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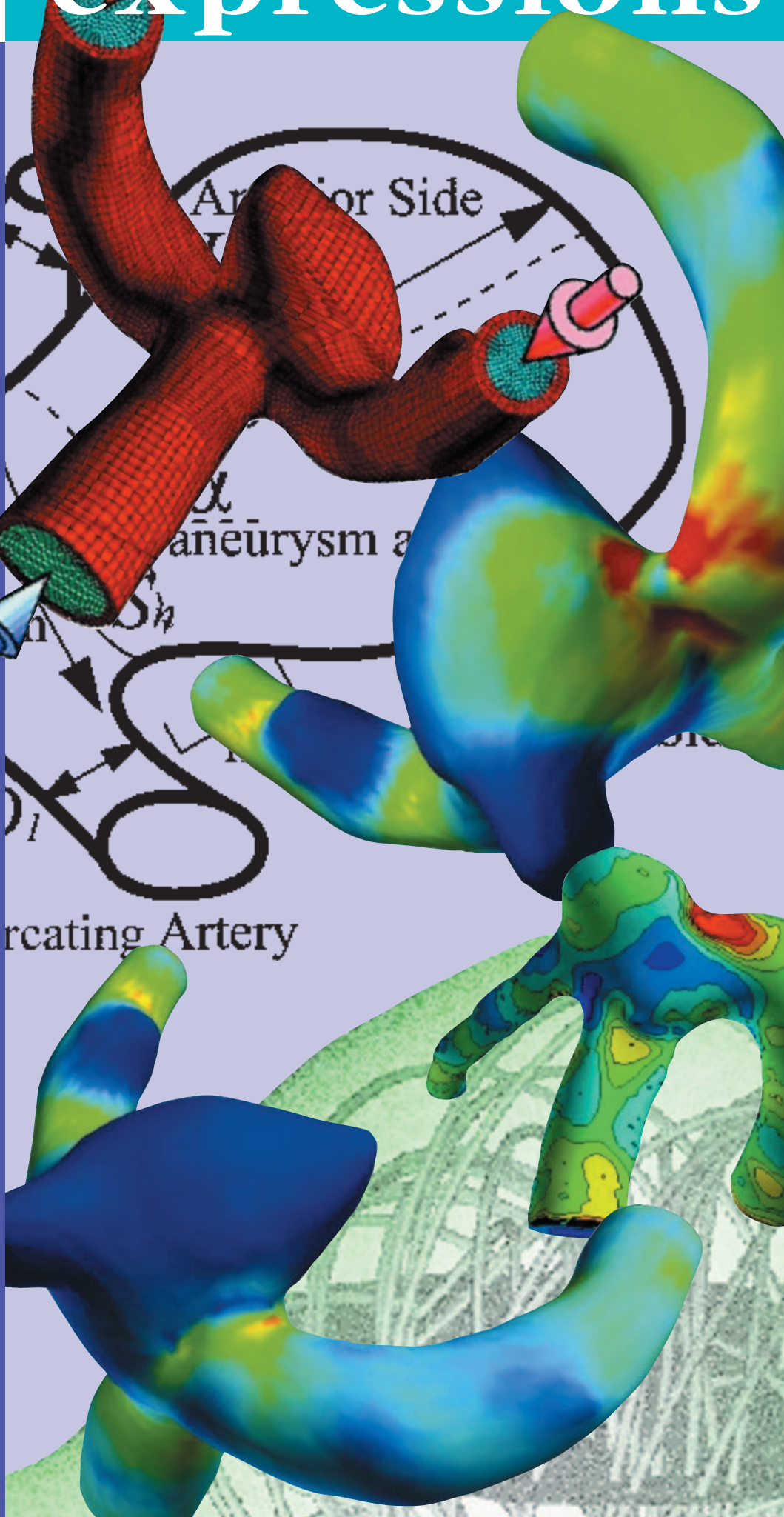

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IACM members are invited to send their contributions to the editors. Views expressed in the contributed articles are not necessarily those of the IACM.

contents

editorial

This issue of Expressions will probably come out at the time of the next World Congress of the IACM to be held in Beijing during 5 - 10 September 2004. The congress is held in conjunction with one of the regular conferences of the Asian-Pacific Association of Computational Mechanics (APACM), a regional organisation grouping national associations affiliated to IACM.

The Beijing meeting is the first of the series of world congresses of the IACM to be held at two years intervals. Previous IACM congresses took place at Austin (1986), Stuttgart (1990), Tokyo (1994), Buenos Aires (1998) and Vienna (2002). The next world meeting of the IACM after Beijing will be held in the city of Los Angeles in 2006.

The motivation to shorten the periodicity of the world congress was to increase the rotation of global IACM meetings across the five continents. The opportunity to merge regional conferences with world congresses is proving to be an excellent occasion for scientists and engineers from a particular area of the world to meet other colleagues from very distant places. Indeed in a time when information and communication tools and means seem to be making the world smaller every day, the chance to meet other colleagues from far distant regions “in person” is indeed an important added value of IACM congresses and this also justifies to speed up the rotation of the world meetings.

It is important however that the theory is validated by the facts, which, by the way, seems to be the case.

Positive proof is that the last IACM world meeting in Vienna attracted some 1400 participants. The latest figures reported indicate that over 1700 delegates will participate in the Beijing meeting, 50% of which are from outside the Asian-Pacific region. This is another clear sign of the growth of the computational mechanics community, and of the interest of our members in “presential activities”, probably as the basis for a better dissemination of their research output, for setting-up networks and, in general, for the search of personal and institutional opportunities.

I believe it is the role of IACM to provide the means and structure so that world congresses are an effective complement to other meetings held at regional and national levels worldwide. The experience of Beijing will be useful to “calibrate” the model towards the next large IACM meeting in Los Angeles and other future world congresses to be held in the years to come.

A key to the success of all IACM initiatives is the personal commitment of a number of scientists who are prepared to graciously invest much time and effort in order to ensure the success of IACM events. I therefore finish these lines with my personal thanks to Profs. M. W. Yuan and W. X. Zhong and their teams for their dedication and excellent work in the organisation of the Beijing congress. See you there!

Eugenio Oñate
President of IACM

A New Approach to Cerebral Hemodynamics
- Patient-Specific Modeling and Numerical Simulation of Blood Flow and Arterial Wall Interaction -

by
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Associate Professor
Institute of Industrial Science
University of Tokyo
Japan

***Abstract**. Hemodynamcs play an important role in the formation, growth, and rupture of cerebral aneurysms, which are the main cause of subarachnoid hemorrhage (SAH). Due to limitations in resolution and data acquisition techniques, currently available medical imaging systems can not provide sufficiently detailed information to quantify the relationship between hemodynamics and cerebral disorders such as SAH. In order to elucidate the relationships in cerebral hemodynamics, this article introduces a new approach based on patient-specific modeling and numerical simulation.*

1. Introduction

It is well known that over 70% of subarachnoid hemorrhages are caused by rupture of a saccular aneurysm, which is a sac-shaped aneurysm occurring in a relatively large cerebral artery, as shown in *Fig. 1* [1]. The risk of rupture is reported to be less than 0.1% [2]. However, once a subarachnoid hemorrhage occurs, 30% to 50% of patients die after the first event [3]. Thus, it is essential to be able to distinguish aneurysms with high risk of rupture from those with low risk.

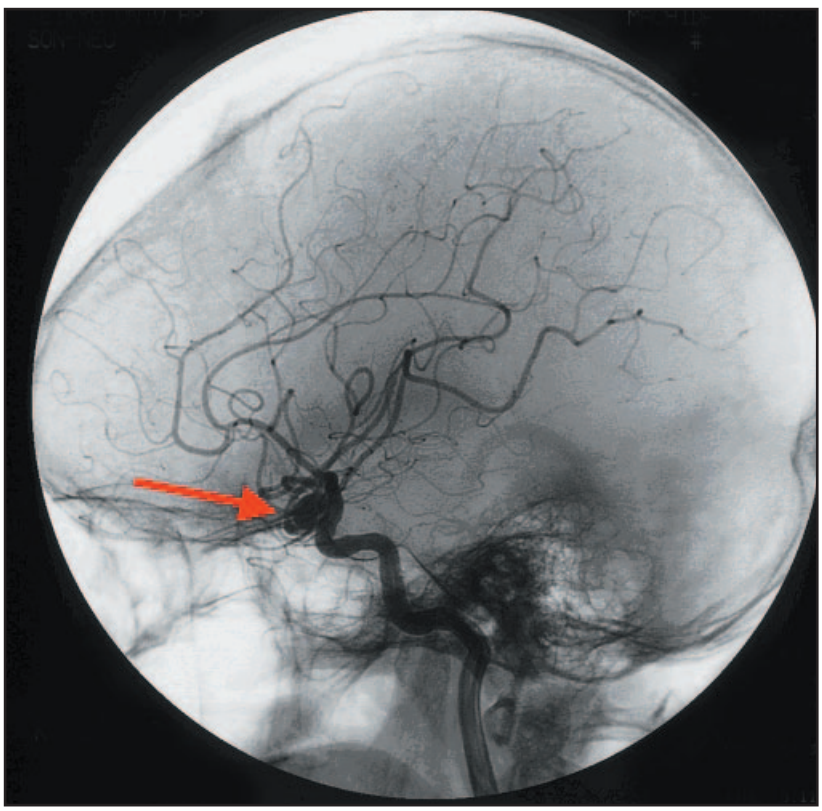

Figure 1:
Agiography of right carotid artery aneurysm (designated by the read arrow in the figure)

Some cardiovascular diseases and cerebral disorders such as arteriosclerosis and cerebral aneurysms are reported to depend on hemodynamic factors, particularly on wall shear stress induced by blood flow [4]. It is therefore important to obtain detailed information on the hemodynamic and structural quantities of the cardio- and cerebral vascular systems. Although medical imaging systems such as MRI (Magnetic Resonance Imaging) and CT (Computed Tomography) can provide adequate information with respect to the anatomical morphology, they can not be used to measure hemodynamic and structural quantities in vivo due to limited resolution and insufficient data acquisition techniques. In particular, measurement of those quantities in the cerebral circulation remains challenging due to the geometric complexity of the system and the presence of the skull and small vessels. On the other hand, in vivo image-based simulations can provide information about hemodynamic quantities in a patient-specific manner using mathematical modeling. This type of information cannot be obtained experimentally. Thus, in vivo image-based simulation has emerged as a new and powerful tool for cardio- and cerebral-vascular studies [5,6].

The author is presently engaged in the development of a patient-specific modeling and numerical simulation system with the aim of obtaining a better understanding of cerebral hemodynamics [7,8]. According to medical statistics [9.10], cerebral aneurysms tend to form at three predominant locations among the at-risk age group ranging from the 40's to the early 60's. The three most likely locations are the junction of the

internal carotid artery (ICA) and the posterior communicating artery (Pcom), the junction of the anterior cerebral artery (ACA) and the anterior communicating artery (Acom), and the junction of the middle cerebral artery (MCA), as shown in *Fig.2*. These locations have common morphological features in that aneurysms tend to form at the apex of the bifurcating arteries where the main artery has large curvature. The vascular morphology varies with age as well as with the structural characteristics of the arterial walls [11]. Thus, it is important to investigate the effects of changes in vascular morphology and arterial structure on cerebral hemodynmaics.

This paper presents two instances of numerical simulations. The first example shows the simulation of blood flow to examine the effects of aneurismal morphology on cerebral hemodynamics through a parametric study. The second example shows the simulation of blood flow and arterial wall interaction to elucidate the effects of structural deformation on cerebral hemodynamics.

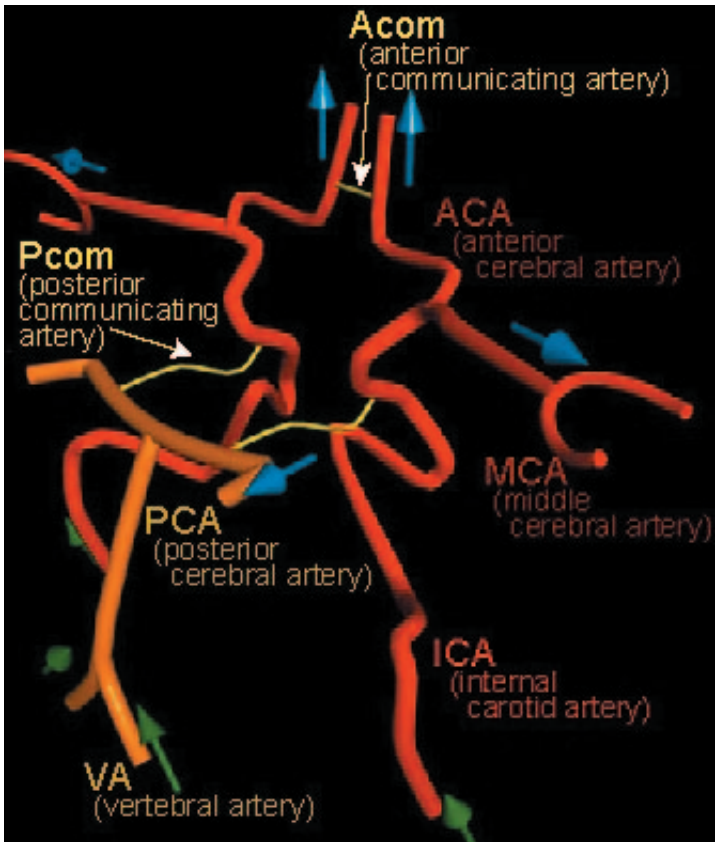

Figure 2:
Schematic illustration of the arterial circle of Willis

2 Patient-Specific modeling and Numerical simulation

The present system consists of patient-specific geometric modeling, grid generation, finite element simulation of blood flow and blood flow-arterial wall interaction, and post-processing including statistical analyses, as summarized in *Fig.3*. Three-dimensional construction of individual vascular geometry is especially important in patient-specific simulation. In general, the modeling process comprises segmentation of medical images and surface construction. The widely used method is based on the marching cubes method [12] in which vascular surfaces are constructed as polygonal surfaces directly from voxels that are segmented using certain threshold values of signals obtained by CT or MRI.

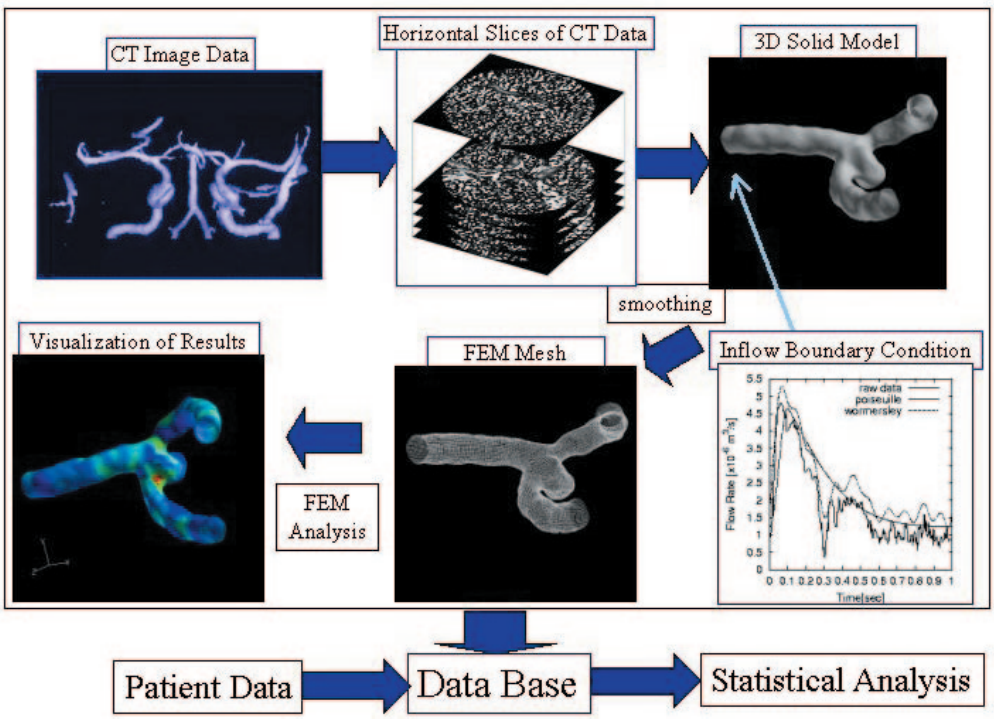

Figure 3:
Patient-specific modeling and simulation system

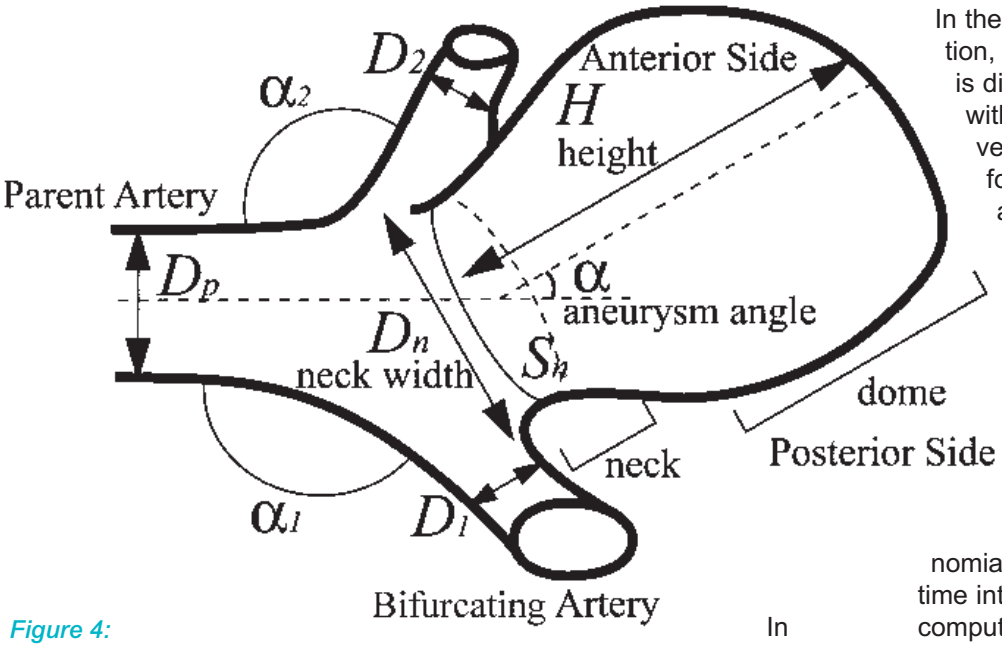

Figure 4:
Schematic illustration of aneurysm with morphological parameters

In this method, however, the polygonal surfaces tend to be over-tessellated. Since the original surfaces affect the numerical simulation and generally result in excessive wall shear stress distributions due to artifacts, it is necessary to perform a smoothing operation using techniques such as surface smoothing [13] or polygonal reduction [14].

