tall, fits within the general size and shape of a child, weighs less than 23 kg and has 69 d.o.f.

This presentation will concentrate on the mechatronic design of the iCub. It will explore the specification process, planning, and development, particularly concentrating on the legs, waist and hands. We will also consider possible future directions for the design of the iCub and other humanoids.



Plenary 2
Thursday May 28th, 2009
09.35 – 10.10

Time-accurate numerical simulations of transitional flows

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Transitional flows are ubiquitous. Examples range from internal flows such as in Osborne Reynolds' famous experiment in which he studied the instability of Poiseuille flow in a pipe - to external flows such as the flow over airfoils. For transition to occur an unstable laminar flow needs to be disturbed. The larger the disturbance is, the quicker the flow will undergo transition. A recent repeat of Reynolds' experiment, using the original apparatus, showed an earlier onset of transition which was attributed to the increased traffic load on the nearby streets.

Over the years, transitional boundary layer flows have received much attention. Transition to turbulence is sometimes triggered explicitly in order to avoid downstream boundary layer separation, which may adversely affect the aerodynamical properties of an airfoil and could lead to stall or mechanical failure. Basically, three types of boundary layer transition can be observed:

1) Natural transition - through the triggering of Tollmien-Schlichting waves that evolve into -vortices in the downstream direction. Farther downstream, the -vortices become unstable and turn into turbulent spots that grow and eventually merge to form a fully turbulent boundary layer downstream. An example of this type of transition can be found in the boundary layer flow over wind turbine blades.
2) In by-pass transition one or more stages of the natural transition scenario are by-passed. Typical examples of by-pass transition can be found in the flow over low-pressure (LP) turbine blades, where relatively strong free-stream fluctuations tend to trigger low-speed streaks in the laminar boundary layer. These streaks (which are small, negative jets) may undergo transition through a KelvinHelmholtz (KH) instability and eventually form turbulent spots.
3) Separation-induced transition may occur naturally in flow over LP compressor blades. It is characterized by the formation of a laminar separation bubble. As the flow separates, it usually undergoes a KH instability leading to a roll-up of the separated boundary layer. Inside the roll turbulence is generated by the triggering of elliptical instabilities. Farther downstream, the flow may re-attach to form a fully turbulent boundary layer.

In modern jet engines the LP turbine supplies power to the fan and, sometimes, the first compressor stages. Recent increases in fan diameters require a higher work-output from the LP turbine at reduced rotational speed. Typically, an LP turbine is relatively heavy since it consists of several stages, while its efficiency strongly influences fuel consumption. Hence, even small improvements have a significant effect. The periodic unsteadiness induced by rotorstator interaction and the low Reynolds number are characteristic for flow in an LP turbine. Both phenomena directly affect blade boundary layer transition, the tendency to separation, heat transfer and flow losses. Separation of the boundary layer along a turbine blade changes the aerodynamical properties of a blade and might eventually cause mechanical failure. Free-stream fluctuations and incoming wakes, generated by the upstream row of blades, can be employed to passively control this boundary layer separation. As the level of external fluctuations is too high for natural transition to occur, by-pass transition is very common and, sometimes, also separation-induced transition can be found.

Because of the relatively low Reynolds numbers, recent increases in computational power have made it possible to perform highly-resolved, time-accurate numerical simulations of flows over model LP turbine and compressor blades. The time-accurate numerical simulations aim to improve the understanding of the complicated interaction of both periodic and uniformly distributed external fluctuations with the blade boundary layer. At first, the periodic suppression of a laminar separation bubble on the suction surface of a LP turbine blade by periodically impinging wakes is studied in great detail. A KH instability is found to be triggered by the large-scale periodic movement of the wake. Further transition to turbulence triggered by small-scale, threedimensional free-stream fluctuations - is found to take place inside the KH rolls. Along the pressure surface a distinctive pattern of streamwise longitudinal vortical structures is found to form by the stretching of the wake's vortical structures by the main flow.
Separation bubbles can be affected by the occurrence of by-pass transition upstream of the location of separation. This will be illustrated by further simulations of flow around a LP compressor blade: The impinging wakes periodically trigger turbulent spots that move downstream and locally suppress separation. Once the turbulent spot has passed, after a transient period the separation bubble is found to recover.

Plenary 3
Friday May 29th, 2009
09.00 – 09.35

Designing intelligent products: the next revolution in virtual engineering

Herman Van der Auweraer
LMS International, Leuven, Belgium

Product innovation managers face continuously increasing challenges with respect to their product portfolio. The traditional demands for improved performance, time-to-market and competitive price setting are strained by requirements related to product branding, personalization and ecological, safety and legislation aspects. This leads to increasingly complex products, implemented by heterogeneous technologies and more and more relying on active components and systems. To enable this evolution, it is mandatory that the product design engineering approach itself evolves, supporting these new demands.

