

MINUTES of the 7th IASSAR Subcommittee 1 on "Computational Stochastic Mechanics"

MEETING DATE: August 5, 1998
MEETING TIME: 6:00 - 7:10 pm
LOCATION: 106 CCE, University of Notre Dame, Notre Dame, IN, USA
ATTENDING: Profs. G.I. Schueller (chair), University of Innsbruck,
E.A. Johnson (recorder), University of Notre Dame,
A. Ams, University of Karlsruhe, (guest)
L.A. Bergman, University of Illinois at Urbana-Champaign,
C. Bucher, Bauhaus University Weimar,
O. Ditlevsen, Technical University of Denmark,
R. Ghanem, Johns Hopkins University,
M. Hoshiya, Musashi Institute of Technology,
H.J. Pradlwarter, University of Innsbruck,
B.F. Spencer, Jr., University of Notre Dame, and
W.V. Wedig, University of Karlsruhe.

(Apologies for inability to attend were received from
Profs. M. Kleiber, F. Poirion, A. Der Kiureghian, T. Takada,
G. Deodatis, and A. Kareem.)

DISCUSSION TOPICS:

1. Welcome of members.
2. Organizational Matters/Membership:
 - a. The chair has asked M. Kleiber and F. Poirion to join the committee; they have accepted, but were unable to attend this meeting.
 - b. The minutes of the last meeting (Santorini, June 9, 1998) were approved without comment.
3. Address of the new Chairman of the "Umbrella"-Committee (Ditlevsen)

Prof. Ditlevsen summarized the previous meetings in San Diego and Santorini. He emphasized the need to discuss the future of the IASSAR committees, especially in terms of our opportunities and plans to educate, particularly through use of the internet and, possibly, thinking forward to the development textbooks. He noted that those in various areas of reliability can take advantage of the work and the methods developed in stochastic structural dynamics. International agreement on terminology is also needed. Prof. Ditlevsen also noted that a WWW home page for the IASSAR committees was still intended for the near future. Of all of the subcommittees, SC1 remains the most active.
- 3b. Prof. Schueller reported briefly on the Parallel Processing workshop he and others attended earlier in the day, organized by WG2 just prior to the SSD'98 conference. He thanked the organizers of the course in particular Professors Spencer, Bergman and Johnson for their respective efforts.
- 3c. Prof. Schueller reported on working group (WG) assignments and a list of members yet unassigned to a working group. The current WG memberships

are as follows

Working Group 1: Development of Design Codes

Ghanem (coordinator)
Bucher Haldar Takada
Deodatis Shiraki Zhang

Working Group 2: Parallel Computation

Bergman/Spencer (coordinators)
Deodatis Johnson Schueller
Ghanem Pradlwarter

Working Group 3: Monte Carlo Simulation - Fragility Curves

Deodatis (coordinator)
(this includes s subsequent change in membership)
Bergman Grigoriu Takada Spencer
Der Kiureghian Naess Shinozuka

Working Group 4: Monte Carlo Simulation - Efficient Algorithms

Pradlwarter (coordinator)
Bergman Johnson Poirion Spencer
Grigoriu Naess Schueller Takada

4. Reports from the Working Groups and their 2-year plans

4.1 WG1: Influence of Stochastic Computational Methods on the Development of Design Codes (Ghanem)

Prof. Ghanem distributed a list of discussion items as follows (clarifications from the discussion are in brackets):

A. Looking into the future: Technological Impetus

1. Possibility of continual monitoring of various motion and state indices [e.g., health monitoring]
2. Availability of remote databases of material properties and related charts [i.e., available over the net, perhaps with a home page at someplace like NIST]
3. Availability of remotely executable computer codes [perhaps "certified codes"; again, available on the net from, for example, NIST]

B. FACTS(?):

1. Design codes must yield the same design under similar data, independently of the designer.
2. Ambiguity and the need for item (1) are the result of uncertainty in models and data.
3. Increased confidence in knowledge and data should be reflected in a reduction in factors of safety.
4. Current performance-based design concepts permit the design with respect to varying data conditions. They do not modify the state of knowledge.

[Bucher commented that cost-effectiveness is extremely important.]

C. Questions to be addressed by a scientific group

1. How can emerging technologies be used in order to improve the state of knowledge and improve confidence and utility of data?

2. What architecture would this entail of a future code (maybe a client-server format)?
3. An evolving database of case histories may be useful
4. Efficient certified and remotely accessible algorithms for various applications
5. How would continual sensing of the evolution of the state of a structure affect the confidence, and hence the safety factors, in the structure ?
6. Would a rigorous continuum mechanics basis for damage backed by an extensive experimental database (e.g. for stochastic finite elements) be useful?
7. Develop an extensive database for benchmark cases (e.g., standard deviation of solution at the center and supports of a beam or a plate given the coefficient of variation of the material properties). Particular cases can be obtained from these cases via interpolation. Uncertainty in whole structure can be obtained by synthesizing the uncertainty from individual components.

A discussion of sensors and health monitoring, notably in new bridges, followed. It was concluded that such data is extremely important for analysis and design of future structures, and may be expected to become yet more critical in the future.

4.2 WG2: Parallel Computing (Spencer/Bergman)

Prof. Spencer reported that the High Performance Computing Workshop was conducted by Prof. Andrew Lumsdaine (Univ. of Notre Dame) earlier in the day. There were approximately 20 participants in the day-long workshop.

4.3 WG3: Monte Carlo Simulation - Efficient Algorithms (Pradlwarter)

Prof. Pradlwarter summarized the discussion about WG3 in Santorini, saying that the scope of the WG need not be limited. Members agreed.

Prof. Ghanem asked what should be done with Monte Carlo results, pointing out that the results are often unmanageable due to overabundance or lack of data; examples from environmental engineering were given.

4.4 WG4: Monte Carlo Simulation - Fragility Curves (Deodatis)

Prof. Deodatis was unable to attend, but the chair read an e-mail from him, stating (in brief):

No notable news to report. Working with Prof. Shinozuka on collecting information. Emphasis will be given to earthquake and wind applications, as well as wave engineering problems. There appears to be a great interest for development of fragility curves by the insurance companies.

5. Date and venue of next meeting

It was generally agreed that the next meeting should perhaps be in Baltimore at the ASCE Engineering Mechanics conference (June 14-16, 1999;

<http://rongo.ce.jhu.edu/emd99/>).

6. Further steps, tasks

Prof. Schueller distributed a flyer from Elsevier noting that the "Special Issue on Computational Stochastic Mechanics" of Probabilistic Engineering Mechanics (vol. 12, No. 4, 1997), produced by members and colleagues of SC1, is available at a reduced price of \$75.

7. Other Business

Prof. Ghanem noted that the US Congress on Computational Mechanics in Boulder, Colorado, August 3-5, 1999, will have several sessions on stochastic computational mechanics. He agreed to e-mail details to the SC1 members. It was also noted that the next World Conference on Computational Mechanics is in Vienna in 2002.

The chairman thanked Professor Spencer for providing such a nice meeting room and thanked all members present for their most valuable contributions.

8. Adjournment

The meeting was adjourned at 7:10 pm.