After the geometric model is constructed, computational grids are generated for the finite element analyses. Blood flow is assumed to be an incompressible Newtonian flow and is treated as laminar flow. In the present study, the arterial wall is assumed to be an elastic material.

In the case of only blood flow simulation, the computational domain of flow is discretized using brick elements with first-order polynomials for the velocity and piece-wise constants for the pressure. The numerical algorithm is based on the MAC method and the second-order Adams-Bashforth method. In the case of blood flow - arterial wall interaction, however, the DSD/SST (Deforming-Spatial-Domain/ Stabilized Space-Time) method is applied in order to handle moving boundaries and interfaces [15,16]. First-order polynomials are used for both space and time interpolation. Deformation of the computational domain is taken into account and treated as deformation of the integration region. Similarly, the governing equation of the structural part is descretized by the standard Galerkin finite element formulation.

3 Numerical Results

3.1 Parametric study of morphological effects on cerebral hemodynamics

In this study, data from 20 patients with MCA aneurysms is used to investigate the effects of the morphology of an MCA aneurysm on hemodynamics. For example, Ujiie, et al. categorized blood flow in the aneurysm using the apsect raio, $AR = H/D_n$, where H is the height of the aneurysm and D_n is the width [17], as shown in *Fig. 4*.

Figure 5:
Flow characteristics in the aneurysms with different aspect ratios

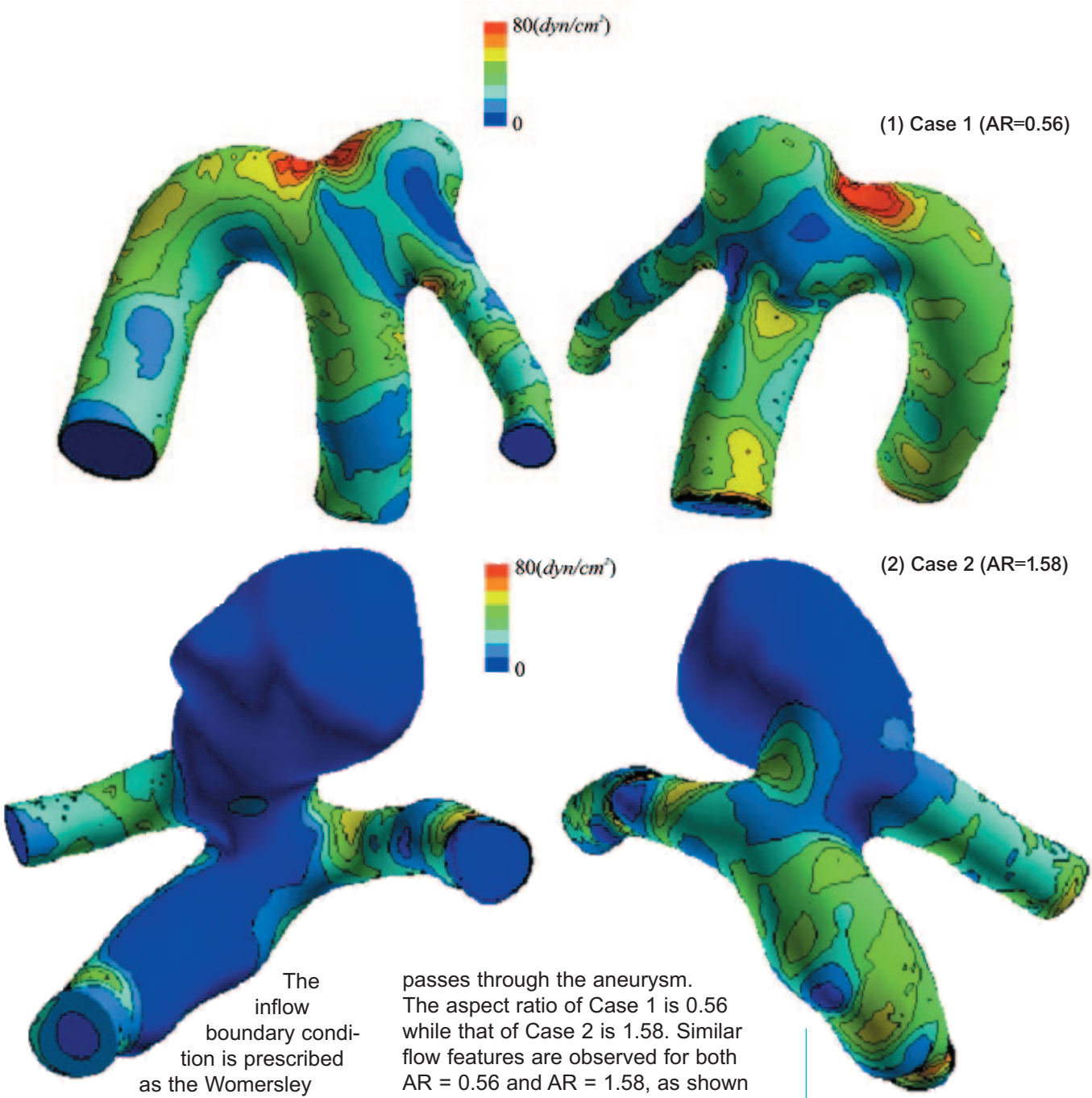

Figure 6:
Comparison of wall shear stress distributions between small and large aspect ratios
(1) Case 1 (AR=0.56)
(2) Case 2 (AR=1.58)

The inflow boundary condition is prescribed as the Womersley velocity profile. The outflow boundary condition is the free-stream condition. The boundary condition at the wall is non-slip. Since the purpose of the present parametric study is to investigate the morphological effects on the hemodynamics, the wall of the artery is assumed to be rigid. Blood is assumed to be a Newtonian fluid and to have a constant kinematic viscosity of 2×10^{-6} m²/s. The resulting Reynolds number varies from 160 to 850 depending on the inflow velocity at the boundary.

Here, let us show two distinctive cases among the 20 cases. According to Ujiie [17], an aneurysm with an AR > 1.6 has a recirculation region inside the aneurysm while that with an AR < 1.6 has no recirculation region and the flow passes through the aneurysm. The aspect ratio of Case 1 is 0.56 while that of Case 2 is 1.58. Similar flow features are observed for both AR = 0.56 and AR = 1.58, as shown in *Figs. 5 (1) and (2)*. The wall shear stress distributions are described in *Figs. 6 (1) and (2)*, respectively.

When the aspect ratio is large, as in Case 2, the wall shear stress in the aneurysm tends to become smaller compared to that in Case 1. Ujiie, et al. mentioned that an aneurysm with an AR greater than 1.6 has a higher possibility of rupturing than one with an AR less than 1.6.

Figure 7 summarizes the relationship between the aspect ratio and wall shear stress based on the numerical results from 20 patients. As the aspect ratio increases, the wall shear stress of the aneurysm normalized against that of the rest of the region decreases, as shown in *Fig. 7*

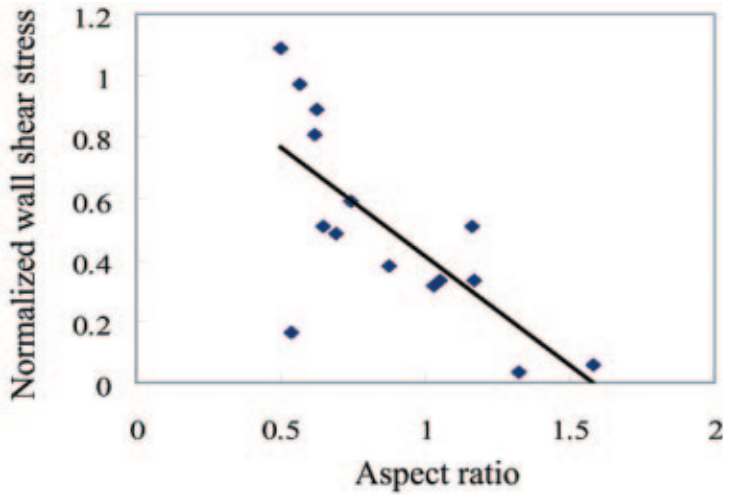

Figure 7:
The relationship between aspect ratio and normalized wall shear stress

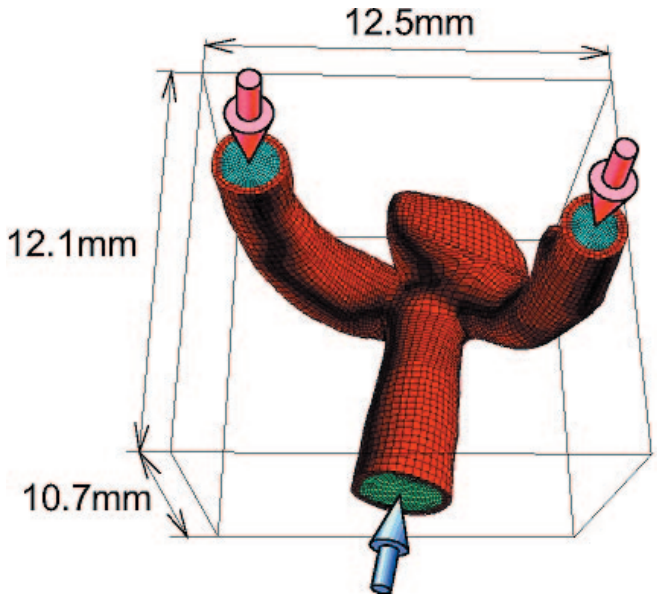

Figure 8:
Analysis model of MCA aneurysm

3.2. *Blood flow – arterial wall interaction*

The analysis is performed for MCA, as shown in *Fig. 8*. The analysis model is constructed using medical images, and the thickness of the arterial wall is assumed to be 0.3 mm with a uniform thickness. The pulsatile condition ranges from a Reynolds number of 160 to 850. The elastic modulus E is determined by comparison with the experimental data [18] and is set at 1.0 MPa. The total number of nodes and elements for the fluid part is 49,395 nodes and 45,760 elements, while the total number of nodes and elements for the structure parts is 18,285 nodes and 12,072 elements, respectively.

Deformation of a MCA aneurysm at the peak of systole is described in *Fig.9*. The maximum deformation is 0.9 mm, and this occurs near the blebs and also at the apex of the branching artery where the maximum wall shear stress is found. The wall shear stress changes with the deformation of the arterial wall. *Figure 10(1)* shows the wall shear stress distribution in the case of a rigid wall while *Fig. 10(2)* shows that in the case of an elastic wall. The magnitude of wall shear in the case of a rigid wall is 300 dyn/cm2 while that of an elastic wall is about 200 dyn/cm2, as shown in *Figs. 10(1) and 10(2)*. The distributions for both cases differ in accordance with the deformation. Since the elastic arterial wall tends to expand in the high-pressure areas, the diameter of the artery becomes large and wall shear stress decreases. Thus, the elasticity of the arterial wall changes both the flow patterns in the aneurysm as well as the wall shear distribution.

4. Future Prospects

This paper presented some examples of patient-specific modeling and numerical simulation of blood flow and arterial wall interaction in an effort to gain a better understanding of cerebral hemodynamics. A computational fluid dynamics-based approach combined with patient-specific modeling is able to provide detailed features of blood flow and the arterial wall. Since the results can be visualized, it is easy to understand what is happening in the blood vessels. Thus, this methodology offers potential as a useful clinical tool to predict the initiation, growth, of rupture of cerebral aneurysms.

At the present, however, the mathematical model includes only macroscopic mechanical functions. If the simulation system can incorporate microscopic functions such as the effects of endothelial cells and also include multi physics functions such as physiological effects, the simulation can more accurately represent phenomena inside the body and can be expected to provide a useful tool for scientific study as well as clinical investigations.

Acknowledgments

The author would like to thank Dr. Kiyoshi Takagi, Teikyo University, Deaprtment of Nuerosurgery, and Dr. Motoyuki Hayakawa, Fujitan Health University, Department of Nuerosurgery, for contributing the CT data used in this study and for their thoughtful advice. The author also would like to thank Dr. Ryo Torii for his contribution in developing the simulation system and Professor Tayfun Tezduyar for his kind advice in developing the flow-structure interaction part of the simulation system. ●

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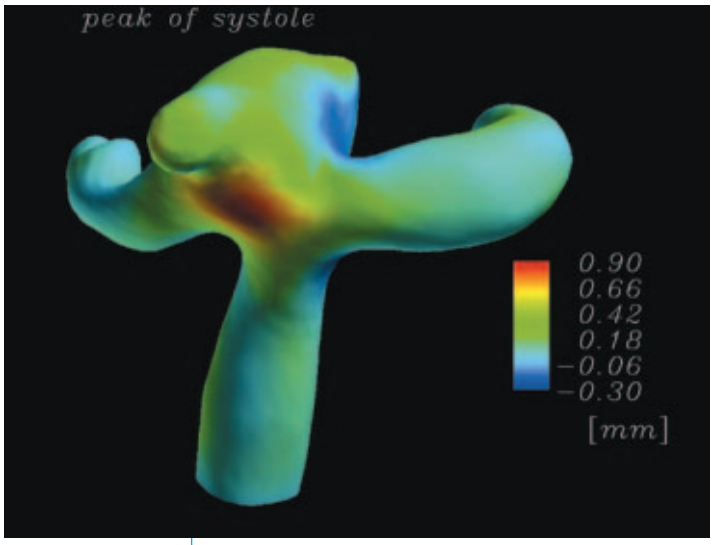


Figure 9:
Deformation of arterial wall

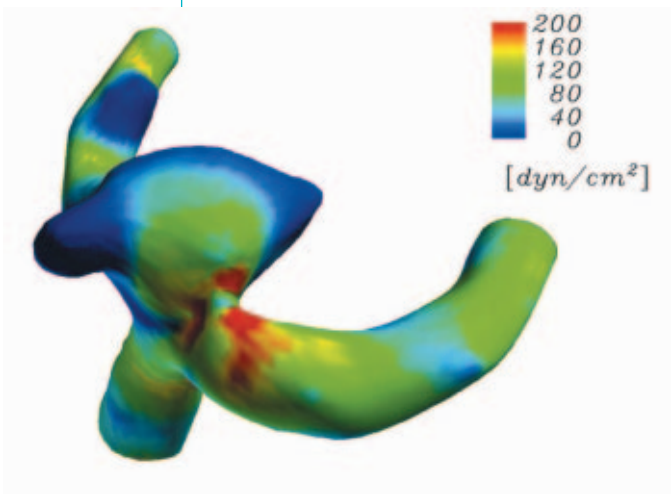
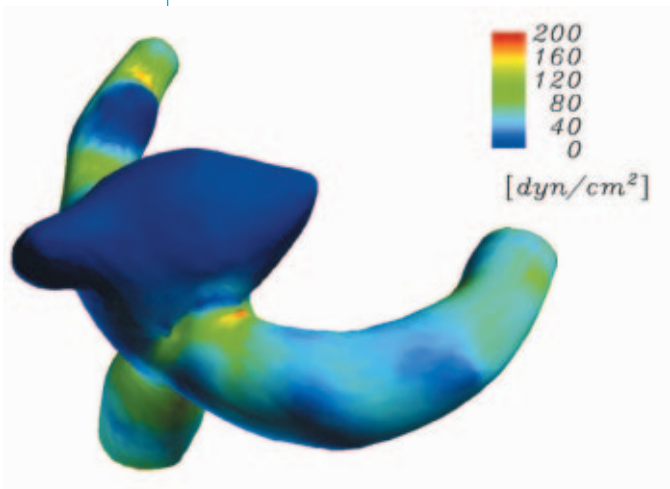


Figure 10 (a) and (b):
Comparison of wall shear stress distributions between rigid and elastic walls. Rigid wall above and Elastic wall below



AM–FEM in Structural Mechanics, a Challenge for the Next Decade

by
Erwin Stein
University of Hannover
Germany

No doubt, that FEM and its variants nowadays is the dominating and leading numerical methodology for solving continuous and discontinuous field problems in research and engineering practice of solid and structural mechanics, especially considering the available powerful commercial general purpose finite element programs for solving a variety of linear and nonlinear boundary- and initial boundary value problems.

The so-called X-FEM's, especially meshfree variants, furthermore discrete elements with process-dependent discontinuities as well as hierarchical and wavelet techniques for implementing asymptotic and efficient dimensional reductions are implemented in various research programs, but these methods are not yet available in the leading commercial finite element program systems.

Verification by A-FEM for reliable and efficient computations

An important development since the late eighties is A-FEM, the adaptive finite element method, based on different *types of a posteriori error estimates of the discretization* error for the reliable (i.e. stable and converging) and cost-efficient enhancements of the finite-dimensional approximation spaces, especially by *h-*, *p-* and *hp*-adaptivity, which is available with rigorous mathematical proofs for certain classes of variational problems and implemented as research versions in many computer programs.

In order to get an appropriate survey of the current state of the art, some classifications are helpful, [2], [3]:

(i) One has to distinguish between *global and goal-oriented error estimates* (for quantities of interest) where the latter need dual (linear) solutions, usually using the same adapted meshes as for the primal solutions. Those quantities of interest may be averaged displacements or tractions of a small subdomain of the boundary as well as linear or non-linear functionals of the whole domain, e.g. the Rice integral as a criterion for crack propagation of an existing crack.

(ii) *Energy based residual a posteriori error-estimates* are natural measures for elliptic boundary value problems; they provide upper bounds of global and goal-oriented error estimates for the primal variational problem by applying the triangle inequality but may not be efficient (or sharp) by strongly overestimating the error. One can derive other representations of residual error estimators with restricted or without upper bound properties which are more efficient and as sharp than the other two types, namely *hierarchical and averaging type estimators* which don't have bounds in case of goal-oriented estimators, but usually yield efficient adaptive approximations. Involving the complementary variational formulations, one can derive lower error bounds, such estimating the approximation error from above and from below which can be necessary for critical problems.