A key challenge is the inherent multidisciplinarity in these "intelligent" products, integrating thermal, hydraulic, mechanical, electronic and control functions. The corresponding test and simulation methodologies must hereto extend beyond the traditional CAD-driven approach and support the use of system and functional models crossing the boundaries of multiple disciplines and integrating systems engineering with control engineering. It will require adopting methodologies crossing the classical Test and Simulation boundaries, leading to new physical and virtual testing paradigms such as Software-in-the-Loop, Hardware-in-the-Loop and Model-in-the-Loop.

These concepts will be illustrated by case studies from vehicle design engineering, demonstrating the combined use of 3D and 1D system models in applications such as vehicle chassis and powertrain design.

This evolution regarding the broadening of the engineering challenges should however not deviate the attention from the fact that, within each discipline, performance standards continuously shift targets. For example, in relation to Noise and Vibration performance, novel methodologies are required to push the test and simulation envelope to higher accuracy, to more complex systems and to higher frequencies.

It can be concluded that the research challenges for the future are hence lying both in further breakthroughs in method performance and in expanding the scope of system complexity to a truly multifunctional system mock-up.

Plenary 4
Friday May 29th, 2009
09.35 – 10.10

Embedded Reduced Order Models for Thermal and Fluid Simulations

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Reduced order modelling is the process of generating low-dimensional models for infinite dimensional systems. A common application of reduced order modelling is to fluid flow. A fluid flow has an infinite range of flow states that can exist.
However, in a typical fluids problem only a small range of those flow states is exhibited. To take advantage of this fact a tool like the proper orthogonal decomposition can be used. The proper orthogonal decomposition finds the smallest set of orthogonal functions (or POD modes) that can accurately represent the range of flow states. The governing equations for the flow can then be compressed onto the space of states described by those functions using weighted integral methods.
This then results in a low dimensional model. In this talk we investigate the performance of such reduced order models, and propose the concept of embedding these models into larger flow simulations. The purpose of embedding is to use POD modes in flow locations where the flow behaviour is low-dimensional while in regions where the flow is higher-dimensional to use normal simulation techniques. As an example, in dilute particle laden flow, the near region of the particles is typically low dimensional while the large scale flow can be turbulent and strongly affected by geometry and inlet conditions. Reduced order models can be generated for the flow around the particle and coupled to the large scale flow simulation allowing fast and accurate computations of particle laden flow.

Plenary 5
Friday May 29th, 2009
14.00 – 14.35

A unifying formulation for discontinuous high-order methods in CFD

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Recently a new high-order formulation for 1D conservation laws was developed by Huynh based on the idea of "flux reconstruction". The formulation was capable of unifying several popular methods including the discontinuous Galerkin, staggered grid multi-domain method, or the spectral difference/spectral volume methods into a single family. The extension of the method to quadrilateral and hexahedral elements is straightforward. In an attempt to extend the method to other element types such as triangular, tetrahedral or prismatic elements, the idea of "flux reconstruction" is generalized into a "lifting collocation penalty" approach. With a judicious selection of solution points and flux points, the approach can be made simple and efficient to implement for mixed grids, and for high-order curved boundaries. In addition, the formulation includes the discontinuous Galerkin, spectral volume and spectral difference methods as special cases. Several test problems in both 2D and 3D will be presented to demonstrate the capability of the method.

References

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Plenary 6
Friday May 29th, 2009
14.35 – 15.10

Mathematical modeling of bone regeneration during fracture healing

L. Geris[1], J. Vander Sloten[1], H. Van Oosterwyck[1]
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I. INTRODUCTION

Over the last decade, mathematical modeling has found its way to the field of bone regeneration research (as reviewed in [1]). At first, simple mechanoregulatory models were proposed linking the nature and magnitude of mechanical stimuli to the cell fate. In general, high stresses and strains give rise to the development of cartilage or fibrous tissue whereas bone can only be formed in areas of low mechanical stimulation. Gradually, more emphasis was laid on the biology steering the process of bone regeneration and bioregulatory models were developed where only biological cues, such as growth factors or the presence of vascularization determine the outcome of the regeneration process. Finally, a third category of mathematical models, mechanobioregulatory models, emerged combining the effects of both mechanical and biological stimuli on the regeneration process. The authors have contributed to these developments by proposing both a bioregulatory model [2] and, based on that, a mechanobioregulatory model [3]. The novelty of these models lies in their special attention for the importance of angiogenesis (i.e. formation of blood vessels) on the regeneration process. These models were used to simulate normal and impaired healing situations and to design novel treatment strategies for the latter. The results have been successfully corroborated by comparison with several in vivo experiments in rodents.

II. MATERIALS AND METHODS

The bioregulatory model describes the spatiotemporal evolution of the concentrations/densities of the main cell, tissue and growth factor types involved in the regeneration process. These concentrations can change due to migration, differentiation, proliferation, decay etc. This is mathematically described by means of continuum scale partial differential equations of the taxis-diffusion-reaction type. This system was implemented using a custom finite volumes code, paying special attention to the model's requirements of mass conservation and non-negativity of the variables [4]. The influence of mechanics was introduced in the bioregulatory models by changing the parameter values of certain processes depending on the local mechanical stimulus after every loading step. For example, the proliferation rate of osteoblasts (bone forming cells) was enhanced for a certain range of fluid flow velocities [5] (tissues were modeled to be biphasic).

