American Society of Civil Engineers
Structural Engineering Institute
Technical Committee on Optimal Structural Design

Unapproved Meeting Minutes
2011 ASCE-SEI Structures Congress
Green Valley Ranch – Las Vegas, Nevada
Estancia E Meeting Room
Thursday, April 15, 2011; 9:00 am - 12:00 pm

Members in Attendance

Asghar Bhatti	University of Iowa	mabhatti@uiowa.edu
Christopher Erwin	Thornton Tomasetti, Inc.	cwje@comcast.net
Jamie Guest (Secretary)	Johns Hopkins University	jkguest@jhu.edu
Michael Gustafson	Tekla, Inc.	michael. gustafson@tekla.com
John Peronto	Thornton Tomasetti, Inc.	JPeronto@thorntontomasetti.com
Colby C. Swan (Chair)	University of Iowa	colby-swan@uiowa.edu

Visitors (and Friends) in Attendance

Dan Frangopol	Lehigh University	dan.frangopol@lehigh.edu
Santiago Hernandez	University de Coruna	hernandez@udc.es
Kapil Khandelwal	University of Notre Dame	kapil.khandelwal@nd.edu
Keith Mueller	Teng and Associates	muellerkm@teng.com
David Shook	Skidmore, Owings & Merrill	david.shook@som.com
Evgueni Filipov	University of Illinois	filipov1@illinois.edu
Steve Wilkerson	Hans, Whaley, and Rice	steve.wilkerson@hayneswhaley.com

The meeting was called to order at 9:03 AM by Chair (Prof. Swan).

1. Introductions (Members, Friends, Guests)

Committee members, friends, and guests provided brief introductions.

2. Approval of Minutes from 2010 Meeting in Orlando, FL

The minutes of the annual meeting at the Orlando congress were approved without amendment.

3. Review and Update of Membership Roster

Committee membership stands at 14 members. Visitors (and Friends) interested in joining (re-joining) the Committee were encouraged to email the Chair. Committee roster can be found on the OSD website (http://www.engineering.uiowa.edu/~swan/asce-osd/index.html). Prospective members should first be members of ASCE in good standing.

4. Discussion of OSD-organized Sessions at 2011 Congress

The Chair reviewed last year's two OSD-proposed Sessions:

- *Optimal Design using Evolutionary Computational Methods*, with organization led by John Peronto. This was the second part of a two-part track co-sponsored with Committee on Aesthetics in Design. Despite a strong line-up of ten speakers this track was declined.
- *Continuum Topology Optimization for Structural Design*, with organization led by Colby Swan. This track was also declined.

The Committee expressed some frustration about the decision process, particularly in the requirement of securing speakers and abstracts before the track actually exists. Prof. Swan announced that he will be a member of NTPC going forward and may perhaps be able to shed light on the decision process in the future. It was also noted that the *Analysis and Computation Specialty Conference* is held in even numbered years, and that the Committee should have better success for next year's conference (2012).

5. Associate Editor's Report

Prof. Swan presented AE statistics on behalf of Dr. Arzhang Alimoradi, Committee's AE representative to the *Journal of Structural Engineering*. Since May 2010, Dr. Alimoradi has received 14 manuscripts (8 new submissions) – the breakdown is as follows:

- 4 papers are presently in review
- 4 papers have completed review, decision pending
- 3 papers have been accepted
- 3 papers have been rejected (1 without review)

The average review time from submission to decision was 45 days. Dr. Alimoradi is commended for his efforts in reducing this time and efforts as an AE.

6. Tentative Session Proposals for 2012 Congress in Chicago

The Committee discussed potential topics for OSD-organized sessions at the 2012 Structures Congress in Chicago, which is held in conjunction with *20th Analysis and Computation Conference* (see above).

A. Topology Optimization

The topic of form finding with topology optimization was discussed in detail - including history, formulations, challenges and the importance of objective function selection. Despite its use for over 20 years by other industries, structural engineers are only recently beginning to leverage their capabilities. David Shook confirmed that these tools are being used by engineers for conceptual design, and expressed an interest in seeing academics and practitioners in the session. John Peronto emphasized the importance of tying these tools into existing (commercial and in-house) software packages to facilitate use by practitioners. Jamie Guest discussed his interactions with software companies on the topic. Various software packages and capabilities were then discussed (Grasshopper, Karamba, Altair OptiStruct, Genesis, Bentley packages, SiteOpt). The advancement of integrated 3d modeling, analysis, and optimization was seen as a future session opportunity, as well as optimization for constructability. The Committee strongly supported

submitting a session on topology optimization.

Action Item: *Colby Swan will draft an abstract for a session on Continuum topology optimization and solicit feedback from Jamie Guest and David Shook. Potential speakers should be identified. Final proposal is due June 6, 2011.*

B. Evolutionary Computational Optimization / Nature-Inspired Forms
It was also widely agreed that last year's proposal led by John Peronto be resubmitted.

Action Item: *John Peronto will circulate last year's proposal to solicit feedback from the Committee. He will also contact the speakers from last year to gauge interest and update presentation areas. Final proposal is due June 6, 2011.*

C. Benchmark Problems in Structural Optimization
Committee's current thrust in developing benchmark problems was then discussed in detail (see below). Industry feedback was viewed as critical, and a session on benchmark problems was viewed as an excellent opportunity to solicit such feedback.

Action Item: *Santiago Hernandez will draft an abstract for a session related to benchmark problems for structural optimization and solicit feedback from subcommittee members Chun-Man Chan, Arzhang Alimoradi, and Colby Swan. Potential speakers should be identified. Final proposal is due June 6, 2011.*

Committee members were encouraged to identify other sessions of potential interest and circulate ideas via email.

7. Discussion of Benchmark Problems
The Chair presented the motivation for the Committee's current thrust in developing structural optimization benchmark problems. A subcommittee composed of Arzhang Alimoradi, Santiago Hernandez, Chun-Man Chan, and Colby Swan was formed at the last committee meeting.

Santiago Hernandez provided an update on a sizing optimization cable-stayed bridge benchmark problem that is nearly ready for circulation. Cable areas are the (continuous) design variables and the design objective is to minimize cable weight. Constraints include deflection and stress constraints on the deck, cable and tower members, applied to the completed structure and at one (final) construction stage. Analysis will require geometric nonlinearity but material model is assumed linear elastic. The Committee discussed the issue of modeling assumptions in complex, nonlinear benchmark problems. The need for a verification step, such as deflection results under as single load case, was emphasized. Prof. Hernandez expressed a willingness to provide all model input in various formats, including Abaqus data file. This was viewed as critical to attracting users and the Committee thanks Prof. Hernandez for his efforts.

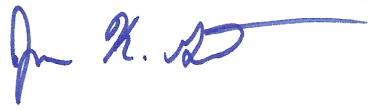
Prof. Hernandez also briefly introduced a shape optimization problem related to dams. The design variables are the coefficients of a polynomial expressing damn thickness and the objective is to minimize volume. Various water levels and thermal loads are to be considered

Chairman Swan strongly encouraged the subcommittee to formulate a proposal for the Technical Activities Division for financial support (typically $3,000-$8,000) to defray costs associated with this effort.

Action Item: *Santiago Hernandez will circulate his benchmark problem to the subcommittee for feedback. Following approval, the problem will be circulated to the entire committee and posted online (location TBD). The subcommittee is then encouraged to develop benchmark problems related to buildings.*

The meeting was adjourned at 11:23 AM.

Respectfully Submitted,



James K. Guest, Ph.D.
Secretary, Technical Committee on Optimal Structural Design
April 15, 2011