(iii) The next distinction concerns *relative (explicit) and absolute (implicit) error estimates* where the former have unknown interpolation and stability constants, whereas the latter - as really quantitative estimators - allow to realize given error tolerances.

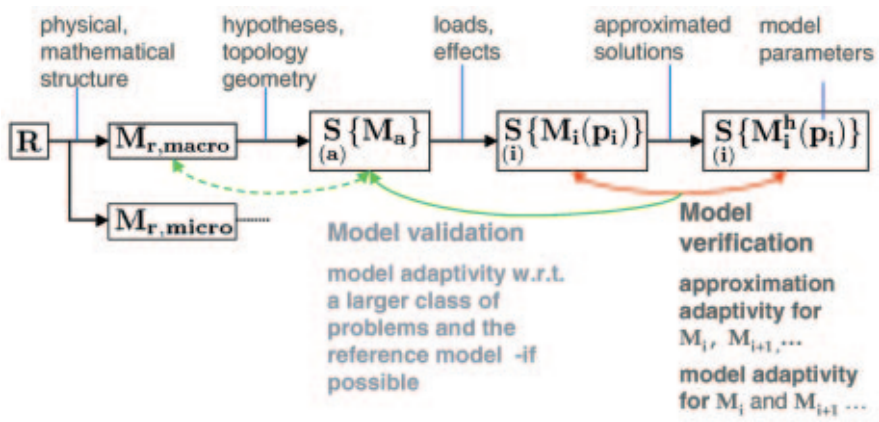


Figure 1:
The process of adaptive modelling and FE-approximation in subdomains of a mechanical system

Relative error estimators are computed by explicit postprocessing where *averaging type* ones only need data from the element domain but no from the element interfaces, whereas *residual and hierarchical type estimates* need data from element interfaces and such from neighboured elements. This is the reason why only averaging type error indicators are implemented in some commercial finite element computer programs so far, e.g. in ANSYS, due to their traditional data and program structures.

Approximated absolute - i.e. constant-free - error estimators need implicit postprocessing with enhanced test spaces. According to the Galerkin-orthogonality, the discretization error can only be approximated - different from zero - by additional test functions with higher p or smaller h, at least by a symmetric and an asymmetric one for each kinematic degree of freedom, in order to get trustworthy estimates.

In case of *residual absolute estimates* they are gained by - improved - C° - continuous (in normal directions) boundary tractions which are computed by local Neumann problems on element level. They yield upper bounds for primal FEM. In case of linearizations of stable nonlinear problems an additional Ritz projection is necessary for the upper bound property.

Hierarchical absolute estimates need the solution of local Dirichlet problems on element patches for hierarchically expanded test functions, generally not yielding upper bounds but good efficiency indices. For linear problems they yield lower bound properties in a corresponding representation.

Lastly, *averaging type implicit estimators* are gained by the so-called SPR method (Super-convergent Patch Recovery), using also enhanced test functions on element patches and the optimal accuracy of approximated gradients in Gaussian quadrature points. Super-convergence is restricted to some conditions for the topology and metric of finite element meshes and the analytical solution as well, but it is not necessary for the usability of this type of estimators.

Numerical verification of a given goal-oriented ensemble of mathematical models for an engineering structure needs the error-controlled parameter identification and numerical analysis - here by A-FEM - for all given load cases in order to guarantee structural safety and integrity with given error tolerances, *figure 1*.

Limited validation by AM-FEM for reliable and efficient engineering modelling and computation

Structural engineers need ingenium - this latin word means imagination, rational thinking, talents for theoria cum praxi, (natural) determination - in order to develop:

(i) the capability and skill of finding optimal material structures in combining expected functions in close connection with structural integrity and safe failure as well as economic demands,

" Structural engineers need ingenium - this latin word means imagination, rational thinking, talents for theoria cum praxi, (natural) determination . . . "

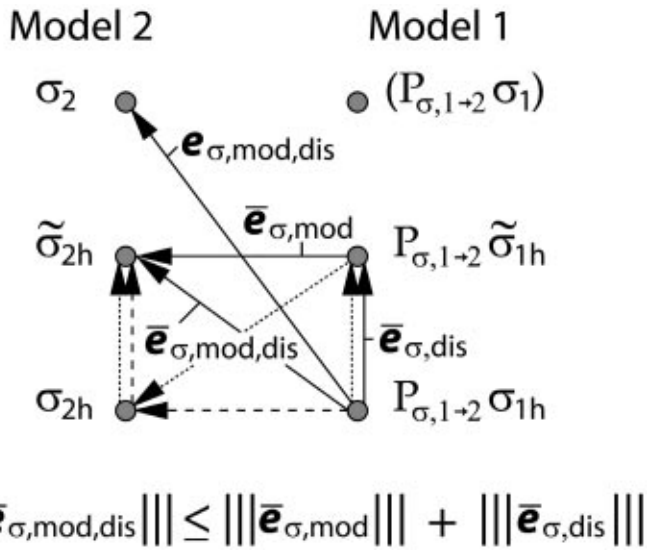


Figure 2:
Decomposition of the coupled a posteriori model- and discretization errors; $\tilde{\sigma}_{II}$ are improved stresses by local postprocessing.

(ii) the theoretical and practical knowledge for finding goal-oriented appropriate physical, mathematical and engineering models according to the claim "as accurate as necessary and as simple as possible."

Adaptive mathematical modelling has to be coupled with A-FEM and depends on many aspects, such as materials and their combinations, the mechanical system with static or dynamic loads, the deformation process and sufficient design resistance against local and global failure states, fatigue limit states and serviceability states, also regarding special risk scenarios if necessary. Probabilistic safety measures, e.g. expressed by fractiles, are lastly determined by political decisions, balancing safety and economy.

AM-FEM is thus the coupled a posteriori error-controlled adaptive modelling and numerical analysis which is discussed in this paper for "compatible" hierarchical models and dimensions on macro-scales as an expansion or updating process from rather simple to more complicated theories in certain sub-domains of the mechanical system during the loading process, capturing the decisive effects, *figure 1*.

An essential feature of model validation - of a purpose-oriented ensemble of compatible models - is the error-controlled (numerical) analysis and parameter identification w.r.t. a reference model nearer to physical reality than the simplified modelling, i.e. the evaluation of the model error in conjunction with the approximation error as near to reality as necessary for the given problem. In that sense, validation is practically limited by the effort and resources concerning time and money and theoretically by fundamental obstacles from the theory of science; for the extensive literature see I. Kant (~1775), K.R. Popper (1935), T.S. Kuhn (1962), P.J. Roache (1998), J.T. Oden and S. Prudhomme (2002) [1], I. Babuska (2003). E. Stein et al. (2004) [2].

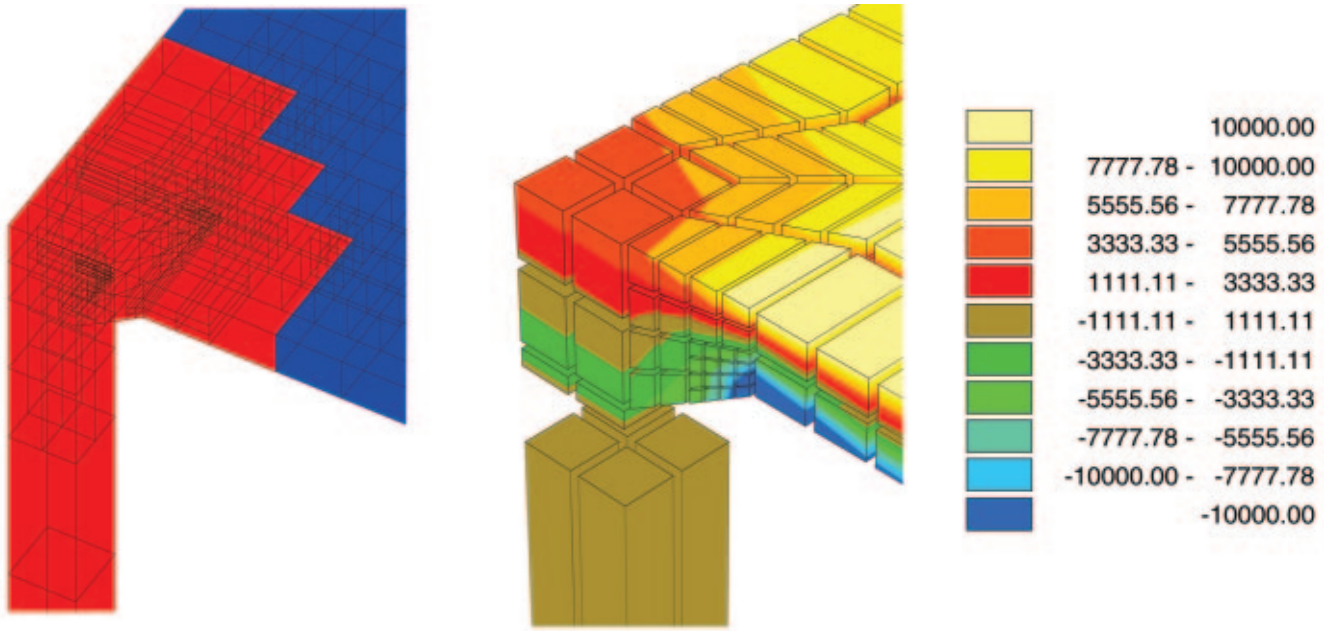
The process of model and discretization adaptivity, illustrated in *figure 1* and published in [2] and [3], points out that several hierarchies of models in space and time of a mechanical system and its deformation processes are needed in order to achieve the same order of magnitude of the errors for the leading physical effects and the discretizations in all subdomains.

Figure 2 shows the decomposition of the approximated a posteriori model and discretization error with an upper bound property. The errors represented here were computed by equilibrated residua, see the first paragraph, and can be analyzed in subdomains of interest, like boundary layers, areas with developing structural or material instabilities, e.g. in conjunction with inelastic deformations. It is complicated and costly to determine optimal spatial interfaces between more and less rich models including dimensions of a system by an optimization process. A direct approximation by a GREEDY method, i.e. moving the interface in both directions and controlling the efficiency quotient of effort and benefit, is more effective, starting with an analytically known decay length of a disturbance in case of elliptic partial differential equations. The use of dual solutions for computing errors of quantities of interest for regional model adaptivity is not efficient so far.

Examples for AM-FEM

In the first example, *figure 3*, a continuous quadratic reinforced concrete slab, haunched at the columns and transversally loaded was analyzed, using 2fiD-elastic Reissner-Mindlin plate elements in regular inner subdomains and anisotropic 3D-elastic volume elements in disturbed areas around the columns with cubic Legendre polynomials in horizontal and linear ones in thickness direction. Depending from the model error, 3D-elements are automatically applied and refined in the disturbed corner area, figure 3(a), and figure 3(b) shows the bending stresses σ_{xx}.

Figure 3:
Coupled adaptivity of a continuous haunched concrete slab supported by columns, perspective view of a part of the slab, computed by S. Ohnimus
Model 1: 2fiD shear-elastic plate theory
Model 2: 3D elastic theory
3a (left): 9th coupled mesh refinement with 2fiD- and 3D-elements,
3b (right): Bending stresses σ_{xx} in the disturbed subdomain



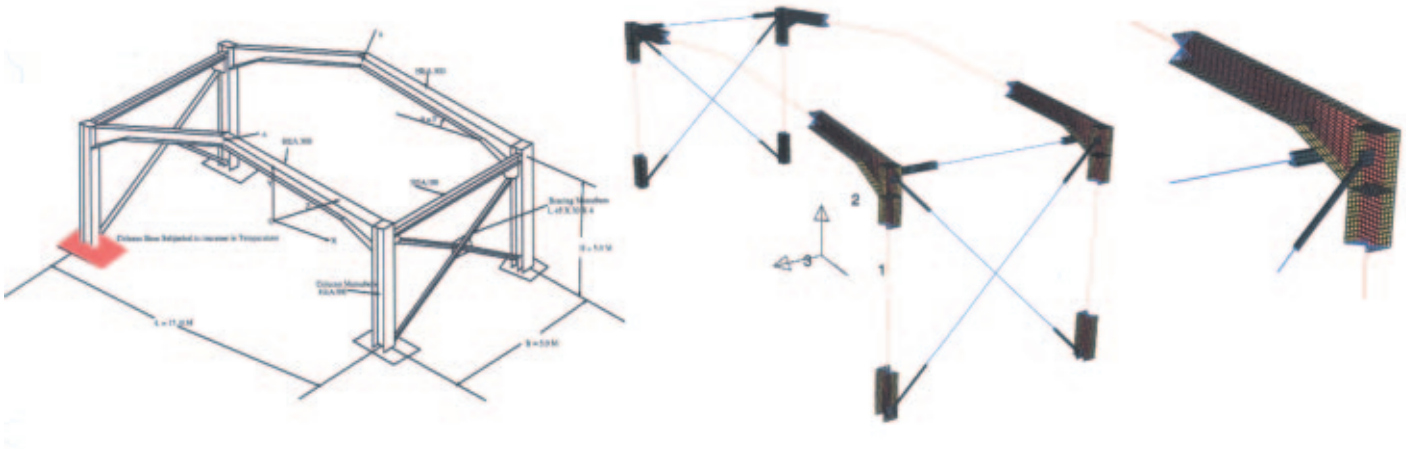


Figure 4:
Consistent coupling of geometrically nonlinear beam and shell elements for a two bay portal frame, computed by K.S. Chavan
4a (left): system,
4b (right) discretized structure with shell elements in the corner areas of the frame where buckling and plastic deformations can occur in the stiffened girders.

Note that by reducing the error tolerances of the approximation and the model error, the subdomain with the expanded 3D-model is enlarged. These computations were carried out by S. Ohnimus, [2], [4], [5].

The second example, *figure 4*, shows the model change for a portal steel frame from 7 parameter beam elements to shell elements in the corner areas where stress distributions in the cross-sections are nonlinear and buckling as well as plastic deformations can appear in thin-walled steel girders. This numerical analysis was performed by K. Chavan, [6].

The transition from a geometrically nonlinear beam theory to a thin shell theory including buckling - also together with inelastic deformations - needs advanced model error estimation which is in progress at the time.

Conclusions

It is obvious that large and complex engineering structures need model adaptivity from simple to advanced models covering various load-depending material and physical effects. It corresponds to engineering thinking and to the general demands of efficiency and profitability to start with adequate simple models and to proceed to complex models for all essential effects. And above all it is and it will be impossible in the next decades to analyze all local and global failure and serviceability states of a wide-spanned modern bridge with the most complex model from the beginnings, because the available computer power is by far not sufficient. Therefore, the challenging new paradigm of reliable and efficient computational mechanics is AM-FEM.

This development is also necessary from the view of norms and codes in structural engineering, e.g. Eurocode 1990-99 "Basis of structural design", "Actions on structures", "Design of concrete structures", etc. Reliable methods in computational mechanics have to interact more than before with the demands of these codes, and - vice versa - the responsible committees for the norms have to implement our advice in order to avoid crucial misunderstandings in applying finite element programs for the proofs of sufficient structural and material resistance. ●

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Computational Mechanics and Information Society Technologies.

A Marriage of Convenience

by
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Information Society Technologies (IST), such as Internet and other advanced communication systems, offer a wide range of opportunities for computational mechanics. Clearly, one of the big challenges in the next coming years will be to transform the huge amount of information provided by Internet via computers and mobile phones of the third (and soon fourth) generation, into knowledge from which one can take decisions to solve a problem.

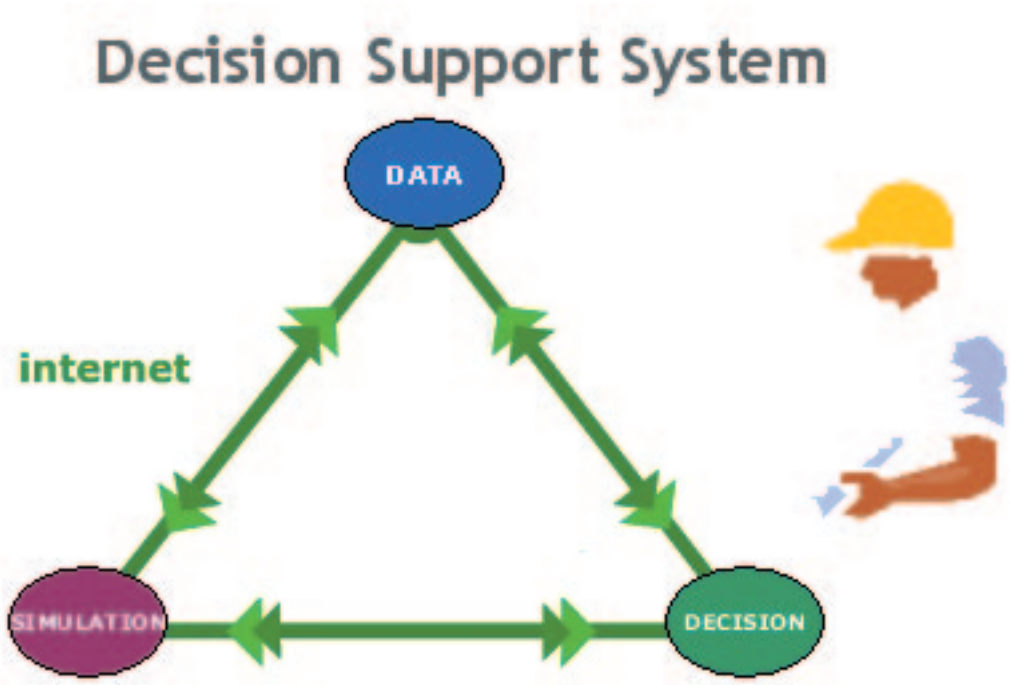

Figure 1:
DSS three node triangle with external human interaction

To achieve this, we need to process the information in order to build up scenarios simulating the predictable behaviour of reality, as an essential step to take the best decision for each particular case. These decision support systems (DSS) will integrate IST tools, computer simulation codes, artificial intelligence (AI) modules and data bases storing piles of information on the scientific, technical, economical and social aspects of the problems to be solved. The new DSS can be represented by a three-node triangle. The upper node gathers the data collection and data processing tasks on a specific problem. The left lower node represents the computer simulation of all the possible scenarios using the available data. Finally, the right lower node collects the AI modules in order to take the best decision to solve the problem. The sides of the triangle linking the activities in the three nodes represent Internet.