III. RESULTS

Figure 1 shows an example of how these models can be used in bone regeneration research. Fig 1a shows the result of an overloaded fracture where no bone is formed and the entire regeneration zone is filled with soft tissue. Simulating treatment of this impaired healing situation by placing a fixator that removes the overload (Fig 1b), predicts the recapitulation of angiogenesis followed by the formation of bone in the regeneration zone. Another treatment strategy that was investigated is the administration of osteogenic growth factors at the moment of stabilization. Again, recapitulation of the healing process is observed, albeit with a slightly

different healing pattern.

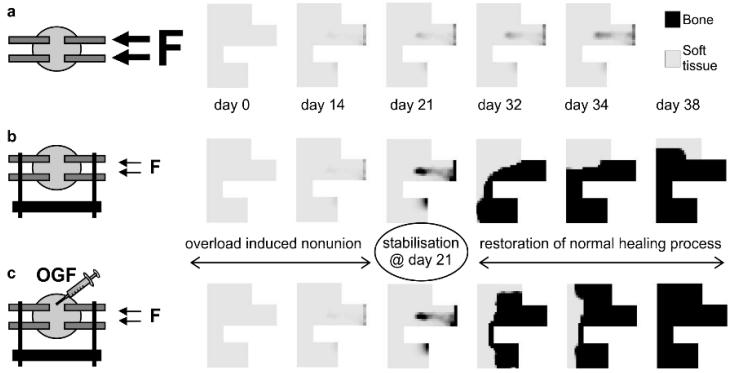

Fig. 1. Overload induced impaired healing and potential treatment strategies. Due to symmetry reasons, only one quarter of the regeneration zone is shown on the right.

IV. CONCLUSIONS

The developed mathematical framework is such that it easily allows for the investigation of additional mechanical stimuli and for additional biological processes to be made dependent on these stimuli. It thereby allows for both the investigation of experimentally testable hypotheses on the regeneration process itself and for the design of clinically relevant treatment strategies for impaired healing situations.

ACKNOWLEDGEMENTS

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Program of the 8th National Congress on Theoretical and Applied Mechanics NCTAM 2009

Vrije Universiteit Brussel

ROOM D.0.03 - Thursday May 28th, 2009

09.00 – 09.15	Opening by Prof. P. De Knop, Rector of the Vrije Universiteit Brussel
09.15 – 09.50	**Plenary 1** – **D. CALDWELL** (Instituto Italiano di Tecnologia, Italy) :
	The iCub Humanoid: Design, Development and Operation
	Chairman: D. Lefeber, VUB
09.50 – 10.25	**Plenary 2** – **J. WISSINK** (Brunel University, UK) :
	Time-accurate numerical simulations of transitional flows
	Chairman: E. Dick, UGent
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10.55 – 12.35	Parallel Sessions: Rooms E.0.05 – E.0.07 – E.0.11 – E.0.12
12.35 – 14.00	Lunch in VUB restaurant
14.00 – 15.40	Parallel Sessions: Rooms E.0.05 – E.0.07 – E.0.11 – E.0.12
15.40 – 16.10	Coffee Break in Nelson Mandela room
16.10 – 17.30	Parallel Sessions: Rooms E.0.05 – E.0.06 - E.0.07 – E.0.11 – E.0.12
17.30	Reception in Nelson Mandela room

ROOM E.0.12 - Thursday May 28th, 2009

Fluid Mechanics 1 (Chair : G. Winckelmans, UCL)

10.55 – 11.15 ILES of airflow around buildings
D. Köse - E. Dick, UGent

11.15 – 11.35 Scales-separation and variational multiscale methods coupled to a stabilized finite element formulation for large eddy simulation of incompressible and turbulent flows
M. Rasquin – K.E. Jansen – G. Degrez, ULB

11.35 – 11.55 High-Order Discrete Explicit Filtering for Large Eddy Simulation
W. Deconinck – C. P.T. Groth - C. Lacor, VUB and University of Toronto

11.55 – 12.15 Hybrid RANS/LES for impinging jet flow
S. Kubacki - E. Dick, UGent

12.15 – 12.35 Large Eddy Simulation of Pulsed Jet in Crossflow
A. Coussement – O. Gicquel – G. Degrez, ULB

Fluid Mechanics 2 (Chair : M. Papalexandris, UCL)

14.00 – 14.20 Bottom friction formulations for 2D free surface flow modeling
O. Machiels – S. Erpicum – P. Archambeau – B. Dewals – M. Pirotton, ULg

14.20 – 14.40 Advances in one-fluid RANS modelling of concentrated particle-laden flows
E. Toorman, KULeuven

14.40 – 15.00 Low Mach-number expansion and equilibrium behaviour of two-phase granular mixtures
Ch. Varsakelis, M.V. Papalexandris, UCL

15.00 – 15.20 Pipe flow velocity profiles of complex suspensions, like concrete
D. Feys – R. Verhoeven – G. De Schutter, UGent

