

WCSMO-10

May 19-24, 2013

Orlando, FL

Panel Discussion Topic: Design under Uncertainty, Approximations and Their Interaction

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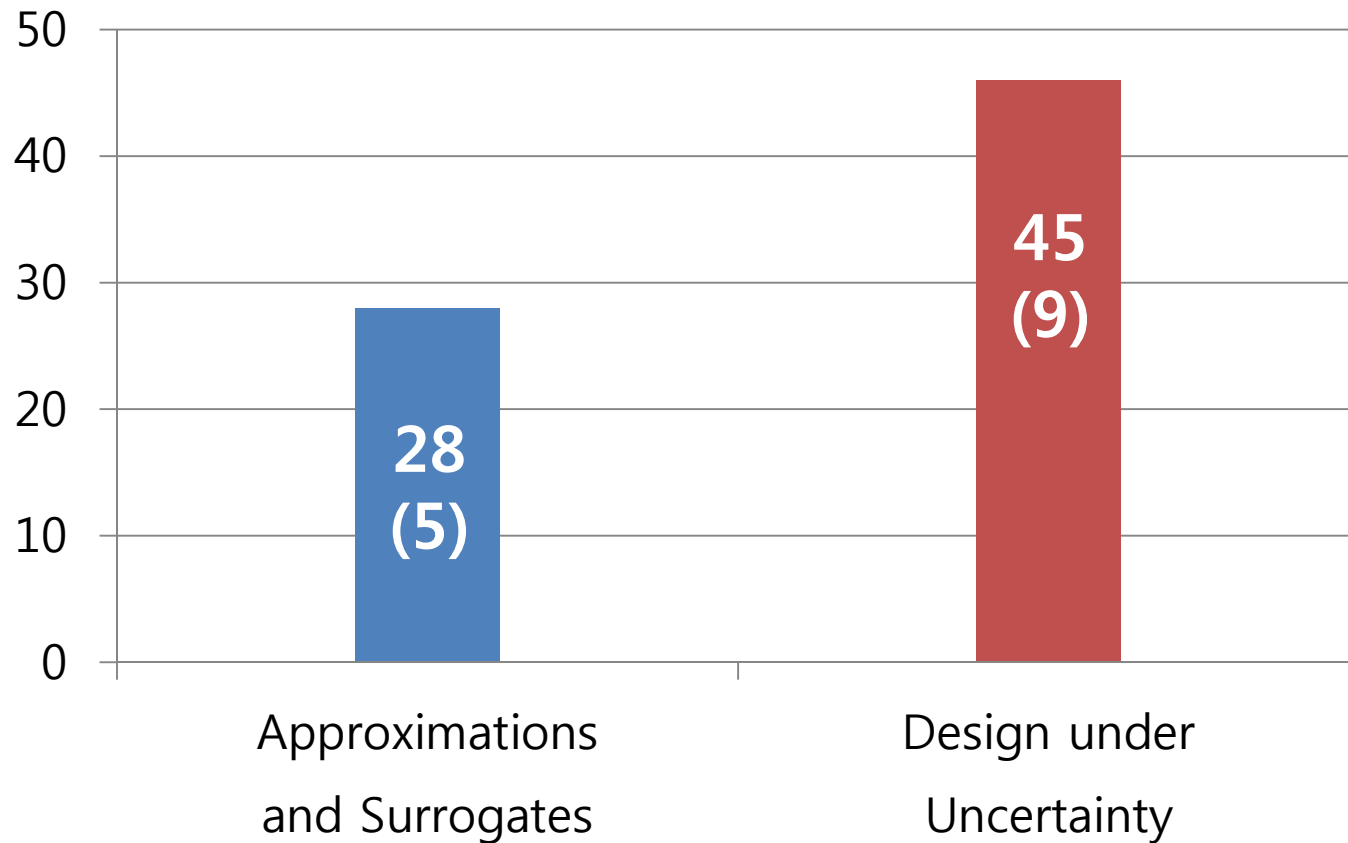
Contents