The DSS can therefore be visualized as forming a closed loop connecting, via internet, information (data) with the decision through the prediction (simulation). The human beings will be in charge of managing the whole process, and, hence, the ones responsible for the final decision, acting from outside the triangular domain *(Figure 1)*.

Nowadays we can find many examples of this magic three-node triangle. Prediction of the weather is one of these. The activities in the upper node focus on collecting the meteorological data, the lower left node takes care of the weather prediction using advanced simulation models and large-scale computer facilities. In the lower right node the available information is used for weather prediction and for providing practical advice on weather matters to the citizens.

In the next sections we present some examples of ongoing developments of DSS at CIMNE in Barcelona.

DSS for risk analysis and management of emergencies during floods

The objective of the DSS is to predict the risk due to a specific flood situation and to define the corresponding emergency actions.

The DSS is developed within the RAMFLOOD project of the IST Programme of the European Commission [1] coordinated by CIMNE.

The RAMFLOOD DSS integrates meteorological and earth observation data within an advanced geographic information system (GIS). The database of the GIS is continuously updated using satellite data. The simulation of floods on the chosen river basin is performed using a finite volume code which solves the Saint-Venart equations for the flow motion. Numerical results from a large number of flood simulations are used to train an expert system based on artificial neuronal networks (ANN) and Montecarlo methods in order to define the risk level for each flood scenario and propose the adequate emergency actions.

Once properly trained the RAMFLOOD DSS can be used to take real time decisions on flood risk by the direct application of the ANN system using actual meteorological data.

The success of the RAMFLOOD DSS lies on the optimal integration of all the steps involved in the interchange of information between the three nodes of the triangle mentioned earlier. The updating of the geo-environmental data requires its adequate segmentation using object-oriented techniques. The interface of GIS data with computational data is performed using the GiD pre-postprocessing system developed at CIMNE [2]. The use of an efficient and accurate fluid flow solver is also mandatory, as well as the use of distributed (grid-based) techniques for computing the hundreds of flooding scenarios needed for education of the ANN system.

Figures 2 ® 5 show some examples of application of the RAMFLOOD DSS.

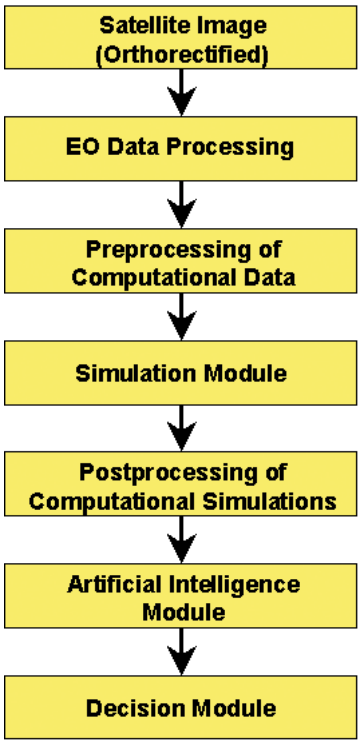

Figure 2: *Flowchart of the RAMFLOD DSS*

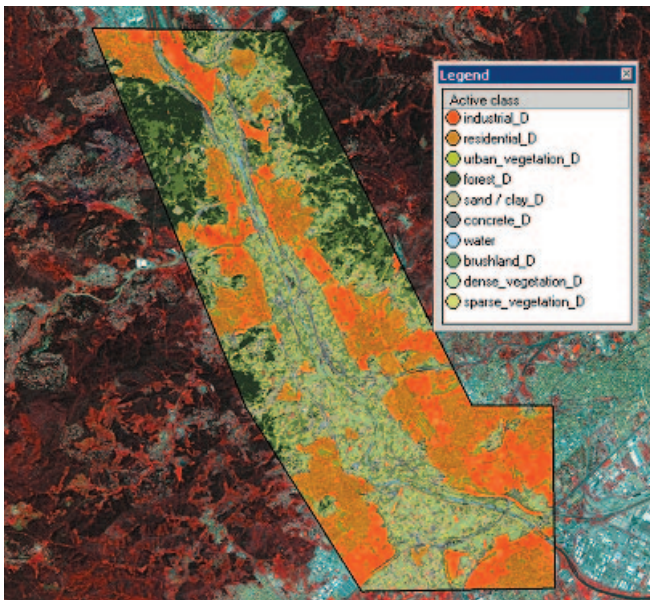

Figure 3: *Segmentation of landscape data in the RAMFLOD DSS*

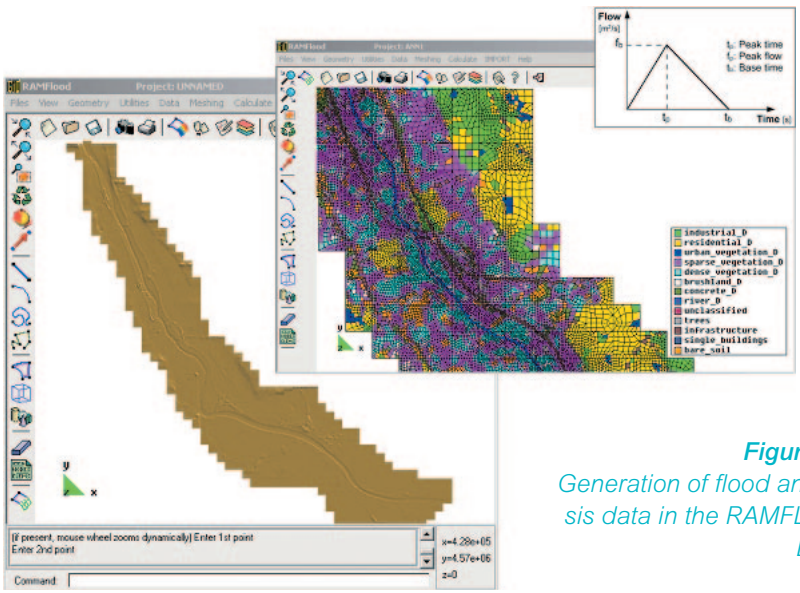

Figure 4: *Generation of flood analysis data in the RAMFLOD DSS*

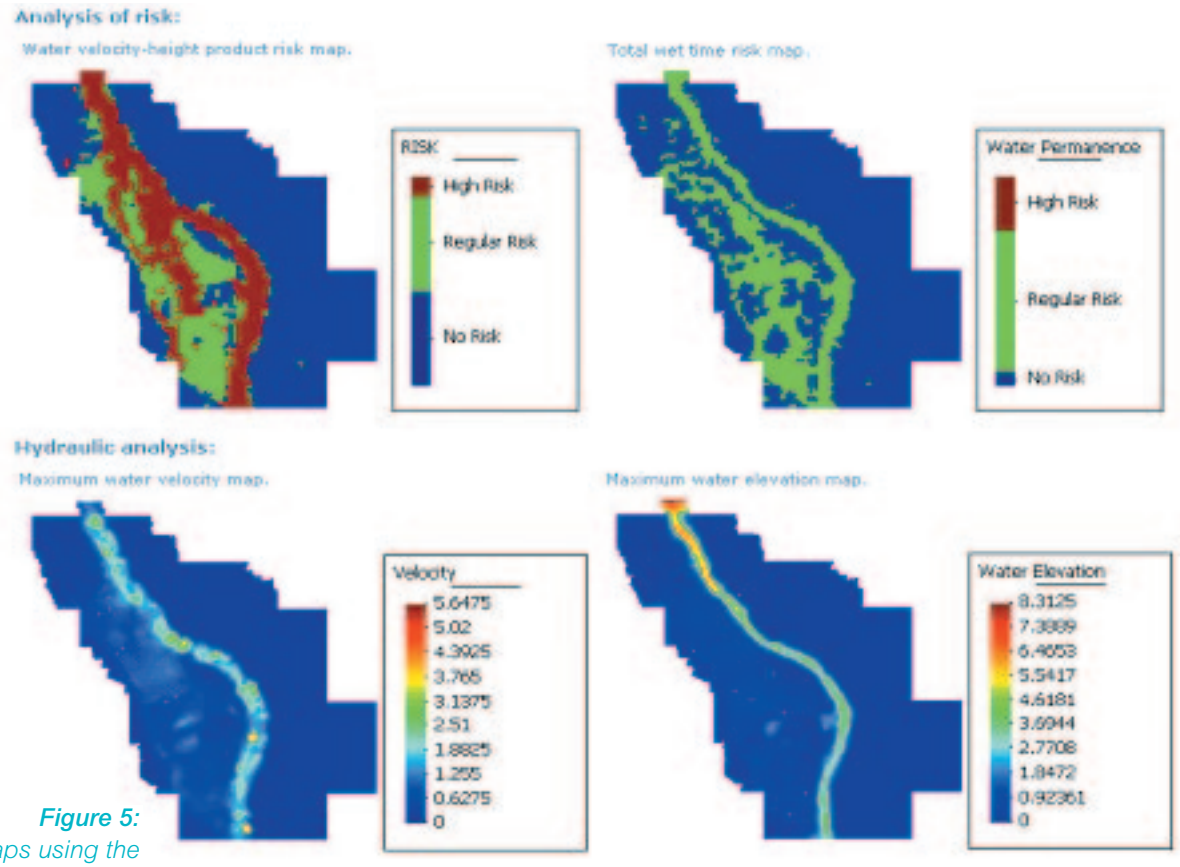

Figure 5:
Flood risk maps using the RAMFLOD DSS

DSS for civil engineering applications

CIMNE is developing a DSS for design of service in urban development projects The services include supply of water, gas, lighting, telephone, sewage, earthwork and road pavement, among others. The DSS combines an internet-managed GIS with algorithms to optimise the design of the different services.

Another DSS developed by CIMNE aims to the optimal managing of the energy consumption in urban areas. The objective of this DSS is to provide information and knowledge on the different energy consume levels in a specific urban region. The final aim is to rationalise the use and maintenance of energy resources. This DSS integrates data of all the energy consumption points in the area with discrete optimisation algorithms and ANN modules. *(Figure 6)*

A promising application of DSS in civil engineering in their use to manage the maintenance of buildings and other civil constructions (bridges, dams, etc.). The DSS in this field currently under development at CIMNE collects and stores data during the building life. Structural analysis codes and simple repair and maintenance rules are used to help the building management team to decide on specific actions on the building.

A DSS for assisting clinical diagnosis and interventions

DSS have a promising future to assist the medical community in taking decisions. Among the many initiatives in this field we note the use of DSS for assisting medical doctors in the clinical diagnosis of cardiovascular diseases, as well as in the design of specific heart interventions and devices. A DSS of this kind is developed within the DISHEART project of the European Commission coordinated by CIMNE [3].

FINAL REMARKS

The need in our modern society to change information into knowledge opens an unlimited number of opportunities for computational mechanics in association with the new IST tools. DSS schematically represented as a three node triangle linking, via Internet, data (information), simulation (computational methods) and decision making modules will be soon an indispensable tool in all engineering fields, as well as in many applied sciences.

Independently of the problem to be solved is important to recall that the final aim of a DSS is to provide information to facilitate the way to solve a problem.

" ... the final aim of a DSS is to provide information to facilitate the way to solve a problem."

Hence, any help for taking a decision must be intimately linked to the source and nature of the data and to the planned use of the information available.

Application of DSS is not, therefore, a step to be taken without considering the different faces of reality.

The temptation of the apparently infinite possibilities of DSS is to think that there is not limit to their applications. Can we envisage a future without risks by managing and linking effectively the activities of the three nodes of the magic triangle? Will one day man be able to control the future?.

These questions have been treated in numerous science-fiction books and movies. The Austrian mathematician Kurt Gödel provided a formal answer in 1931. In a time when Wiener, Von Neumann and Shannon settled the basis of Communication Theory, Gödel proved that a logic system based on axioms contains undecidable questions. In other words, it is impossible that a closed system can answer all the questions. Some questions, therefore, have to be answered from outside the system.

Gödel's theorem reminds us that, despite the complexity of a DSS, there will always be problems which the DSS cannot decide upon, unless we apply criteria which are external to the system. These criteria must invariably be of extra-scientific and extra-technological type and can only be supplied by man, who as a free human being, *acting from outside the system*, will have the capacity to enrich the nodes of the magic triangle with adequate criteria. These criteria will necessarily combine the scientific and technical aspects of the problem with all the other humanistic, historical, environmental, economical and social features that are intrinsic to human life.

In conclusion, the new Information Society Technologies, and in particular the DSS, will open new perspectives in our society as they turn information into knowledge to help in the solution of problems. The judicious use of DSS will indeed bring in many new services to our everyday life, in an attempt to break the time and space barriers. Despite the increasing sophistication of the crossroad of networks, databases and computer simulations is however important to remember that, after all, humans will be the final responsibles for the decisions taken and also for ensuring that the solutions chosen satisfy the necessary social and ethical conditions. ●

" Application of DSS is not, therefore, a step to be taken without considering the different faces of reality. "

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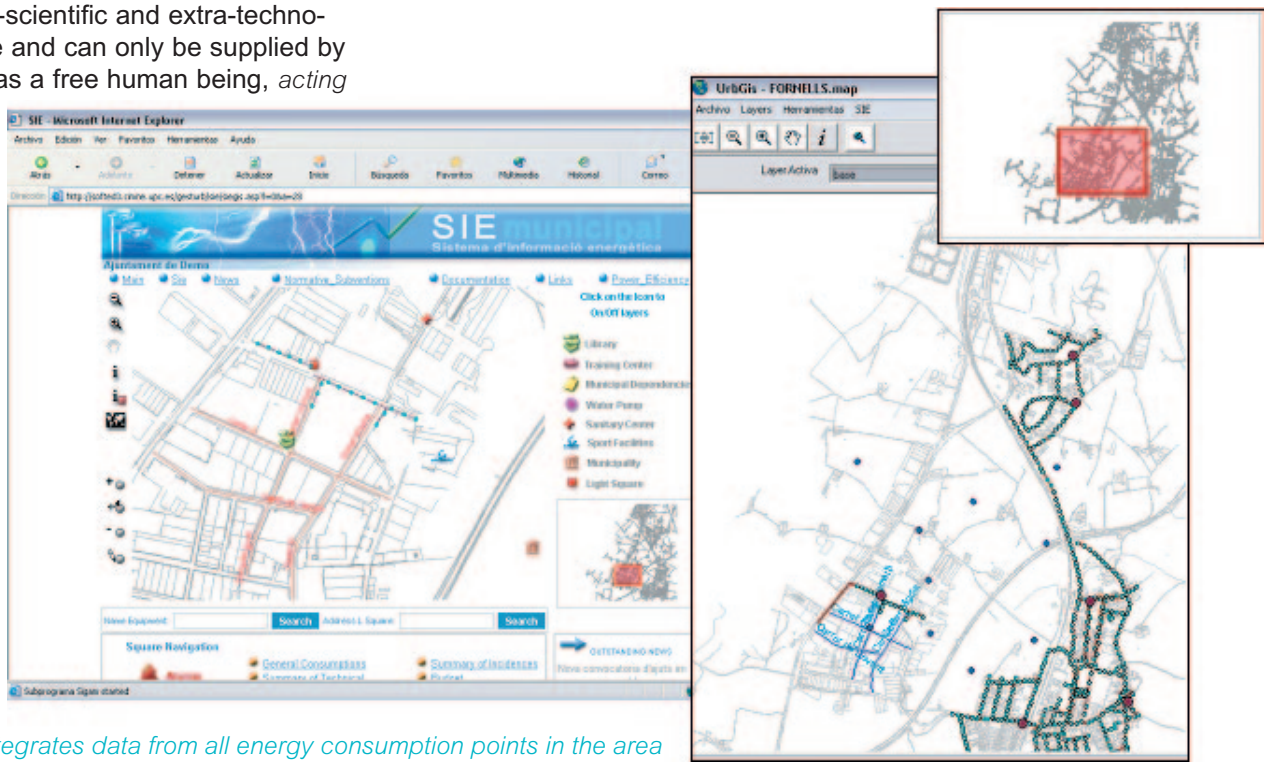

Figure 6:
The DSS integrates data from all energy consumption points in the area with discrete optimisation algorithms and ANN modules.

The IACM Awards and a Brief History of Gauss-Newton Award Winners

by
Thomas J.R. Hughes

"Ray is credited with naming the finite element method and he co-authored arguably the most influential paper in the history of the subject ..."

The first and highest IACM Award, the Congress Medal, also known as the **Gauss-Newton Medal**, was instituted prior to the first World Congress of Computational Mechanics which was held in Austin, Texas in 1986. The first recipient of the Award was **Ray W. Clough**, a highly distinguished University of California at Berkeley researcher in Computational Mechanics and earthquake engineering. The Award was presented to Ray at the first World Congress, and the precedent of presenting IACM Awards at World Congresses was established and has been adhered to almost without exception.

Ray Clough was a very worthy recipient of the first Congress Medal. He made many pioneering contributions to Computational Mechanics prior to 1970. His work focused on the development of finite element methods in structural mechanics. Ray is credited with naming the finite element method and he co-authored arguably the most influential paper in the history of the subject: "Stiffness and Deflection Analysis of Complex Structures," by M.J. Turner, R.W. Clough, H.C. Martin and L.J. Topp, Journal of Aeronautical Sciences, 1956.

The second recipient of the Congress Medal was **John H. Argyris**. The award was presented at the second World Congress, which was held in Stuttgart, Germany, in 1990. John, who recently passed away, was a giant in the history of the subject. His work in computational structural mechanics began in the 1940's. His classic series of papers in Aircraft Engineering in 1954 was a landmark in the development of the finite element method and modern structural mechanics. These articles, co-authored by Sidney Kelsey, were republished in book form by Butterworths under the title Energy Theorems and Structural Analysis. This book, a masterpiece in scientific exposition, inspired a generation of researchers. John held the positions of Professor of Aeronautics at Imperial College in London and Director of the ISD in Stuttgart, a mecca of Computational Mechanics research activity. He founded the international journal Computer Methods in Applied Mechanics and Engineering (CMAME) in 1970.