15.20 – 15.40 Investigation on the influence of various sediment-fluid coupling approaches to the flow and sediment transport
P. Widera – C. Lacor, VUB

Fluid Mechanics 3 (Chair: W. Bosschaerts, RMA)

16.10 – 16.30 Simulation and design of flapping wings for a Micro Air Vehicle
K. Evers – D. Vandepitte – D. Reynaerts, KULeuven and KHBO

16.30 – 16.50 Air-oil separation devices for aircraft engine lubrication systems
A. Ruelle – J. Steimes – F. Gruselle – B. Servais – P. Hendrick, ULB and Techspace Aero

16.50 – 17.10 Experimental analysis of stall flutter phenomena of a bridge deck
T. Andrianne – G. Dimitriadis, ULg

17.10 – 17.30 Simulation-based Sensitivity Analysis of a Mach 4.5 Mixed-Compression Intake
H. Kato – K. Ito, Cenaero

ROOM E.0.11 - Thursday May 28th, 2009

Structural Mechanics 1 (Chair : J. Degrieck, UGent)

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L. Brassart – I. Doghri – L. Delannay, UCL

11.15 – 11.35 Finite element modeling of the material behaviour of glass fibre textile reinforced cementitious composite
T. Tysmans, S. Adriaenssens, J. Wastiels, VUB

11.35 – 11.55 Michromechanical modeling of composite materials with coupled viscoelastic-viscoplastic behaviour
B. Miled, I. Doghri, L. Delannay, UCL

11.55 – 12.15 A natural neighbour approach of linear elasticity, elastoplasticity and fracture mechanics based on Fraeijs de Veubeke variational principle
L. Xiang, S. Cescotto, L. Duchêne, ULg and Dalian Univ. Of Technology

Structural Mechanics 2 (Chair : S. Vanlanduit, VUB)

14.00 – 14.20 Blast wave attenuation process by shock absorbing material
V. Croquet, J.-M. Ndambi, J. Vantomme, RMA

14.20 – 14.40 The use of SASW tests to determine the material damping ratio in the soil
S.A. Badsar, M. Schevenels, G. Degrande, KULeuven

14.40 – 15.00 A new stress-strain model for linepipe steels in strain-based design
S. Hertelé, W. De Waele, R. Denys, UGent

15.00 – 15.20 Behaviour of Expanded Metal Sheets under Shear Loading
D. Phung Ngoc, A. Plumier, ULg

15.20 – 15.40 Modeling of preloaded threaded pipe connections
J. Van Wittenberghe, P. De Baets, W. De Waele, UGent

Structural Mechanics 3 (Chair: A. Deraemaeker, ULB)

16.10 – 16.30 Combined experimental-operational modal testing of a bow-string footbridge
E. Reynders, g. De Roeck, KULeuven

16.30 – 16.50 An automatic tool for the simplified modelling of discrete cracking phenomena in masonry structures: case study on the Magdalene church in Tournai
J. Noël, T. Descamps, L. Van Parys, FPMs

16.50 – 17.10 Operational Transfer Path Analysis using the H1 estimator
G. De Sitter, Ch. Devriendt, P. Guillaume, VUB

17.10 – 17.30 Consideration of the dynamic effects of the bridges due to passage of train
K. Liu, G. De Roeck, G. Lombaert, KULeuven

ROOM E.0.05 - Thursday May 28th, 2009

Mechatronics and Robotics 1 (Chair : D. Caldwell, IIT, Italy)

10.55 – 11.15 Control a Pneumatic Artificial Muscle (PAM) with hysteresis
T.V. Minh, H. Ramon, H. Van Brussel, KULeuven

11.15 – 11.35 A powered knee exoskeleton for gait rehabilitation
P. Beyl, P. Cherelle, R. Versluys, I. Vanderniepen, D. Lefeber, VUB

11.35 – 11.55 Design of SAM, a new fully portable exoskeleton device with local joint control
P. Letier, M. Avraam, S. Veillerette, M. Horodinca, A. Preumont, ULB

Mechatronics and Robotics 2 (Chair: O. Verlinden, FPMs)

14.00 – 14.20 Dynamic simulation and embedded control of the AMRU5 hexapod robot
Q. Bombled, O. Verlinden, FPMs

14.20 – 14.40 The Huggable Robot Probo
K. Goris, J. Saldien, D. Lefeber, VUB

14.40 – 15.00 Self-reconfigurable robots : locomotion control using CPG's
Ch. Chariot, E. Filippi, O. Verlinden, FPMs

15.00 – 15.20 Design and assessment of an autonomous ducted rotor UAV
F. Buysschaert, M. Yacoubi, J. Sans, M. Seiler, F. Pomirski, ULB and Ecole des Mines d'Alès

Kinematics, Dynamics and Theoretical Mechanics (Chair: P. Fisette, UCL)

16.10 – 16.30 Multibody modelling of a travelling wave linear piezomotor
J.-F. Collard – Ch. Vloebergh – B. Dehez – P. Fisette, UCL

16.30 – 16.50 Hamiltonization and geometric integration of nonholonomic mechanical systems
T. Mestdag – A.M. Bloch – O.E. Fernandez, UGent and Univ. of Michigan