- WCSMO-10 Summary
 - Design under uncertainty
 - Approximations (and surrogates or metamodels)
 - Their interaction
- Challenging Issues
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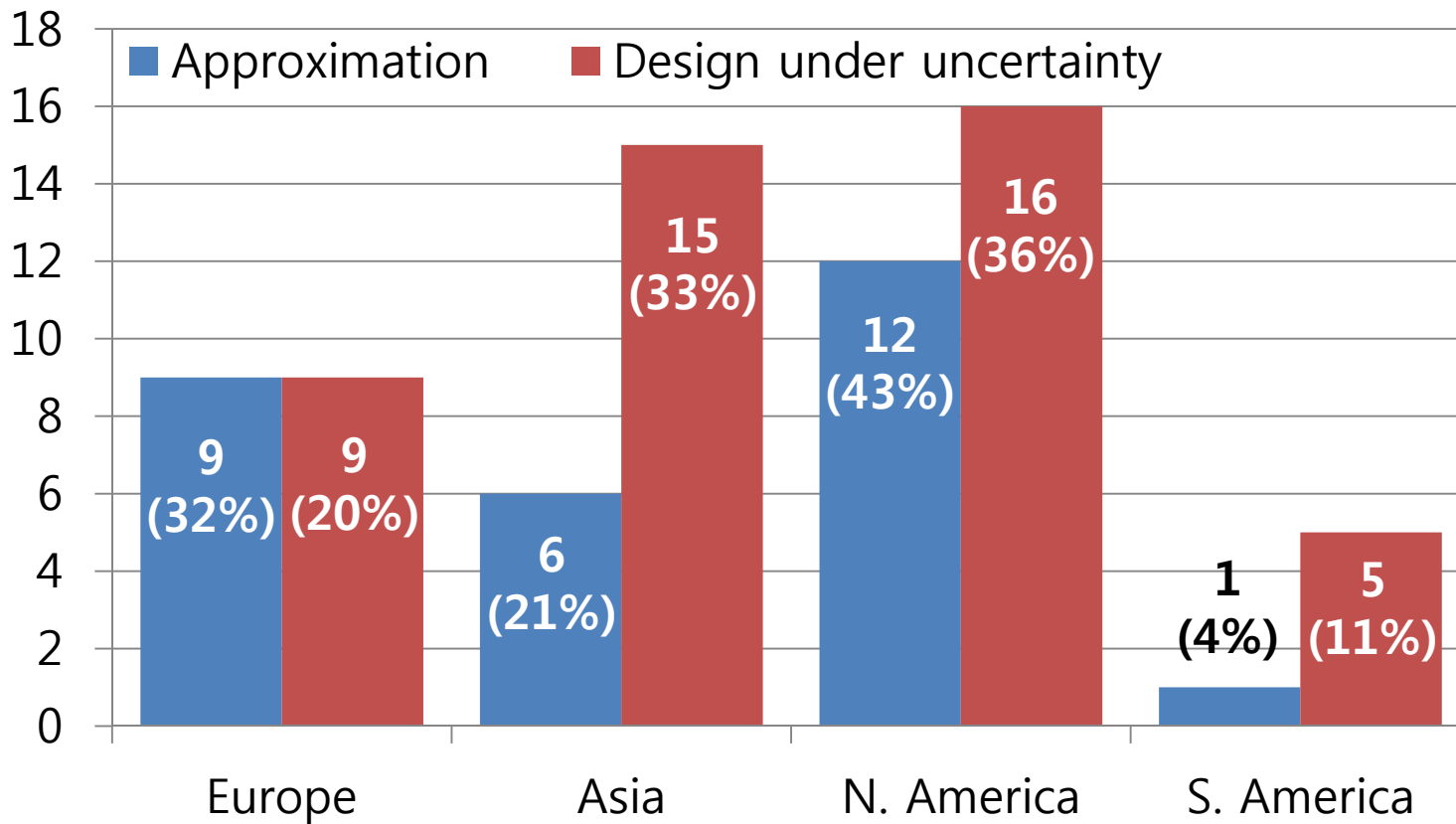
WCSMO-10 Summary