The one exception to presenting IACM Awards at World Congresses occurred in 1991 when **Richard H. Gallagher** and **Olek C. Zienkiewicz** were awarded Gauss-Newton Medals. Dick Gallagher and Olek both initially researched finite element methods for structural mechanics but were instrumental in the generalization of finite element methods to a wide variety of field problems in other branches of engineering and science. Olek is credited with numerous pioneering contributions in finite elements, including the isoparametric concept of element formation (with Bruce Irons), and the famous Ziekiewicz-Zhu error estimator. He wrote the first text on finite elements (with Y.K. Cheung) which had immeasurable impact on the growth of the subject.

Figure 1:
John R. Argyris, Richard H. Gallagher and Olek C. Zienkiewics together at a conference in 1999

Olek, jointly with Dick, founded the International Journal of Numerical Methods in Engineering. Their long association with the publisher John Wiley and Sons led to the publication of numerous monographs on Computational Mechanics and the founding of many other new journals. Olek continued over the years, in collaboration with Bob Taylor, to update and enlarge the scope of his finite element text. The latest incarnation of the "bible," as it is referred to in finite element circles, encompasses three volumes. There are rumors another edition is in the works. Olek is retired Chair of Civil Engineering at the University of Wales at Swansea. Prior to coming to Swansea, he was Professor at Northwestern University.

Dick Gallagher also wrote one of the earliest books on the finite element method. He published the first tetrahedral finite element along with many other seminal contributions in the 1950's and 1960's. Dick was born and raised in Brooklyn, New York. He attended the Good Shepherd Catholic School, in the Marine Park neighborhood of Brooklyn. (How does the author know this bit of trivia? More trivia: He also attended Good Shepherd!) In addition to Dick's pioneering research contributions, he went on to have a very distinguished career as an academic administrator, holding positions of Chair of Civil Engineering at Cornell University, Dean of Engineering at the University of Arizona, Provost at Worcester Polytech, and President of Clarkson College. Dick passed away in 1997.

In 1994 **J. Tinsley Oden** was awarded the Gauss-Newton Medal at the World Congress in Chiba, Japan. Tinsley profoundly influenced the direction of Computational Mechanics research by recognizing that nonlinear continuum mechanics and mathematics provided the proper basis for future discoveries in the finite element method. His text Finite Elements of Nonlinear Continua published in 1972 was the first in which nonlinear continuum mechanics formed the underpinnings of all developments. Tinsley has made fundamental contributions to virtually all phases of finite element research over a professional career encompassing four decades. He was a pioneer in the development of h,p-mesh refinement strategies and goal-oriented adaptivity. One of his greatest accomplishments was building a series of institutes at the University of Texas at Austin. These were, in chronological order, TICOM, the Texas Institute for Computational Mechanics, TICAM, the Texas Institute for Computational and Applied Mathematics, and ICES, the Institute for Computational Engineering and Sciences. In each instance, the new institute subsumed the former and enlarged its scope. ICES, which occupies its own building of approximately 200,000 square foot is acknowledged to be the premier institute in the field. Numerous leading researchers have become affiliated with ICES as visitors and permanent staff. Tinsley is the Director of ICES, the Associate Vice President of Research, the holder of the Cockrell Regents' Chair at the University of Texas at Austin, and Professor of Aerospace Engineering and Engineering Mechanics.

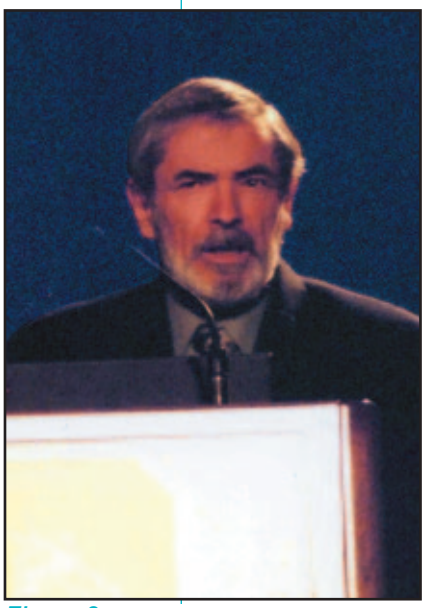

Figure 2:
J. Tinsley Oden

At the 1998 World Congress in Buenos Aires, Argentina, **Thomas J.R. Hughes** and **Erwin Stein** received **Congress Medals**. I have little to say about TJRH, other than he became the second graduate of Good Shepherd School, to receive the Congress Medal. Given that there are only nine recipients of the Award so far and that there are an untold number of grade schools on Earth, it is rather remarkable that two recipients came from the same school. Readers are invited to estimate the probability of this occurrence.

Figure 3:
Thomas J.R. Hughes

Erwin Stein recently retired after a long career as Professor and Chair at the University of Hannover in Germany. Erwin was responsible for creating one of the strongest centers of Computational Mechanics research at Hannover, and is justly famous for the quality of the many brilliant students he produced there who, in turn, went on to distinguished research and teaching careers at leading universities. Erwin remains an active participant in the community and his most recent

focus has been on the soon-to-be released Encyclopedia of Computational Mechanics (Wiley, 2004). Erwin is Principal Editor of this unprecedented publishing project which entails web-based and hard-bound versions.

The most recent Gauss-Newton medalists were **Ted Belytschko** and **Robert L. Taylor** who received their awards at the World Congress in Vienna, Austria, in 2002. Both Ted and Bob are world-renowned researchers and very active participants in all aspects of the field. Ted, a chaired professor at Northwestern University, is famous for his numerous pioneering contributions to explicit transient analysis, the fundamental technology employed in crash and metal forming codes. Ted also became a prime mover in the "mesh free" revolution of the 1990's and wrote several highly-referenced papers on this new analysis technology. Ted recently wrote a highly-acclaimed text on nonlinear finite element analysis which filled a substantial void in the literature. Ted and the author have taught short courses on nonlinear finite element analysis to thousands of industrial and academic researchers and practioners in the U.S., Europe, and Japan, during the last twenty plus years.

Bob Taylor has made fundamental contributions to nonlinear solid mechanics and finite element analysis. He is particularly well-known for contributions to plate and shell elements, contact problems, treatment of incompressible kinematics in the Lagrangian description, and the use of return mapping algorithms in inelastic constitutive theory. His code FEAP is widely distributed and used by many finite element researchers throughout the world. As mentioned previously, Bob is co-author of the recent editions of the finite element "bible." Bob is Emeritus Professor in the Graduate School at the University of California at Berkeley where he previously held the T.Y. Lin Chair. Numerous leading Computational Mechanicians received their graduate training at Berkeley under the tutelage of Bob and his many distinguished colleagues.

In 1998 four additional award categories were introduced by IACM. These are the **IACM Award, the Compu-tational Mechanics Award, the Young Investigator Award, and the Fellows Award**. Descriptions of these awards appear in the Call for Nominations which accompanies this article. A list of recipients of all IACM Awards also accompanies this article.

At the World Congress this year in Beijing, China, the next IACM Award winners will be announced and they will receive their awards at the Awards Ceremony. Because the World Congress is now scheduled to be held at two-year intervals, there will be a reduced number of awards, approximately one-half, compared with recent Congres-ses. Who will be this year's awardees? Who will receive the ultimate prize in Computational Mechanics, the Congress Medal? You are invited to join us in Beijing in September to share in the excitement of the moment. ●

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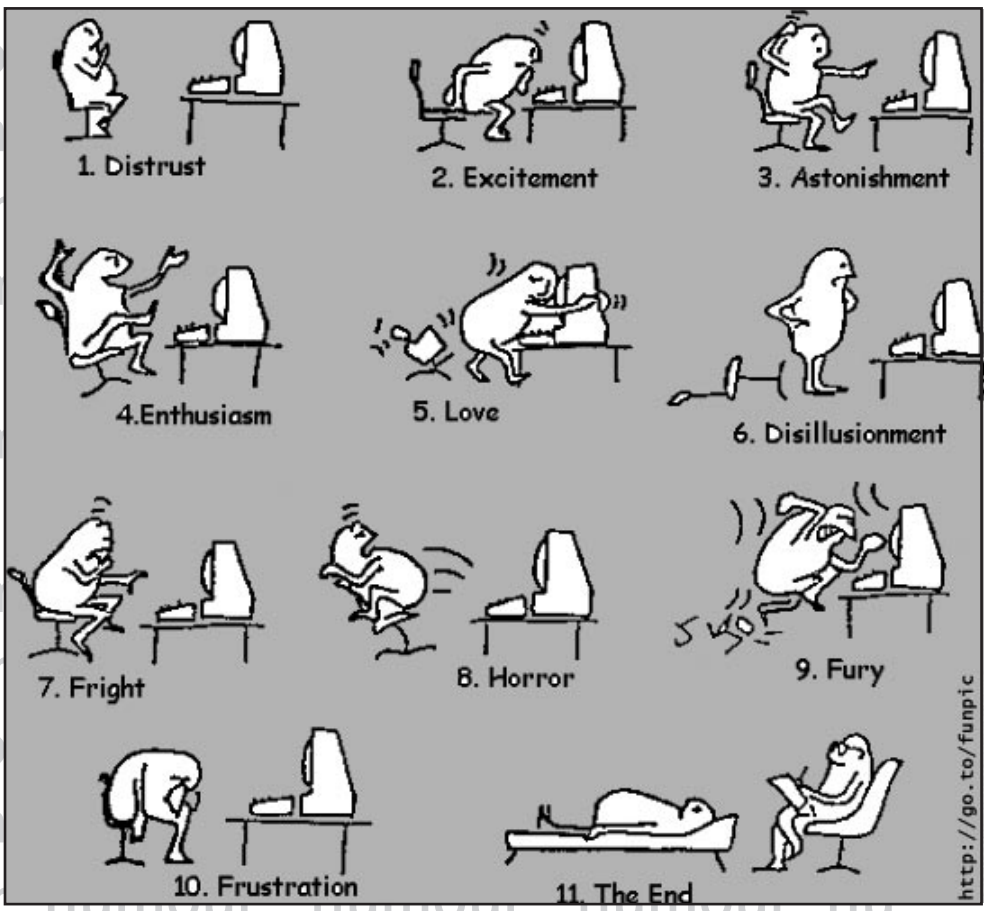

IACM Awards

The International Association for Computational Mechanics announces five awards to recognize outstanding contributions in computational mechanics:

The IACM Award is given in recognition of outstanding and sustained contributions to the broad field of computational mechanics. These contributions shall generally be in the form of important research results which significantly advance the understanding of theories and methods impacting computational mechanics, but special individual contributions in leadership and administration, industrial applications, and engineering analysis that advance computational mechanics shall also represent accomplishments worthy of recognition.

The IACM Award for Computational Mechanics will be given for contributions to traditional areas, such as computational structural mechanics and computational fluid dynamics, but may also be given to recognize contributions outside these specific areas. For example, the Award may be given in recognition of accomplishments in software development, scientific computing, research contributions in computational electromagnetics, semi-conductor device simulation, biomechanics or other areas not traditionally embraced by computational structural mechanics and fluid dynamics but which have general applicability to computational mechanics.

The IACM Award for Young Investigators in Computational Mechanics recognizes outstanding accomplishments, particularly outstanding published papers, by researchers 40 or younger. Eligibility requires that the nominee not turn 41 in the year the award is presented.

The Fellows Award recognized individuals with a distinguished record of research, accomplishment and publication in areas of computational mechanics and demonstrated support of the IACM through membership and participation in the Association, its meetings and activities.

The IACM Congress Medal (Gauss-Newton Medal) is the highest award given by IACM. It honors individuals who have made outstanding, sustained contributions in the field of computational mechanics generally over periods representing substantial portions of their professional careers. The medal is bronze and carries the images of Newton and Gauss in recognition of the synergy between mathematics, numerical analysis, and mathematical modeling of physical events that underpin much of the broad field of computational mechanics.

General guidelines and features of the awards are listed as follows:

Eligibility. All recipients shall be members in good standing of the International Association for Computational Mechanics.

Frequency. The awards shall not be given more frequently than once every two years. In **Beijing, China, September 5-9, 2004** the awards will be given at the World Congress. The next awards will be given at the **WCCM7** Congress in Los Angeles *(www.iacm.info)*

Nominations. The IACM Awards Committee, appointed by the Executive Council, solicits nominations from the IACM Membership. Nominators may nominate no more than one individual for each of the awards, with the exception of the Fellows Award in which case two individuals may be nominated, during the two-year interval between World Congresses. Self-nominations are not accepted. Nominators are invited to submit a one-page maximum combined nominating statement/vita in support of the nominee. The Awards Committee shall select candidate winners of each award and provide its recommendations of recipients to the IACM Executive Council, which shall select the awardees.

The Awards Committee consists of twenty-eight appointees and the most recent winners of each award. The past awardees who are not among the twenty-eight appointees are eligible to vote only for the awards which they received, with the exception of the Fellows Award. It is the responsibility of the Awards Committee to make all preparations for the selection and presentation of the awards to awardees at the IACM Congress. If a member of the Awards Committee is nominated for an award that member is ineligible to vote for that award and is otherwise removed entirely from the selection of that award.

Call for Nominations. All members of IACM in good standing are invited to submit nominations to the Awards Committee Chairman: Professor Thomas J.R. Hughes, The University of Texas at Austin, ICES, 201 East 24th Street, ACES 6.412, 1 University Station C0200, Austin, TX 78712-0027, hughes@ices.utexas.edu. ●

ENIEF'2004

For all inclusions under AMCA please contact:

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http://venus.arcride.edu.ar/AMCA

XIV Congress on Numerical Methods and their Applications
Bariloche, Argentina, 8-11 November 2004

Since 1983 annual meetings on numerical methods in engineering are held in Argentina. They are official congress of AMCA and they begun taking place in Bariloche, city which hosted most of these congress. The **XIV Congress on Numerical Methods and their Applications - ENIEF 2004** will take place again in Bariloche, Argentina, on **November 8-11th 2004.**

Bariloche is one of the most important touristic centres of Argentina. It is a beautiful city in northern Patagonia, located in the majestic Andes mountains, on the southern shore of Nahuel Huapi Lake and at 770 meters above sea level. Located in the Patagonia ecotone, the scenery around Bariloche is extremely varied. The arid low hills and valleys of the steppe to the east merge with the snow-capped Andes with its typical Valdivian cold wet forest. Possible outdoor activities in November include sightseeing, trekking, biking, golfing, wild-trout fishing, among others. Frequent flights connect Bariloche with Buenos Aires, the capital and largest city of Argentina

Figure 1:
A summer view of Lake Nahuel Huapi, at Bariloche

ENIEF 2004 is organized by the Centro Atómico Bariloche, from Comisión Nacional de Energía Atómica (CNEA), Argentina, and sponsored by AMCA and CNEA. The organizing Committee is composed by: G. Buscaglia (Chairman), D. Arnica, E. Dari, L. Guarracino, C. Mazufri, C. Padra, N. Silin and O. Zamonsky.

The topics comprise all areas of numerical methods, in particular in Solid and Fluid Mechanics; Heat and Mass Transfer; Structural Analysis; Bioengineering; Industrial and Environmental Applications; Mathematical Foundations; Optimal Design; Software Development; High Performance Computing.

A Student Poster Session will take place. Both graduate and undergraduate students are encouraged to submit papers to the Student Poster Session. Student Awards instituted by the AMCA will be granted at this Session for the first time. For the paper to be eligible, the student must be its first author.

Further information: G. Buscaglia, Centro Atómico Bariloche, 8400 Bariloche, Argentina. **gustavo@cab.cnea.gov.ar**. Or visit the web page: **www.cab.cnea.gov.ar/enief**. ●

AMCA Awards

The AMCA Awards have been instituted as recognition of the scientific trajectory in the field of computational mechanics and are granted in three categories: Young Researchers; Scientific, Professional and Teaching Trajectory; and International Scientific Trajectory. They have been given every two years since 2000.

The first motivation for these awards was to help the work of outstanding young researchers. It was afterwards extended to the other categories. The award for Young Researchers is reserved for researchers not older than 40 years. Outstanding publications, teaching and application works are taken into account.

The award to the Scientific, Professional and Teaching Trajectory is intended to recognize the research, teaching and professional activities, in the last 10 years, in computational mechanics. In this category, as well as for Young Researchers, mainly the activities accomplished in Argentina are considered. The award to the International Scientific Trajectory, have been instituted to recognize not only the scientific trajectory in the field of computational mechanics but also the interaction with research centres of Argentina. The AMCA awards consists in a statuette made by an argentine artisan. In addition a cash prize is granted for the Young Research award.

Eugenio Oñate and Michel Géradin, in the International Category; Alberto Cardona, Gustavo Sanchez Sarmiento and Angel Menéndez, as Argentine researchers; and Gustavo Buscaglia and Enzo Dari, in the category of young researchers have received these awards.

Nominations for the AMCA Awards 2004 may be sent to the AMCA Secretariat before August 31st 2004. The Awards will be granted in a ceremony during the ENIEF 2004 Banquet in Bariloche, Argentina, on November 11th 2004. ●

SEMNI

Sociedad Española de Métodos Numéricos en Ingeniería

www.semni.org

APMTAC

Associação Portuguesa de Mecânica Teórica, Aplicada e Computacional

www-ext.lnec.pt/APMTAC/

APMTAC-SEMNI Congress on Computational Methods

On **May 31st – June 2nd** the **Congress on Computational Methods in Engineering** was held in the city of Lisbon (Portugal). The congress was jointly organized by the Portuguese Association for Theoretical, Applied and Computational Mechanics (APMTAC) and the Spanish Society for Numerical Methods in Engineering (SEMNI). This congress followed a previous similar joint event held in Madrid on June 2000.

The Lisbon meeting was attended by some 400 participants mainly from Portugal and Spain. The Keynote Speakers to the congress included Prof. A. M Baptista (Oregon Health & Science University, USA), Prof. Manuel Doblaré (University of Zaragoza, Spain), Prof. Charbel Farhat (University of Colorado, USA), Prof. Xavier Oliver (Universitat Politecnica de Catalunya, Spain), Prof. António Reis (Instituto Superior Técnico, Portugal) and Prof. Olé Sigmund (Technical University of Denmark).