16.50 – 17.10 A system-level modal description of flexible multibody dynamics
G. H.K. Heirman – O. Brüls – W. Desmet, KULeuven and ULg

17.10 – 17.30 Contribution of symbolic generation to the sensitivity analysis of automotive suspension parameters
A. Poncelet – J.-F. Collard – P. Fisette, UCL

ROOM E.0.07 - Thursday May 28th, 2009

Vibration and Noise 1 (Chair : H. Sol, VUB)

10.55 – 11.15 On the use of Transmissibility in the field of Operational Modal Analysis and Structural Health Monitoring
Ch. Devriendt – G. Steenackers – P. Guillaume, VUB

11.15 – 11.35 Free field vibrations due to traffic and construction activities on a concrete road
M. Amin Lak – G. Lombaert – G. Degrande, KULeuven

11.35 – 11.55 Frequency domain modal parameter estimation in the OMAX framework
T. De Troyer - K. Deckers - P. Guillaume - M. Runacres, EhB and VUB

11.55 – 12.15 Vibration cancellation of a pneumatically actuated cryocooler
B. de Marneffe - A. Preumont, ULB

Vibration and Noise 2 (Chair : P. Guillaume, VUB)

14.00 – 14.20 A 2.5D coupled FE-BE methodology for the dynamic interaction between longitudinally invariant structures and the soil
S. François - M. Schevenels - P. Galvìn - G. Lombaert - G. Degrande, KULeuven

14.20 – 14.40 The determination of stiffness and damping parameters of soils with the SASW method
M. Schevenels – S.A. Badsar - G. Degrande, KULeuven

14.40 – 15.00 Simulation of blast-induced soil wave propagation
B. Desmet – J. Vantomme – G. Degrande, RMA and KULeuven

15.00 – 15.20 Evaluation of structural power flow using an optimized regressive discrete Fourier series
C. Vuye – S. Vanlanduit – P. Guillaume, Artesis HA and VUB

15.20 – 15.40 On the use of a multi-level wave based modelling approach for the steady-state dynamic analysis of 2D perforated solids
K. Vergote – B. Van Genechten – D. Vandepitte – W. Desmet, KULeuven

Manufacturing, Production and Design (Chair: P. Hendrick, ULB)

16.10 – 16.30 Conceptual design of a PEM fuel cell powered unmanned aerial vehicle
D. Verstraete – J. Steimes – P. Hendrick, ULB

16.30 – 16.50 Chip formation in micro-milling
R. Ducobu – E. Filippi – E. Rivière-Lorphèvre, FPMs

16.50 – 17.10 Textile Reinforced Inorganic Phosphate Cement composite moulds
J. Blom – P. Van Itterbeeck – J. Van Ackeren – J. Wastiels, VUB

ROOM E.0.06 - Thursday May 28th, 2009

Biomechanics (Chair : H. Van Lenthe, KULeuven)

16.10 – 16.30 Experimental study of multilayer stent effects on haemodynamics in abdominal aortic aneurysm
C. Wailliez – G. Coussement, FPMs

16.30 – 16.50 Effect of root form on stress patterns in the periodontal ligament: An analytical study
A. Van Schepdael – J. Vander Sloten, KULeuven

16.50 – 17.10 On the Assessment of Antagonistic Muscle Forces During Forearm Flexion/Extension
M. Raison – Ch. Detrembleur – P. Fisette – J.-C. Samin, UCL

17.10 – 17.30 Anisotropic continuum damage model coupled to viscoplasticity for a pressure dependent alveolar bone remodelling law
M. Mengoni – J.P. Ponthot, Ulg

Program of the 8th National Congress on Theoretical and Applied Mechanics NCTAM 2009

Vrije Universiteit Brussel

ROOM D.0.03 - Friday May 29th, 2009

09.00 – 09.35 **Plenary 3** – **H. VAN DER AUWERAER** (LMS, Belgium):

Designing intelligent products: the next revolution in virtual engineering

Chairman : W. Desmet, KULeuven

09.35 – 10.10 **Plenary 4** – **B. HELENBROOK** (Clarkson University, USA):

Embedded Reduced Order Models for Thermal and Fluid Simulations

Chairman : V. Legat, UCL

10.10 – 10.40 Coffee Break in Nelson Mandela room

10.40 – 12.40 Parallel Sessions: Rooms E.0.05 – E.0.06 - E.0.07 – E.0.11 – E.0.12

12.40 – 14.00 Lunch in VUB restaurant

ROOM D.0.03

14.00 – 14.35 **Plenary 5** – **Z.J. WANG** (Iowa State University, USA):

A unifying formulation for discontinuous high-order methods in CFD

Chairman : G. Degrez, ULB

14.35 – 15.10 **Plenary 6** – **L. GERIS** (KULeuven, Belgium):

Mathematical modelling of bone regeneration during fracture healing

Chairman : Ph. Boulanger, ULB

15.10 – 15.40 Coffee Break

15.40 – 17.20 Parallel Sessions: Rooms E.0.05 – E.0.07 – E.0.11 – E.0.12

17.20 End of the conference

Fluid Mechanics 4 (Chair : C. Lacor, VUB)

