RECENT AND CONTINUING ACTIVITIES IN VERIFICATION & VALIDATION BY STANDARDS AND OTHER GROUPS

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Abstract. This presentation provides an overview of some of the international activities in the area of verification and validation in computational mechanics, with an emphasis on those organizations developing standards. A brief history of verification and validation formalism provides a background for describing some of the most recent standards related activities and documents.

Keywords: Verification, Validation, Standards

1. INTRODUCTION

The growing interest in the area of Verification and Validation can, in part, be assessed by the number of organizations that have formed standards or interest groups. A partial list of such groups includes:

- American Institute of Aeronautics and Astronautics (AIAA)
  - Computational Fluid Dynamics (CFD) Standards Committee
- American Society of Civil Engineers (ASCE)
  - Verification and Validation of 3D Free-Surface Flow Models
- American Society of Mechanics Engineers (ASME)
  - Standards Committees V&V-10 and V&V-20
- National Aeronautics and Space Administration (NASA)
  - Modeling and Simulation Standard
- NAFEMS (formerly National Agency for Finite Element Methods and Standards)
  - Analysis Management Working Group
- Nuclear Regulatory Commission/US Department of Energy
  - Idaho National Laboratory meeting 21-25 July 2008
  - Updating of NRC Standard
  - Updating ASME Standard
  - American Nuclear Society
- Technical Publications with Verification & Validation Editorial Policies
  - AIAA Technical Journals
  - Clinical Biomechanics Journal
  - ASME Fluids Engineering Journal

Also worth inclusion are the two books and short courses on Verification & Validation.

Books:
Roache, “Verification and Validation in Computational Science and Engineering”
Oberkampf & Roy “Verification and Validation in Computational Simulation”

Short Courses:
Oberkampf & Roy “Verification and Validation in Computational Simulation”
Hemez & Farrar “Finite Element Model Validation, Updating and Uncertainty Quantification”

2. A BRIEF RECENT HISTORY OF V&V FORMALISM

No claim is made that this brief history is accurate, but rather that it is good enough for ‘engineering purposes.’ Corrections and additions are welcomed.

It would seem the genesis of Verification & Validation formalism in computational mechanics stems from the American Nuclear Society (ANS) and their January 1987 document:

“Guidelines for the Verification and Validation of Scientific and Engineering Computer Programs for the Nuclear Industry”
But the modern era of Verification & Validation formalism in computational mechanics is the seminal work of Patrick Roache:

“Verification and Validation in Computational Science and Engineering”

Until most recently, Dr. Roache’s was the only book length exposition on Verification & Validation. With all due deference to my friend, I believe Pat Roache will one day soon be anointed with the title “founder of modern verification & validation” for his heroic efforts in compiling this work that remains relevant.

Published in the same year, i.e. 1998, the American Institute of Aeronautics and Astronautics (AIAA) Computational Fluid Dynamics Committee on Standards released the first modern standards document

“Guide for the Verification and Validation of Computational Fluid Dynamics Simulations” (AIAA G-077-1998)”

At the wise and gracious behest of the AIAA CFD Committee, an ad hoc committee with a focus on computational solid mechanics was initiated in 1999 under the governance of the US Association for Computational Mechanics. This ad hoc committee was formally recognized by the American Society of Mechanics Engineers (ASME) as a V&V Standards Committee in 2001. This committee released its first standard document in December of 2006:

“Guide for Verification & Validation in Computational Solid Mechanics (ASME V&V-10-2006)”

The most recently released contribution to the formalism of Verification & Validation is the National Aeronautics and Space Administration (NASA) July 2008 document

“Standard for Models And Simulations”

Soon to be released is another American Society of Mechanics Engineers (ASME) Verification & Validation Standards Committee, i.e. V&V-20, with a focus on fluid dynamics and heat transfer. Their anticipated early 2009 publication is entitled

“Standard for Verification and Validation in Computational Fluid Dynamics and Heat Transfer”

These milestone documents will be briefly described during the presentation along with the current activities of these and other organization interested in Verification & Validation.

3. ACKNOWLEDGEMENTS

This work represents the efforts of the American Society of Mechanics Engineers (ASME) V&V Standards Committee (V&V 10). Reprinted by permission of The American Society of Mechanical Engineers. All rights reserved.

4. REFERENCES

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http://catalog.asme.org/Codes/PrintBook/VV_10_2006_Guide_Verification.cfm


Roache, P.J., “Verification and Validation in Computational Science and Engineering.”

http://www.aiaa.org/content.cfm?pageid=231&masterid=102

Short Course: “Finite Element Model Validation, Updating and Uncertainty Quantification,” Instructors Francois Hemez and Charles Farrar.
http://www.la-dynamics.com/


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