A number of Awards were delivered during the congress banquet by the presidents of APMTAC and SEMNI, Profs. C. Mota Soares and M. Casteleiro respectively.

APMTAC delivered the following Awards:
Award for Young Investigators of 2003: Drs. Paulo José Brandão and Barbosa Lourenço. A special honourable mention was given to Prof. Marcelo Hissakiti Kobayashi
Award for the best Ph. D. thesis of 2003 on Computational and Applied Mechanics: Prof. Miguel Pedro Tavares Da Silva
Special Award as Honorary Member of AMPTAC: Prof. Eduardo Arantes e Oliveira and Prof. Carlos Mota Soares.

SEMNI delivered the:
SEMNI Award: Prof. Robert L. Taylor (University of Berkeley).
Juan Carlos Simó Award to Young Scientists: Dr. José Manuel García Aznar, University of Zaragoza.
Prof. Eugenio Oñate was appointed *Honorary President of SEMNI*.

The next joint meeting of SEMNI and APMTAC will take place in the city of Granada, Spain, on 4-7July2005
http://congress.cimne.upc.es/semni05

Figure 1:
Robert Taylor displaying his SEMNI award in the company of M. Casteleiro

Figure 2:
Paulo Barbosa Lourenco receiving the APMTAC Award for Young Researcher 2003 from C. Mota Soares

Figure 3:
E. Oñate (right) delivering the APMTAC Award to C. Mota Soares

USACM Chronicle

United States Association for Computational Mechanics

The 8th USNCCM will be hosted by I.C.E.S. of the University of Texas at Austin from **July 25-27, 2005**.
The Congress website is now open to accepting minisymposium proposals at **http://www.ices.utexas.edu/usnccm8.html**.

Important Dates

April 1, 2004	Web site open for minisymposia proposals
September 1, 2004	Deadline for minisymposia proposals
September 15, 2004	Final selection of minisymposia
July 1, 2004	Web site open for abstract submissions
January 1, 2005	Deadline for abstract submissions
March 1, 2005	Final selection of abstracts
May 1, 2005	Deadline for print-ready abstracts
June 1, 2005	Deadline for early registration
July 25-27, 2005	USNCCMVIII Technical Program
July 24 & 28, 2005	Pre- & post-conference short courses

Scientific Program Committee

John Aidun * Ivo Babuska *
Ted Belytschko * Martin Bendsoe *
David Benson * Tom Bickel *
Tadeusz Burczynski * Mark Bush *
Graham Carey * J.S. Chen *
Mark Christon * Bernardo Cockburn *
Alvaro Coutinho * Clint Dawson *
Paul Dawson * Rene de Borst *
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Joe Flaherty * David Gartling *
Fred Habashi * Bob Haber *
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Tom Hughes * Greg Hulbert *
Mac Hyman * Sergio Idelsohn *
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Herbert Mang * Arif Masud *
Ken Morgan * Bob Moser *
Alan Needleman * J. Tinsley Oden *
Eugenio Onate * Jaime Peraire *
Paulo Pimenta * Peter Pinsky *
Ekkehard Ramm * J.N. Reddy *
Bernhard Schrefler * Mark Shephard *
Stein Sture * Eitan Tadmor *
Charles Taylor * Robert L. Taylor *
Tayfun Tezduyar * Mary Wheeler *
Peter Wriggers * Genki Yagawa *
Mingwu Yuan * Tarek Zohdi *

Plenary Lectures

The Congress will feature three plenary and six semi-plenary lectures by leading experts, including:
Weng Cho Chew, *University of Illinois*
Jacob Fish, *Rensselaer Polytechnic Institute*
Omar Ghattas, *Carnegie Mellon University*
James Glimm, *SUNY at Stony Brook*
George Karniadakis, *Brown University*
Patrick Le Tallec, *Ecole Polytechnique*
Michael Ortiz, *California Institute of Technology*
Tetsuya Sato, *Keio University*
David Srolovitz, *Princeton University*

Minisymposium Topics

In addition to Computational Nanotechnology, Computational Biotechnology, and Computational Multiphysics, the current tentative list of other topics includes: Mesh Generation, Error Analysis, Meshfree Methods, Localization Analysis, Failure Analysis, Applications in Engineering Practice, Optimization and Sensitivity Analysis, Computational Dynamics, Stochastic FEA, Inverse Problems, Coupled Problems in Environmental Engineering, Computational Acoustics, Computational Electromagnetics, Automotive Problems, Advances in Commercial Finite Element Software, Polycrystal Plasticity at the Micromechanical Level, Computational Advances in Modeling Heterogeneous Materials, Geotechnical Applications, Contact-Impact Problems in Nonlinear Mechanics, Discontinuous Galerkin Methods, Computational Combustion, Methods and Applications in Coupled Engineering Simulation, and Advances in Flow Simulation and Modeling.

Congress Organizers

Honorary Congress Chair
J. Tinsley Oden,
The University of Texas at Austin

Congress Chairs
Leszek Demkowicz,
The University of Texas at Austin
Clint Dawson,
The University of Texas at Austin
Joe Flaherty,
Rensselaer Polytechnic Institute

Local Organizing Committee
John Bass
Graham Carey
Clint Dawson
Leszek Demkowicz
Yusheng Feng
(congress secretary)
Tom Hughes
J. Tinsley Oden

For all inclusions under USACM please contact:

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President - USACM
Professor
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Israel Association for Computational Methods in Mechanics

ISCM-15 and 16

Sixteen Israel Symposia on Computational Mechanics have been held over the past nine years. Each Symposium consists of one full day of lectures given by eminent international scientists and prominent Israeli researchers, as well as graduate students and young practitioners.

The Fifteenth Israel Symposium on Computational Mechanics (ISCM-15) was held on October 23, 2003, at Tel Aviv University. The local organizers were Alex Gelfgat and Slava Krylov. Opening remarks by Touvia Miloh, the Dean of the Faculty of Engineering, were followed by the keynote lecture given by Charles Hirsch of Vrije Universiteit Brussel, Belgium, on trends and requirements in CFD towards multiphysics and design oriented applications. Papers presented in two lecture sessions were devoted to computational aspects of Damage and Fracture Mechanics, Thermo-mechanics of Composite Materials, Biomechanics, and Structural Mechanics. The last session in the Symposium was a tutorial lecture given by Leslie Banks-Sills of Tel Aviv University on Finite Elements and Fracture Mechanics. Approximately 60 participants, practitioners and researchers, attended the meeting. The General Assembly of the Association took place during the Symposium, followed by an Award Ceremony for the Third IACMM Paper Competition. The winner, Noam Shemesh who was a student at Tel Aviv University, received a certificate and will present his paper at the European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS 2004), with IACMM support for expenses in attending the meeting.

Figure 1:
Noam Shemesh, winner of the Third IACMM Paper Competition, receives a certificate from Isaac Harari, IACMM President, at ISCM-15.

The Sixteenth Israel Symposium on Computational Mechanics (ISCM-16), dedicated to Soft Computing, was held on March 25, 2004, at the Caesarea Edmond Benjamin de Rothschild Foundation Institute for Interdisciplinary Applications of Computer Science (CRI), University of Haifa. Opening remarks by Martin Golumbic, the Director of the Institute, were followed by the keynote lecture given by Anath Fischer of the Technion - Israel Institute of Technology on reconstruction of large-scale noisy meshes for modeling and analysis. Papers presented in a lecture session were devoted to soft computing techniques for Computational Fluid Dynamics and Solid Mechanics. Two tutorial lectures were given in this Symposium, one on Fuzzy Logic by Yossi Levitas of RAFAEL, and the other on Genetic Algorithms by Daniel Lewin of the Technion - Israel Institute of Technology. Approximately 40 participants, practitioners and researchers, attended the meeting. The General Assembly of the Association took place during the Symposium, including a report by the Auditing Committee. At this time Erez Gal of the Ben-Gurion University of the Negev received a certificate for being nominated as a finalist for the ECCOMAS Award for the best Ph.D. thesis in 2002.

Figure 2:
Larry Manevitz of CRI, Haifa, raises a fundamental question at ISCM-16 on Soft Computing.

Both Symposia were quite successful in terms of attendance as well as the excellent quality of the presentations. The Israel Symposia on Computational Mechanics have become an established setting for the dissemination of knowledge and a fitting forum for the exchange of ideas in the field. These activities will continue at the next Symposium, planned for October 2004 at the Ben-Gurion University of the Negev, with a keynote lecture by Roger Ohayon of the Conservatoire National des Arts et M´etiers, France. ●

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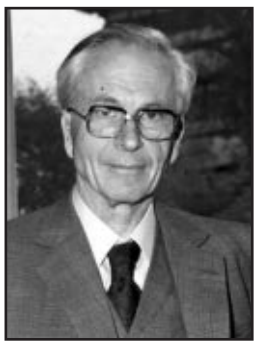
In Memoriam of John H. Argyris



With great sadness we have to realize that the Honorary President of GACM , Professor John H.Argyris, passed away in Stuttgart on April 2nd, 2004. As one of the founders of the Finite Element Method he became a wordlwide leading scholar and scientist in Computational Sciences. The legacy of his outstanding scientific achievements will be remembered for centuries to come.

We asked two prominent members of the German Computational Mechanics Community to write a few thoughts on John Argyris : Professor Erwin Stein who met John in the early 1960's during his time at the University of Stuttgart and Professor Ingolf Grieger, a longtime member of the famous ISD.

Ekkehard Ramm
President of the German Association for Computational Mechanics

Professor Dr. Dr. h. c. John Argyris, Professor Emeritus of the University of Stuttgart, former head of the 'Institute for Statics and Dynamics of Aerospace Structures', passed away, at the age of almost 91.

Born on 19 August 1913 in Volos, Greece, John Argyris studied Civil Engineering in Athens and Munich where he got his diploma in 1936. His first job was with Gollnow in Stettin. After stations in Berlin and Zurich he joined the research department of the Royal Aeronautical Society in England. In 1959 Argyris joined the University Stuttgart and founded the 'Institute for Statics and Dynamics of Aerospace Structures (ISD)'. He wanted to create a computer-oriented computation method, which could solve elasticity problems with the help of numerical methods, instead of differential equations. This lead to the Finite Element Method which mainly goes back to John Argyris. However, he called it 'Matrix Displacement Method' since the term 'Finite Element Method' was coined by R.W. Clough in 1960.

Prof. Argyris has always been a highly appreciated academic lecturer, who could inspire students as well as scientists. His lectures were always held with great enthusiasm and required great concentration from the audience. He was able to create an ideal working atmosphere, so that about 10% of the students of my year stayed on to work at the institute. A highlight was in 1965 with the *'Opening Address to the Conference on Matrix Methods of Structural Mechanics'*, Wright - Patterson Air Force Base, Ohio. All members of his Institute had dedicated themselves to the 200 page presentation *'Continua and Discontinua'* for months.

Industrial applications and the development of a programme for the Finite Element Method required teamwork and strong dedication. John Argyris always knew how to motivate his staff. He himself set a very good example. He gave his staff a lot of freedom in carrying out tasks he had set and only asked for the results to be presented at a certain time. Particularly intense was the effort put into publications and it was always understood that everybody had to give his best and not flinch from putting in extra hours on week-ends. John Argyris was always open for new developments. A large computer was permanently at our disposal and the ISD was one of the first institutes to have a graphic system, all of which immensely facilitated the data control and the evaluation of calculations.

For his scientific work Argyris was awarded numerous decorations. However, such a strong personality also has his drawbacks. He favoured the mathematical formulation of finite elements with the 'Natural Mode Technique'. This only led to rods, beams, triangles and tetrahedron, which, understandably, made the discretisation of three-dimensional structures difficult. Research activities within the institute were strongly supported but not much consideration was given to activities on the outside. Professor Argyris could have seen his aim as a lecturer in founding an entire new school, however, research at 'his' institute was most important to him.

John Argyris has done invaluable pioneer work in the fields of aerospace engineering and various other fields of engineering. The University of Stuttgart has lost one of its great personalities.

Ingolf Grieger
Prof. Dr.-Ing. habil. ,ISD

On April 2nd, 2004, Professor John H. Argyris passed away after a longer period of serious illness. As Professor and Director of the well-known "Institute for Structural Mechanics of Aerospace Structures (ISD)" at the University of Stuttgart, founded and tailored for him in 1959, he was the creator and designer of the Computer-based Computational Mechanics in Germany.

After graduating "with distinction" in 1936, he worked as a structural and project engineer in the steel construction company J. Gollnow & Sohn in Stettin, Germany, at that time one of the leading companies for building wide-spanned bridges and sheds. In 1940 he published his first paper in the Journal "Der Stahlbau", entitled "Investigation of a special (wind-) load case of a three sided cable prestressed radio transmission tower" (in German). In 1940 he enrolled at the Technische Hochschule Berlin for aerodynamics and advanced mechanics and mathematics. He was interned in April 1941 as a consequence of World War 2 but fled to Zürich, Switzerland, in October 1941, where he continued his studies in aerodynamics under the guidance of Professor Ackeret, graduating in 1943.

Figure 1: *At a conference in 1999 together with Tinsley Oden.*

He was lucky to travel to London in the same year where his outstanding career in Computational Mechanics began as a researcher at the Royal Society and as Professor at Imperial College. The following rapid development of rigorous energy-based matrix calculus in structural and fluid mechanics with complementary representations, primarily for beam-type structures, the fifties were strongly influenced and shaped by John with important publications. The break-through of the new methods came with the first commercial digital computers from IBM and Zuse which became available in the early fifties. The first papers on the finite element method with polynomial interpolations of the unknown functions in element domains were published by Courant in 1943 (as a mathematical representation) and by Turner, Clough, Martin and Topp in 1956 in an engineering format for two-dimensional static problems, using the principle of virtual work directly on element and global level. As often claimed by him, he had worked out classified unpublished material long before this but so far this could not be clarified.

The boom of developing and inventing finite elements for a large variety of boundary value problems of elliptic partial differential equations began in the early sixties, stimulated and dominated by John and his very productive Institutes in Stuttgart and London. He invented the concept of "natural strain finite elements" with systematic representations of the TRIM-, TUBA-, SHEBA-, …-series and many other element families for elastic, elastoplastic and creep deformations, and very early he developed algorithms for non-linear structural analysis and dynamic response, e.g. for the cable structure of the wide-spanned stadium roofs of the Olympic Games of 1972 in Munich.

Figure 2: *During a reception together with Ray Clough (Berkeley) and Olec Zienkiewicz (Swansea).*

During a conference on computer-based methods in structural mechanics in 1963 at the University of Stuttgart, a controversial discussion on future trends took place where some well-known Professors advocated to devote more efforts on advanced finite difference methods. At the end – without a winner in this controversy – John put his right index finger into his mouth, then raised it into the air and said smiling something along the lines: I know it because the computational methods derived from energy principles with interpolations in finite element domains have two major advantages: methodological width and depth with logical and algorithmic simplicity and well-posedness in regular cases – and he was completely right,, as we all know.

In that sense the first commercial general purpose finite element program ASKA developed at ISD and released in 1969, was an important milestone in the history of the finite element method and its industrial applications.

Another long-sighted achievement was the foundation and shaping of the international journal "Computational Methods in Applied Mechanics and Engineering" in1970.

John H. Argyris was not only an outstanding scientist and engineer but he also organised and supported the progress of "The Finite Element Method" in many countries with new paradigms for the cooperation in applied science as an international joint venture of university research and teaching together with industrial developments and requirements.

He received many important academic awards, the most famous medals and 33 honorary doctor degrees, among them the Dr.-Ing. E.h. of the Universität Hannover in 1983. The German Community of Computational Mechanics. represented by GACM, is grateful for his many achievements and impulses. We conceive this obituary as a letter of thanks and will treasure John's memory.

Erwin Stein
Professor em., Universität Hannover
Honorary Chairman of GACM

NEWS

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Keynote Lectures:

Fumio Fujii, Gifu University
Computational ¨Entertainment¨ Mechanics

Marie Oshina, University of Tokyo
Blood flow and arterial wall interaction in the cerebral vascular system

Hirohisa Noguchi, Keio University
Multi-scale Material and Structural Stability Analysis by Finite Element and Meshfree Methods

Wolfgang A. Wall, Technical University Munich,
Flows, Shells and their Interaction

Karl Schweizerhof, University Karlsruhe and DYNAmore GmbH
On developments in explicit dynamics and applications in the German automotive industry

Günther Kuhn, Freidrich-Alexander-University Erlangen-Nürnberg
The BEM as special tool for 3D fatique crack growth simulations ●

http://www.icces.uni-hannover.de

IASS - IACM 2005 is the 5th conference of a series of meetings initiated by Working Group No 13 of Numerical Methods for Shell and Spatial Structures of IASS and will take place from **June 1 to 4 in Salzburg, Austria**. It follows the very successful 4th colloquium, held on June 4-7, 2000 in Chania-Crete, Greece, organized and chaired by Professor Manolis Papadrakakis/ Athens, Greece.

The conference will be organised by: E. Ramm, W.A. Wall, K.-U. Bletzinger and M. Bischoff under the auspices of: the International & German Associations for Computational Mechanics (IACM/GACM) and the International Association for Shell & Spatial Structures (IASS)

It is also strongly related to the activities of the European Community in Computational Methods in Applied Sciences (ECCOMAS), also representing the interest of IACM in Europe.

The main objective of this conference is to provide an international forum for the presentation and discussion of recent advances on various aspects of the analysis and design of shell and spatial structures.

In particular, it is intended to reflect the state-of-the-art advances in computational methods in mechanics, software development and engineering practice for shell and spatial structures.

Abstract deadline is November 1, 2004.

For further information please contact: **iassiacm2005@statik.uni-stuttgart.de**

http://www.iassiacm2005.de ●

APACM NEWS

Asian-Pacific Association of Computational Mechanics

Special Symposium

Professor Valliappan´s Retirement from UNSW

A special symposium in honour of **Professor Valliappan** on his retirement from the **School of Civil and Environmental Engineering, UNSW** after 35 years of service was organized by his former students and colleagues on Saturday, 21st February, 2004 at the Four Points Sheraton Hotel, Sydney

In response to the special invitation sent out to Australian and overseas colleagues of Professor Valliappan, the invited lecturers came from Canada, Japan, Germany and within Australia from the states of Victoria, Queensland, Western Australia and NSW.