10.40 – 11.00 High Order Upwind Residual Distribution Schemes on Isoparametric Curved Elements
M. Vymazal – N. Villedieu – T. Quintino – H. Deconinck, VKI

11.00 – 11.20 Highly Transient Mixed Flows with Air/Water Interactions: Homogeneous Equilibrium Model and Friction Correlations
F. Kerger – P. Archambeau – S. Erpicum – B.J. Dewals – M. Pirotton, ULg

11.20 – 11.40 A new library of multigrid solvers for large-scale CFD calculations
M. Rasquin – G. Degrez – H. Deconinck, ULB and VKI

11.40 – 12.00 Effective modelling of mass transfer in electrochemical reactors using a hybrid spectral/finite-elements method
M. Krivilyov – M. Rasquin – R. Laguerre – G. Degrez – J. Fransaer, KULeuven and ULB

12.00 – 12.20 Hydrogen micromix combustion – Introductory study – Cold flow
E. Recker – W. Bosschaerts, RMA

ROOM E.0.11 - Friday May 29th, 2009

Structural Mechanics 4 (Chair : S. Cescotto, ULg)

10.40 – 11.00 Lateral-torsional and lateral-distortional buckling of I-section members with web openings
D. Sonck - J. Belis - G. Lagae - W. Vanlaere - R. Van Impe, UGent

11.00 – 11.20 An adapted dynamic programming algorithm for the identification of moving forces
E.-M. Lourens - G. Lombaert - G. Degrande - G. De Roeck, KULeuven

11.20 – 11.40 The buckling behaviour of steel cylinders with engaged columns
W. Vanlaere - D. Sonck - D. Callewaert - R. Van Impe - G. Lagae, UGent

11.40 – 12.00 Global size and shape optimization of trusses
S. Arnout - G. Lombaert - G. De Roeck, KULeuven

12.00 – 12.20 Rate Dependent Moment-Curvature Relations for the Progressive Collapse Analysis of RC Structures
B. Santafé - T.J. Massart - Ph. Bouillard - J. Vantomme, RMA and ULB

12.20 – 12.40 Nested inverse method for mechanical material parameter identification using DIC and FE computed deformation fields
B. Belkassem - S. Bossuyt - H. Sol, VUB

ROOM E.0.07 - Friday May 29th, 2009

Vibration and Noise 3 (Chair : D. Vandepitte, KULeuven)

10.40 – 11.00 Study of the influence of design parameter variation on the dynamic behaviour of honeycomb sandwich panels
S. Debruyne – D. Vandepitte – E. Debrabandere – M. Hongerloot, KULeuven and KHBO

11.00 – 11.20 Modelling of the dynamic behavior of electronic boards used for spatial applications
D. Wattiaux - O. Verlinden - Ch. De Fruytier, FPMs and Thales Alenia Space

11.20 – 11.40 Microphone positioning optimization for conditioning inverse tonal aeroacoustic problems
F. Presezniak - G. Steenackers - P. Guillaume, VUB

11.40 – 12.00 On the use of B-spline functions in a wave based prediction technique for solving bounded Helmholtz problems
E. Deckers – B. Drofmans – B. Van Genechten – D. Vandepitte – W. Desmet, KULeuven

12.00 – 12.20 Finite-amplitude homogeneous waves in pre-strained incompressible materials
E. Rodrigues Ferreira – Ph. Boulanger, ULB

12.20 – 12.40 Trailing Edge Noise of a Controlled-Diffusion Airfoil at Moderate and High Angle of Attack
J. Christophe- J. Anthoine – S. Moreau, VKI and Univ. De Sherbrooke

ROOM E.0.05 - Friday May 29th, 2009

Experimental Techniques 1 (Chair : D. Van Hemelrijck, VUB)

10.40 – 11.00 Mechanical properties of friction stir spot welds of 6063-T6 aluminum alloy
C. Jonckheere – A. Simar – B. de Meester, UCL

11.00 – 11.20 Design and production of cruciform composite specimens for in-plane biaxial tests
C. Ramault – A. Makris – D. Van Hemelrijck – E. Lamkanfi – W. Van Paepegem, VUB and UGent

11.20 – 11.40 Turning Point Based Control of Pneumatic Artificial Muscles for Fatigue Testing
K. Deckers - P. Guillaume - D. Lefeber, VUB

11.40 – 12.00 Experimental material determination of visco-elastic glass/ionomer laminates
D. Callewaert – D. Delincé – J. Belis – R. Van Impe, UGent

12.00 – 12.20 2D permeability tensor identification of fibrous reinforcements for RTM
G. Morren – H. Sol – S. Bossuyt, VUB

ROOM E.0.06 - Friday May 29th, 2009

Applied Thermodynamics and Heat Transfer (Chair : J. Vierendeels, UGent)

10.40 – 11.00 Modelling coating quality in fluidized bed coating: spray model
M. Vanderroost – F. Ronsse – K. Dewettinck – J.G. Pieters, UGent

11.00 – 11.20 Small scale biomass heating systems: standards, quality labelling and market driving factors
V.K. Verma – S. Bram – J. De Ruyck, VUB

11.20 – 11.40 One-dimensional Numerical Investigation of an Enthalpy based model for the Pyrolysis of Wet Charring Materials
S.R. Wasan – P. Rauwoens – J. Vierendeels – B. Merci, UGent

11.40 – 12.00 Detailed study of the impact of co-utilization of biomass in a natural gas combined cycle power plant through perturbation analysis
F. Delattin – J. De Ruyck – S. Bram, VUB

ROOM E.0.12 - Friday May 29th, 2009

Fluid Mechanics 5 (Chair : H. Deconinck, VKI)

15.40 – 16.00 Modified actuator disk with non-uniform loading and blade wake velocity deficit
B. Marinus – J. Pelletier – A. Cuny – W. Bosschaerts, RMA and Academies of Saint-Cyr Coëtquidan

16.00 – 16.20 Numerical investigation of the self-similarity of a two-dimensional shear-layer
C. Bailly – C. Carton de Wiart – F. Thirifay – G. Winckelmans, UCL

16.20 – 16.40 Smoke propagation in buildings: a simulation toolbox
S. Datoussaïd – S. Brohez – D. Lalisse – T. Capron, FPMs

16.40 – 17.00 Fluid-Structure Interaction Algorithm for the Simulation of a Bileaflet Prosthetic Heart Valve
S. Annerel – J. Degroote – J. Vierendeels, UGent

17.00 – 17.20 Study of the Effects of Geometrical parameters on the Performance of Cyclone Separators
Kh. Elsayed – C. Lacor, VUB

ROOM E.0.11 - Friday May 29th, 2009

Structural Mechanics 5 (Chair : J. Vantomme, RMA)

15.40 – 16.00 A Deployable Mast for Kinematic Architecture
N. De Temmerman, M. Mollaert, L. De Laet, T. Van Mele, VUB

16.00 – 16.20 Future Giant Segmented Mirrors: Scale Effects in Active Optics and the Use of Composites in ELTs Structures
R. Bastaits, G. Rodrigues, B. Mokrani, A. Preumont, ULB

16.20 – 16.40 Mechanisms for Deployable Tensairity Structures
L. De Laet, M. Mollaert, R. Luchsinger, N. De Temmerman, T. Van Mele, VUB and EMPA

16.40 – 17.00 Optimization at conceptual design stage with morphological indicators: pros and cons
T. Vandenbergh, W.P. De Wilde, VUB

ROOM E.0.07 - Friday May 29th, 2009

Damage (Chair : T.J. Massart, ULB)

15.40 – 16.00 A coupled two-scale computational approach for quasi-brittle out-of-plane structural failure
B. C.N. Mercatoris – T.J. Massart, ULB

16.00 – 16.20 Degradation models for reliability estimation and mean residual lifetime
Ch. Letot – P. Dehombreux, FPMs

16.20 – 16.40 A numerical study on the axial crushing response of pultruded tubes under blast load
D.A. Kakogiannis – D. Van Hemelrijck – J. Van Ackeren – J. Wastiels – S. Palanivelu – W. Van Paepegem – J. Vantomme, VUB, UGent and RMA

16.40 – 17.00 Micromechanical damage modelling of elastoplastic composites with misaligned short fibers
S. Kammoun – I. Doghri – L. Delannay, UCL

17.00 – 17.20 An investigation of the mechanical behaviour of carbon epoxy cross ply cruciform specimens under biaxial loading
A. Makris – C. Ramault – D. Van Hemelrijck – E. Lamkanfi – W. Van Paepegem, VUB and UGent

ROOM E.0.05 - Friday May 29th, 2009

Experimental Techniques 2 (Chair : R. Van den Braembussche, VKI)

15.40 – 16.00 Conjugate Heat Transfer in Turbine Blade Internal Cooling Channel
F. Coletti – T. Arts, VKI