Figure 1:
Prof. Valliappan

Professor Rory Hume, Vice-Chancellor of the University of NSW delivered the Welcome Address. Interesting and intellectually stimulating papers in the fields of Computational Mechanics were presented. From IACM Council Members, Professor Yagawa and Professor Wriggers were present.

At the time of the Symposium, a Special Volume entitled 'Selected Works of Professor Valliappan' was released and presented to the participants.

"On his retirement Professor Valliappan was conferred the title of Emeritus Professor by the Council of University of NSW". ●

Figure 2:
Group Photo

Figure 3:
Prof. Rory Hume

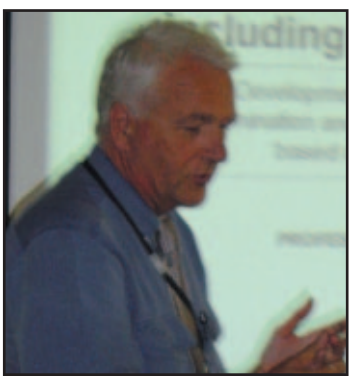

Figure 4:
Peter Wriggers

Figure 5:
Genki Yagawa

For all inclusions please contact:

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University of
New South Wales
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errata - issue 15

Errata 1:
Tarun Kant
IndACM - Review

Errata 2:
Prof. Iu
APACM - EPMESC XI

Thematic Conferences 2005

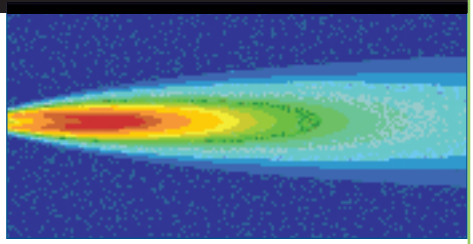
ECCOMAS organizes in Europe Thematic Conferences and Workshops in cooperation with universities, research centers and industry. In 2003 ECCOMAS organized 7 Thematic Events (see www.eccomas.org for details). A total of 15 ECCOMAS Thematic Conferences are planned in 2005. A short description of each event is given below. For more information visit the web address of each conference or the ECCOMAS web page. www.eccomas.org

COUPLED PROBLEMS
Computational Methods for Coupled Problems in Science and Engineering

25-28 May 2005, Santorini Island, Greece

The objectives of the Coupled Problems conference are to present and discuss state of the art, mathematical methods, numerical methods and computational techniques for solving coupling problems of multidisciplinary character in science and engineering. Emphasis will be given on showing the potential of new computational methods for solving practical multidisciplinary problems of industrial interest. The conference goal is to make a step forward in the formulation and solution of real life problems with a multidisciplinary vision accounting for all the complex couplings involved in the physical description of the problem.

http://congress.cimne.upc.es/coupledproblems



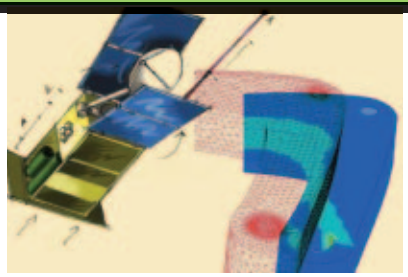
COMPUTATIONAL COMBUSTION
International Conference on Computational Combustion

21-24 June 2005, Lisbon, Portugal

The objectives of this conference are:

- to present the up-to-date state-of-the-art in the field of computational combustion
- to present the actual trends in this field
- to address fundamental combustion issues based on computational methods
- to address combustion technological applications using computational methods

http://navier.ist.utl.pt/compcomb05



MULTIBODY DYNAMICS
II International Conference on Advanced in Computational Multibody Dynamics

21-24 June 2005, Madrid, Spain

Recent developments of computer hardware and general purpose software motivated a demand for efficient analysis and simulation tools by the industry, specially aerospace and automotive, which in turn provoked the need to include in such tools advanced features such as: real-time simulation capabilities, highly non-linear control devices, work space and path planning, active control of machine flexibility and multidisciplinary features increasing the reliability and accuracy of the analysis results.

http://www.mecanica.upm.es/multibody2005

MARINE
Computational Methods in Marine Engineering

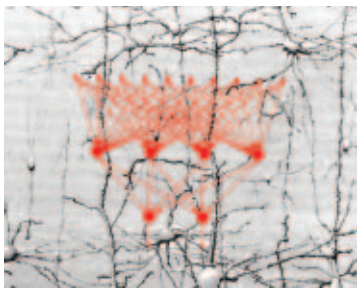
27-29 June 2005, Oslo, Norway

The objectives of the Marine 2005 conference are to present and discuss state of the art, mathematical models,numerical methods and computational techniques for solving problems in the field of marine engineering. Emphasis will be given to showing the potential of new computational methods for solving practical marine engineering problems of industrial interest. The conference goal is to make a step forward in the formulation and computational solution of marine engineering problems accounting for all the complex couplings involved in the physical description of the problems.

http://congress.cimne.upc.es/marine05

NNSC-2005
International Symposium on Neural Networks and Soft Computing in Structural Engineering

June 30 - July 2, 2005 Cracow, Poland



The Seminar will be addressed to young researchers and engineers who are interested in specialized computational methods of artificial intelligence and their applications in structural engineering.

www.pk.edu.pl/nnsc

MESHLES METHODS
International Conference on Meshless Methods

11-14 July 2005, Lisbon, Portugal

The objectives of this Conference are:

- to present the up-to-date state-of-the-art in the field of meshless methods and other mesh reduction methods;
- to encourage discussion and to contribute to new developments in this field.

http://www.math.ist.utl.pt/meshless

SMART STRUCTURES
II International Conference on Smart Structures and Materials

18-21 July, Lisbon, Portugal

The objectives of this Conference are:

- to present the state-of-the-art in the field of smart materials and structures
- to present the actual trends in this field
- to verify the academic viewpoint versus industrial needs
- to search for potential, joint, academia-industry innovative initiatives.

www.dem.ist.utl.pt/~smart05

NMCM
10th International Conference on Numerical Methods in Continuum Mechanics (NMCM) & 4th Workshop on Trefftz Methods.

23-26 August 2005, Zilina, Slovakia

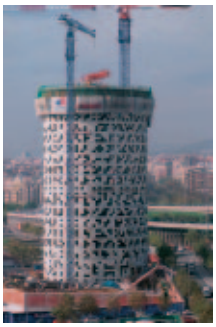
The NMCM conferences are regularly organized in Slovakia, sponsored by the CEACM and by the Slovak Society of Mechanics. The conferences like this enable the researchers of Associated Countries (AC) to present their results and to meet the colleagues from the other countries and newest scientific achievements for lower expenses. In the conferences many prominent scientists from the whole world accept invitations to present their current research results and to meet the researchers from AC. Special sessions (Workshop) on Trefftz methods will be held during all 4 days of the Conference.

http://mppserv.utc.sk/NMCM2005

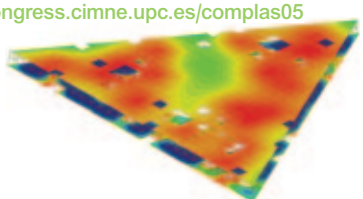
COMPLAS VIII
VIII International Conference on Computational Plasticity Fundamentals and Applications

5-8 September 2005, Barcelona, Spain

COMPLAS 2005 will address both the theoretical bases for the solution of plasticity problems and the numerical algorithms necessary for efficient and robust computer implementation.
The ability to provide numerical simulations for increasingly complex problems isadvancing rapidly due to both remarkable strides in computer hardware development and the improved maturity of computational procedures for non-linear systems. Significant advances have been made in the formulation and implementation of algorithms for static and dynamic problems involving finite strains, complex contact interaction laws, constitutive material behaviours including multi-physics or multi-scale effects, progressive large scale fracturing, etc..



http://congress.cimne.upc.es/complas05



ADMOS II
II International Conference on Adaptive Modeling and Simulation

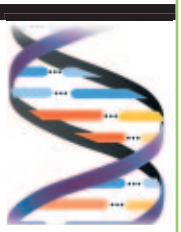
8-10 September 2005, Barcelona, Spain

The objective of ADMOS II is to present and discuss the current state-of-the-art developments on the field. Special interest is devoted to industrial applications of Adaptive strategies.

The design process in the industrial practice is a trial and error loop. In the kernel of the design loop, Numerical Simulations are essential to replace prototyping and laboratory testing. The implementation of the adaptive approach will allow controlling uncertainty in the Simulation part of the design loop.

http://congress.cimne.upc.es/admos05

EUROGEN 2005
Evolutionary Methods for Design, Optimization and Control with Applications to Industrial Problems



12-14 September 2005, Munich, Germany

EUROGEN'05 is the sixth of a series of International Conferences previously held in Las Palmas de Gran Canaria (1995), Trieste (1997), Jyväskylä (1999), Athens (2001) and Barcelona (2003), and devoted to Evolutionary Computing for Industrial Applications. It aims a bringing together specialists from Universities, Research Institutions and Industries developing or applying Evolutionary Methods in optimization of design and emphasizing industrial and societal applications.

http://www.lhm.mw.tu-muenchen.de/EUROGEN05

ICCB 2005
International Conference on Computational Bioengineering

14-16 September, 2005, Lisbon, Portugal

The objective of this conference is to promote a forum for the discussion and diffusion of the recent advances in Computational Bioengineering trying to detect common areas of potential collaboration between researchers of different disciplines within this area.

http://www.dem.ist.utl.pt/~iccb2005

EMG8
8TH European Multigrid Conference

27-30 September 2005, Scheveningen, The Hague, The Netherlands

The conference is devoted to dissimination of recent advances and ideas concerning multigrid, multilevel and multiscale methods.
Multigrid methods are generally accepted as being the fastest numerical methods for the solution of elliptic partial differential equations and among the fastest methods for other types of partial differential equations.

http://pcse.tudelft.nl/emg2005

STRUCTURAL MEMBRANES
II International Conference on Textile Composites and Inflatable Structures

2-4 October, 2005, Stuttgart, Germany

The objectives of STRUCTURAL MEMBRANES 2005 are to collect and disseminate state-of-the-art research and technology for design, analysis, construction and maintenance of textile and inflatable structures. Textile composites and inflatable structures are becoming increasingly popular for a variety of applications in - among many other fields - civil engineering, architecture and aerospace engineering. Typical examples include membrane roofs and covers, sails, inflatable buildings and pavilions, airships, inflatable furniture, airspace structures etc.

http://congress.cimne.upc.es/membranes05

AI-METH 2005
VI Symposium on Artificial Intelligence (AI) Methods

16-18 November, 2005, Gliwice, Poland

The Symposium provides the opportunity to bring together researchers from diverse fields to present the state-of-the-art in the AI field and new applications of AI methods in such domains as: mechanical, material, civil, biomedical, and other engineering, computer science, optimization, management, ecology, etc. The Symposium is a forum of intensive and efficient exchange of new ideas and concepts. It is also known as a valuable forum for PhD students who may present concepts and results of their research.

http://www.ai-meth.polsl.pl

www.eccomas.org

ECCOMAS Thematic Conferences 2005

conference

debrief

The First National and III International Congress in Numerical Methods in Engineering and Applied Sciences

The First National and III International Congress in Numerical Methods in Engineering and Applied Sciences was celebrated in the city of **Monterrey, Nuevo Leon**, with seat in the School of Administration (EGADE) in the Technological Institute of Superior Studies of Monterrey, from the **22 to the 24 of January of 2004**.

The congress was organized by the Technological Institute of Superior Studies of Monterrey (ITESM), in collaboration with the International Center of Numerical Methods in Engineering (CIMNE), the Mathematical Research Center (CIMAT), the International Association for Computational Mechanics (IACM), the Autonomous National University of Mexico (UNAM), the Autonomous University of Nuevo Leon (UANL) and the University of Monterrey (UDEM). Researches from different countries meet up at the congress, with high participation of the Mexican scientific and technological community, as well as the public and productive sectors.

In this appointment agreed investigators from many countries like Mexico, Spain, Peru, Argentina, Germany, the United States, Venezuela, Slovakia, and Italy.

The inauguration of the event was in charge of Dr Alberto Bustani, Director of the ITESM Monterrey Campus, that stressed the importance and impact of the event.

In this congress the most excellent practical and research works were presented. Recent experiences related to some aspect of the numerical methods in engineering and applied sciences were shared. These works were compiled in the proceeding of the congress: a CD that can be reached by Internet inside the Congress web page http://www.cimne.upc.es/congress/mty2004

In the Congress activities, all the key note lectures had an important role. Remarkable interventions from recognized investigators and professionals in the international scope stood out. Outstanding communications were given by Dr. Eugenio Oñate president of the IACM, Dr Bernard Kröplin from the Univ. of Stuttgart, Dr Charbel Farhat from the Univ. of Colorado in Boulder, Dr Ismael Herrera from the UNAM and president of the SMMNICA, Dr Jaume Peraire from MIT, Dr Manuel Doblaré, Director of the Univ Institute. of Investigation of Ing. in Aragón, Dr Tayfun E. Tezduyar from the Univ. of Rice, Houston, Dr Thomas J. R. Hughes from the Univ. of Texas in Austin and Dr Xavier Oliver of the Polytechnic University of Catalonia.

The Congress by itself has marked the big push of the Numerical Methods in Science and the Industry in Latin America and mainly in Mexico where the Mexican Society of Numerical Methods in Engineering and Applied Sciences (SMMNICA) has increased the number of its partners. His president Dr. Ismael Herrera informed, throughout the Congress, important actions to maintain the Society in continuous activity.

It is important to emphasize the interest of the participants to the Congress, due the crowdie attendance in the conference rooms; they were at full capacity throughout the three days of Congress (even on Saturday), demonstrating the big interest developed by the topics treated.

On the social activities emphasized the Congress supper served at the Novotel, (host hotel of the Congress) in where it brightened up an pleasant quartet to accompany a selection by Mexican typical plates.

The closing of the event, made by the Dr. Eugeño García, Director of the Engineering and Architecture Division in the ITESM, was carried out with a detailed summary of the activities made, leaving a very good flavor to all the congressmen. ●

Monterrey, Mexico
22 - 24 January 2004

Figure 1:
Group photo of delegates attending the Congress in Numerical Methods in Engineering and Applied Sciences.

Figure 2:
Profs. B. Kroplin and J. Oliver enjoying a light moment during one of the breaks.

Figure 3:
A well attended lecture in one of the conference halls

Book Report

A Guide to Writing as an Engineer, 2nd Edition

Eds: David F. Beer, David McMurrey
ISBN: 0-471-43074-9, Paperback
John Wiley & Sons
259 pages, April 2004
US $38.95

A Guide to Writing as an Engineer provides a brief, easy to use guide to the technical writing issues critical to today's engineering professionals. Specifically constructed with the needs of engineers in mind, this text offers an "engineering-approach" to technical writing and features practical and relevant examples from today's industry.

This book addresses important writing concepts that apply to professional engineering communication. It deals with the content, organization, format, and style of specific kinds of engineering writing such as reports, business letters, office memoranda, and e-mail. It also covers oral presentations and details how to find engineering information, both in the traditional ways and on the Internet. ●

Handbook of Mathematics 4th Edition

Eds: Bronshtein, I.N., Semendyayev, K.A., Musiol, G., Muehlig,
ISBN: 3-540-43491-7, Softcover
H. Springer-Verlag
2004, XLII, 1157 p. 745 illus.

This guide book to mathematics contains in handbook form the fundamental working knowledge of mathematics which is needed as an everyday guide for working scientists and engineers, as well as for students.

Easy to understand, and convenient to use, this guide book gives concisely the information necessary to evaluate most problems which occur in concrete applications. For the 4th edition, the concept of the book has been completely re-arranged. The new emphasis is on those fields of mathematics that became more important for the formulation and modeling of technical and natural processes, namely Numerical Mathematics, Probability Theory and Statistics, as well as Information Processing.

Written for:
Students, researchers and professionals in engineering, physics and computer science. ●

ICCMS-04

International Congress onComputational Mechanics and Simulation

Indian Association for Computational Mechanics (IndACM), in collaboration with Indian Institute of Technology Kanpur announce ICCMS-04 to be held on **9-12 December 2004** in **IIT-Kanpur**.

The advances in computational mechanics have transformed the way problems in engineering and science are tackled today. Problems in mechanics of solids, structure-fluid interaction and their scientific disciplines are investigated through computational mechanics and implemented in engineering design and manufacturing. Computational mechanics has emerged as a key area of research and application.

The Indian Association for Computational Mechanics (IndACM) was founded on 1 January 2000 to bring together this community to have meaningful interaction to further the growth of computational mechanics in different disciplines. To achieve this objective ICCMS-04 is being organized. The purpose of the Congress is to provide a forum for scientists, engineers and designers in universities, laboratories and industry to share their research findings to further the cause of computational mechanics.

THEMES
- New computational techniques
- High performance computing
- Transient dynamic problems
- Nonlinear mechanics
- Fibre-reinforced composite materials
- Fracture and Damage Mechanics
- Soil-structure interaction
- Fluid-solid interaction
- Smart structures

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Phones: +91-512-259 7756
ashwini@iitk.ac.in
Or refer to the web site:
www.iitk.ac.in ●

ICRA-05

International Conference on Robotics and Automation

The 2005 IEEE International Conference on Robotics and Automation will be held at the Catalonian Palace of Congresses in **Barcelona, Spain** on **April 18 - 22 2005** and will be sponsored by the IEEE Robotics and Automation Society.

IEEE is a non-profit, technical professional association of more then 377,000 individual members in 175 countries. The full name is the Institute of Electrical and Electronic Engineers and is a leading authority in technical areas ranging from computer engineering, biomedical technology and telecommunications, to electrical power, aerospace and consumer electronics, among others.

The Robotics and Automation Society is a very active world-wide research association working on the future of robotics. The conference will join experts in the field of robotics and automation for technical communication through presentations and discussions. The conference will create a remarkable environment to indulge all the delegates in the frontier of science and technology in robotics and automation.

This 5th congress will last five days, consisting of one and a half days of workshops and tutorials and three and a half days of technical presentations with plenary speeches / panel discussions, exhibitions technical and non-technical tours and RA society meetings.