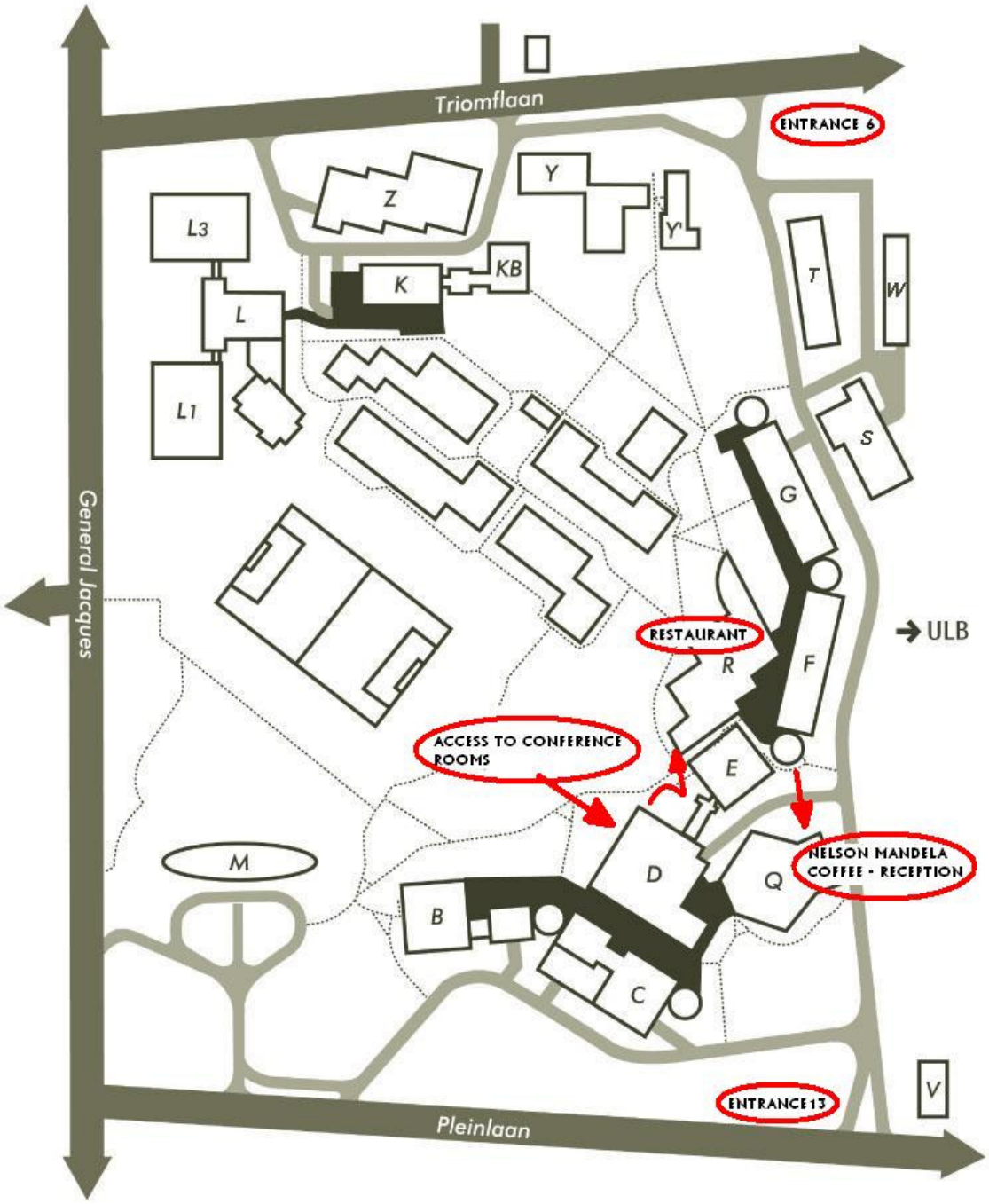
16.00 – 16.20 Droplet internal recirculation measurement by micro-PIV
M.R. Vetrano - F. Lebeau - J. van Beeck - M. Riethmuller, VKI and UMC

16.20 – 16.40 One pixel resolution temporal profilometry technique
B. Ribbens – S. Vanlanduit – P. Guillaume, Artesis HA and VUB

16.40 – 17.00 Study of large deformation phenomena in SPIF using an in-process DIC technique
I. Vasilakos - J. Gu – B. Belkassem – H. Sol – J. Verbet – J. Duflou, VUB and KULeuven

17.00 – 17.20 Experimental investigation of scaling laws for mechanical fatigue behaviour
B. Van Hooreweder – P. Sas – R. Boonen – D. Moens – F. De Coninck, KULeuven

General information



Building D : the main entrance to the conference rooms is on the esplanade (+1), then go down the stairway to the ground floor where room D.0.03 can be found.

Conference rooms in building E : can be accessed from building D without leaving the buildings. The conference rooms in building E can also be accessed using the entrance between building E and F (the rooms are at the same floor)

Restaurant : either go to the elevator between E and F building and go up one floor, leave the building in the direction of the restaurant, or leave through the main D entrance and go in the direction of the restaurant. In the restaurant go down one floor and get your lunch in the freeflow.

Coffeebreaks, reception and exhibition : Leave building E on the ground floor and direct yourself to the Nelson Mandela room (Building Q on streetside).

Parking facilities : It is advised to follow the signs to the car-park underneath Building Q

Exhibition

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Committees

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- Prof Chris Lacor, conference chairman
- Prof Sigrid Adriaenssens
- Prof Jacques De Ruyck
- Prof Patrick De Wilde
- Prof Patrick Guillaume
- Prof Patrick Kool
- Prof Dirk Lefeber
- Prof Hugo Sol
- Prof Steve Vanlanduit
- Prof Danny Van Hemelrijck
- Prof Marc Van Overmeire
- Prof Jan Wastiels

Scientific committee

- Yvan Baudoin (RMA)
- Philippe Boulanger (ULB)
- Serge Cescotto (ULg)
- Calogero Conti (FPMs)
- Roland Decuypere (RMA)
- Geert Degrande (KUleuven)
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Barcode (car access entrance 6 and 13)