In the year 2000 the number of papers surpassed the barrier of one thousand, with papers coming from North America, Europe and Asia.

Quality is the key aspect of ICRA congresses where, for example, in 2004 only 57% of papers submitted were accepted.

Please contact the below address for any further information required:
CIMNE (Barcelona, Spain)
Tel: (34) 93 401 74 41
Email: icra05@cimne.upc.es
http://www.cimne.org ●

In Memory of
Jean Donea

Jean Donea passed away after a sudden short illness at his summer home in Spain on June 17th 2004. He was born in Belgium in June 1937 and obtained his degree in Civil Engineering from the University of Liège in 1961. The leading edge in engineering mechanics during those years at the University of Liège was provided by two outstanding professors: Ch. Massonnet and B.M. Fraeijs de Veubeke. Jean had the opportunity and ability to work with both them. After his graduation he spent three years working as researcher in the Civil Engineering Department with Ch. Massonnet.

Then the "call from the South" attracted him to the Joint Research Center of the European Commission at Ispra (Italy) where he moved with his wife, Marie-Paule, in 1965. There he developed the majority of his career first as an engineer and then as researcher. In fact, Jean was very quickly attracted by research and was crucial in fostering quality research in his group. With the modesty that has characterized his whole scientific career; he was suggesting doctoral topics for his entourage even before thinking on his own thesis. He completed his doctorate in Applied Sciences at the University of Liège under the supervision of Professor Fraeijs de Veubeke in 1973.

He contributed original and exceptional pieces of research, in particular for accurate time integration in flow problems (Taylor-Galerkin, fractional step methods…) and fluid-structure interaction (arbitrary Lagrangian-Eulerian formulation).

Jean combined this intense research activity with extraordinary skills in management as the Head of the Structural Mechanics Division in Ispra. He was able to put Ispra, this little town in northern Italy, in the map of computational mechanics bringing to the center, and his house, today's prominent figures in the field. He ensured high-quality standards for the research in his group.

At the same time he was able to carry out a visionary project (convincing first all the national authorities of the European Union) building the largest reaction-wall in Europe. In fact, he left Ispra in 1996 just after the inauguration of ELSA (European Laboratory for Structural Assessment). His management and administrative abilities were a direct consequence of his commitment to the Structural Mechanics Division and its researchers.

This early retirement was an excuse to invest time in his two favorite "hobbies": research and teaching. His devotion for teaching was an old story: during his 31 years at Ispra, he would sacrifice his own holidays to teach at the Politecnico de Milano. The retirement of Jean was very particular; he divided his heart between "North and South" and became a Faculty Professor at Liége and Visiting Professor at Barcelona where he delivered courses and advised graduate students at the Technical University of Catalunya (UPC). He still found time to write a book. His energy, activities and his working rhythm were clearly not those of a standard retiree.

Finally, and most importantly, Jean was unquestionably a gentleman both professionally and personally. His modesty, sense of duty and fine humor are assets that complemented the fact that he was an eminent researcher and scholar. This combination made of Jean a remarkable person.

We all mourn his passing, but we also should praise the privilege of having shared time and research with him.

Antonio Huerta
Barcelona, June 2004

iacm news

Professor Dr-Ing. mult. John H. Argyris

The Computational Mechanics Community was shocked to learn of the sudden demise of **Professor Dr-Ing. mult. John H. Argyris.** Our heart-felt condolences go to his bereaved family. May his soul rest in peace.

Ted Belytschko 10 th in the ISI ranking

Ted Belytschko ranked fourth in the field of engineering in the ISI 10 most-cited list of researchers for the first bimonthly period of 2004. He also ranked between 5th and 9th in 2003. The list is compiled by ISI and ranks authors by the number of citations for papers published in the last 10 years. the lists can be found at: ***http://in-cites.com/top/2004/index.html#Engineering***.

Herbert A. Mang elected to U.S. National Academy of Engineering

Prof. Mang was elected to the Foreign Associate of the U.S. National Academy of Engineering.
He was also awarded the degree of Dr.h.c. of the National Technical University of Ukraine (Kiev Polytechnic Institute).

Prof Jean Donea

We are sorry to announce the unexpected and sudden death of **Prof. Jean Donea**. He was one of the pioneers in the development of accurate time integration in flow problems and fluid-structure interaction. He will be very much missed by his many students and friends worldwide.
IACM expresses its condolences and sorrow to his family.

New President of the Australian Association of Computational Mechanics

Prof. Graham Baker has been recently appointed new President of the Australian Association of Computational Mechanics.
He takes on the position held until recently by **Prof. S. Valliappan** who has retired from his academic duties.
We thank Prof. Valliappan for the excellent work done and wish Prof. Baker best of luck in his new position. For details of AACM activities visit: ***http://www.civeng.unsw.edu.au/staff/somasundaram.valliappan/aacm.htm***

New President of the Brazilian Association for Computational Mechanics (ABMEC)

Prof. Paulo Roberto Maciel Lyra has been recently appointed new President of the Brazilian Association for Computational Mechanics (ABMEC). We wish Prof. Lyra much success in his new position.
For details on ABMEC activities visit ***http://www-math.cudenver.edu/ccm/abmec/***

ECCOMAS Awards

The European Community on Computational Methods in Applied Sciences and Engineering (ECCOMAS) has recently delivered the following awards:

- *O. C. Zienkiewicz Award to Young Scientists in Computational Engineering Sciences*, awarded to **Dr. Perumal Nithiarasu** from the School of Engineering of the University of Wales, Swansea, United Kingdom.
- *J. L. Lions Award to Young Scientists in Computational Mathematics*, awarded to **Dr. Mark Ainsworth**, from Strathclyde University, Scotland, United Kingdom.
- *Best Ph.D Thesis of 2003 on Computational Methods in Applied Sciences and Engineering*, awarded to **Dr. Furio Lorenzo Stazi**, from the Università di Roma "La Sapienza", Italy.

Further details on ECCOMAS activities can be found in ***http://www.eccomas.org***

John Argyris Award

The John Argyris Award, offered by the book publisher Elsevier, has been awarded to **Dr. Marcus Wagner**, former post doc student at Stanford University and currently working at BMW Group in Germany.
The Award will be presented to Dr. Wagner at the VI World Congress on Computational Mechanics (WCCM VI) to be held in Beijing, China, from 5 to 10 September 2004 ***http://www.wccm6-apcom04.org.cn/*** .

Science, Democracy, Cooperation and Exchange

The Theme of WCCMVI

Mingwu Yuan
Chairman,
WCCM VI
Peking University
Beijing
China

The sixth World Congress on Computational Mechanics in conjunction with **The Second Asian-Pacific Congress on Computational Mechanics (WCCMVI-APCOM'04)** will be held in Beijing, China, **September 5-10**. We have received 1400 abstracts from 55 countries in the world so far. 83 minisymposia containing 163 sessions or 800 papers have been organized successfully and another 600 regular papers were collected in regular sessions. This Congress will be a great event for the scientists and engineers in the field of computational mechanics. On behalf the Organizing Committee of the Congress I would like to cordially welcome all of the participants come to Beijing, China.

As you may know China has 5000 years of history. Many important discoveries were happened in this country, for example, explosive, compass and printing technique are the highlights in the Chinese history. Tang Dynasty(618-907DC) was the brightest time of China. China has ever been very strong historically. The famous Silk Road from Changan (Now, Xian) to Rome was a great bridge connecting Europe, Middle Asia and Far-east. Trade and civilisation exchanged on this long Road for 12 centuries. Marco-Polo was the delegate of this event, who came to China from Italy. This is an evidence that culture exchanging promoted the developing of economy, science and culture. Many countries on the Road were benefited from this international exchange and cooperation. It was a peaceful road and developing road.

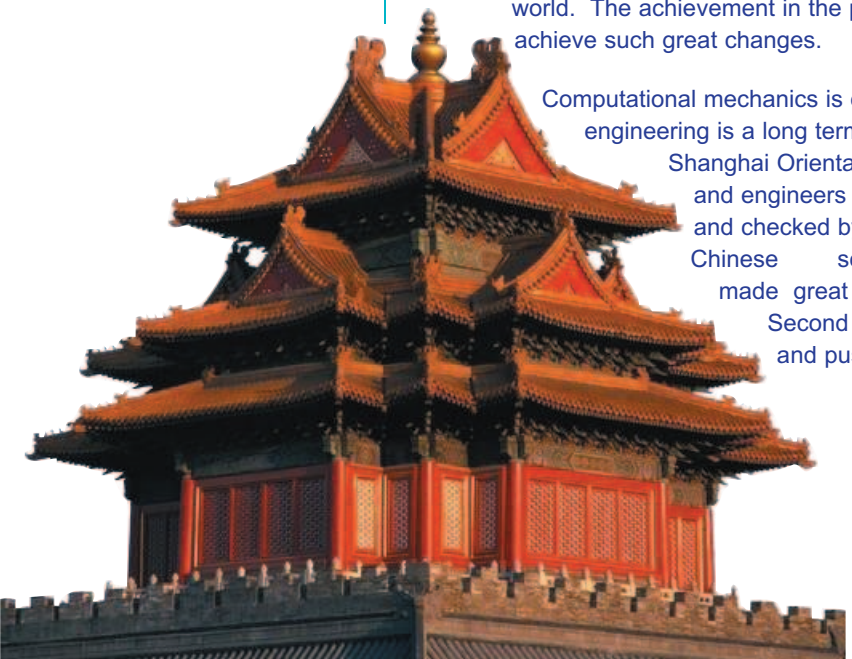
Unfortunately, China has hundreds of year's of dark time during the Qing Dynasty, (1644-1911) the last royal system since the 16th Century. Because of corruption and the closed policy, China lost the chance to learn advanced industrial techniques from Europe and got very behind in the world. China suffered time and became quite weak. Humiliating and unequal treatments made the country even weaker. Inner wars created famine refugee everywhere.

In 1919, the students of Peking University and other universities first shouted the slogan of "Science and Democracy" and recognized that was the way for China to survive. I am proud that the pioneers of this movement were the students of Peking University where I have been studying and working for 50 years.

The most important event in China´s recent history is that Chinese leader, Mr. Deng Xiaoping designed the developing road of reforming and open policy of China. A great change in economy and culture has occurred. As the first group of scholars, we were proud to be sent to United States, United Kingdom, Canada, Germany, Japan and many developed countries. China is gradually joining to the international society and getting the benefit from the world.

From the point of view of the average per population, China is still very poor. Especially in western China, people's living standards are very low. China still has a long way to go in eliminating the difference between the East and West. GDP per population ranks low in the world. China needs a long-term peaceful environment to develop their economy and improve people's living standard. In science and technology, China needs further exchange and cooperation with all the countries in the world. The achievement in the past 25 years indicates that open policy is the major point to achieve such great changes.

Computational mechanics is one of the most successful applied fields in China. Civil engineering is a long term prosperous field. Three Gorge Dam in Yantze River and Shanghai Oriental Pearl Tower are both designed by Chinese scientists and engineers independently. These structures are based on analyses and checked by computational mechanics software. Thousands of Chinese scientists and professors are working in this field and have made great contributions. We are proud that the Sixth WCCM and Second APCOM are to be held in China. It hopefully will promote and push our research to reach a new heights. ■



The theory and practice of computational mechanics defined...

WILEY

Encyclopedia of Computational Mechanics

- Explores the entire spectrum of computational mechanics from theoretical foundations to real world applications
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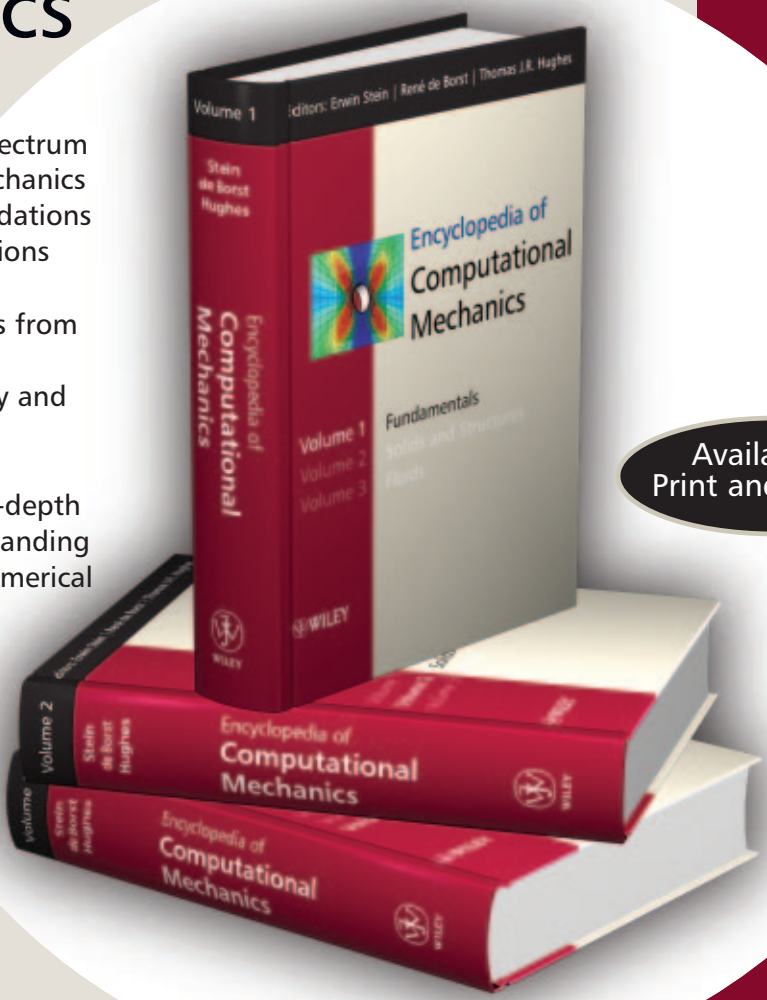
- Includes numerous in-depth articles to aid understanding and assessment of numerical analysis systems



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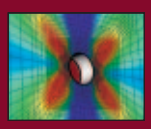

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9 - 12 December 2004	**ICCMS 04 - International Congress on Computational Mechanics and Simulation**		
	Venue: Kanpur, India	*Email:*	ngri@iitk.ac.in, ashwini@iitk.ac.in
		Contact:	www.iitk.ac.in
15 - 17 December 2004	**ICCM2004 - International Conference on Computational Methods**		
	Venue: Singapore	*Contact:*	http://www.nus.edu.sg/ACES/ICCM2004.htm
18 - 22 April 2005	**ICRA05 - IEEE International Conference on Robotics andAutomation**		
	Venue: Barcelona, Spain	*Contact:*	http://www.irca2005.org
4 - 6 April 2005	**FEF05 - 13th Conference on Finite Element for Flow Problems**		
	Venue: Swansea, Wales	*Email:*	o.hassan@swansea.ac.uk
		Contact:	http://www.swansea.ac.uk/fef05
25 - 28 May 2005	**Computational Methods for Coupled Problems in Science and Engineering**		
	Venue: Santorini, Greece	Contact:	http://congress.cimne.upc.es/coupledproblems
1 - 4 June 2005	**IASS IACM - 5th Int. Conference on Computation of Shell & Spatial Structures**		
	Venue: Salzburg, Austria	*Email:*	info@iassiacm2005.de
		Contact:	http://www.iassiacm2005.de/
14 - 17 June 2005	**Third M.I.T. Conference on Computational Fluid and Solid Mechanics**		
	Venue: Massachusetts Institute of Technology, Cambridge, U.S.A.		
		Contact:	http://www.thirdmitconference.org
21 - 24 June 2005	**ECCOMAS Thematic Conference on Computational Combustion**		
	Venue: Lisbon, Portugal	*Contact:*	www.eccomas.org
21 - 24 June 2005	**II International Conference on Advances in Computational Multibody Dynamics**		
	Venue: Madrid, Spain	*Contact:*	www.eccomas.org
27 - 29 June 2005	**Computational Methods in Marine Engineering**		
	Venue: Oslo, Norway	*Contact:*	http://congress.cimne.upc.es/marine05
30 June - 2 July 2005	**NNSC2005 - International Symposium on Neural Networks and Soft Computing in Structural Engineering**		
	Venue: Cracoe, Poland	*Contact:*	www.pk.edu.pl/nnsc
4 - 7 July 2005	**VII Congreso de Métodos Numéricos en Ingeniería**		
	Venue: Granada, Spain	*Contact:*	www.semni.org
11 - 14 July 2005	**ECCOMAS Thematic Conference on Meshless Methods**		
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18 - 21 July 2005	**II ECCOMAS Thematic Conference on Smart Structures and Materials**		
	Venue: Lisbon, Portugal	*Contact:*	www.eccomas.org
24 - 28 July 2005	**USNCCM'05 - 8th US National Conference on Computational Mechanics**		
	Venue: Austin, Texas, USA	*Contact:*	www://www.ices.utexas.edu/usnccm8.html
23 - 25 August 2005	**NMCM - 10th International Conference on Numerical Methods in Continum Mechanics and 4th Workshop on Trefftz Methods**		
	Venue: Slovakia	*Contact:*	http://congress.cimne.upc.es/NMCM2005
5 - 8 September 2005	**COMPLAS VIII - VIII International Conference on Computational Plasticity**		
	Venue: Barcelona, Spain	*Contact:*	http://congress.cimne.upc.es/complas05
8 - 10 September 2005	**ADAMOS II - International Conference on Adaptive Modelling Simulation**		
	Venue: Barcelona, Spain	*Contact:*	www.cimne.com
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	Venue: Munich, Germany	*Contact:*	www.eccomas.org
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16 - 18 November 2005	**AL-METH 2005 - VI Symposium on Artificial Intelligence**		
	Venue: Gliwice, Poland	*Contact:*	http://www.al-meth.polst.pl
4 - 8 June 2006	**CSSM 2006 - III European Congress on Computational Solid and Structural Mechanics**	*Email:*	carlosmotasoares@dem.ist.utl.pt
	Venue: Lisbon, Portugal	*Contact:*	www.dem.ist.utl.pt/~cssm2006
16 - 22 July 2006	**WCCM7 - VII World Congress on Computational Mechanics**		
	Venue: California, USA	*Contact:*	WCCM7@mail.mech.northwestern.edu.
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