- Paper bin counting in approximations and design under uncertainty
- Continental and country distributions
- Topic 1 – Design under uncertainty
 - Classification in analysis vs. design; uncertainty types
- Topic 2 – Approximations
 - Classification in types of research, approximation techniques
- Topical Interaction

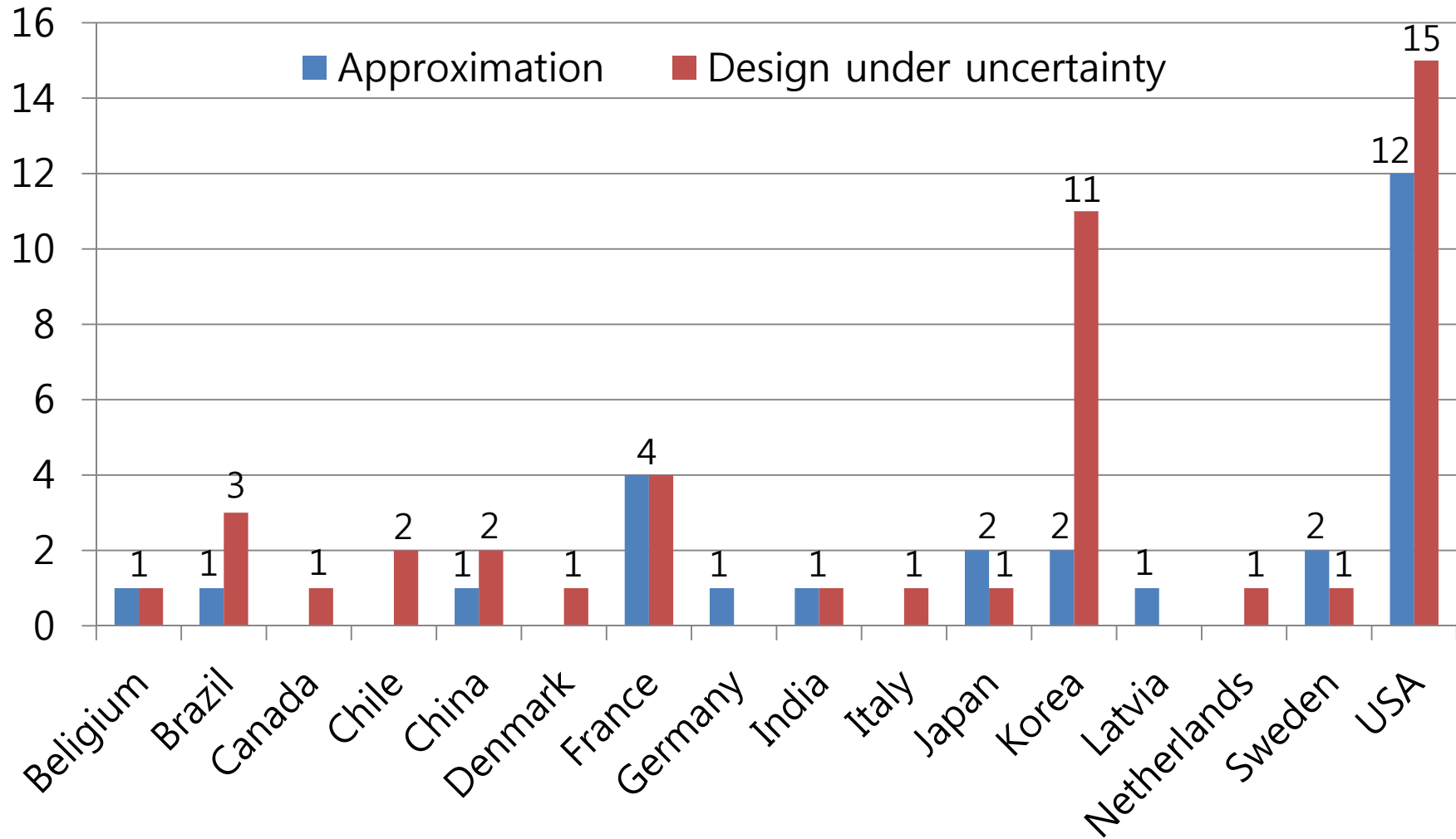
of Papers (# of sessions)



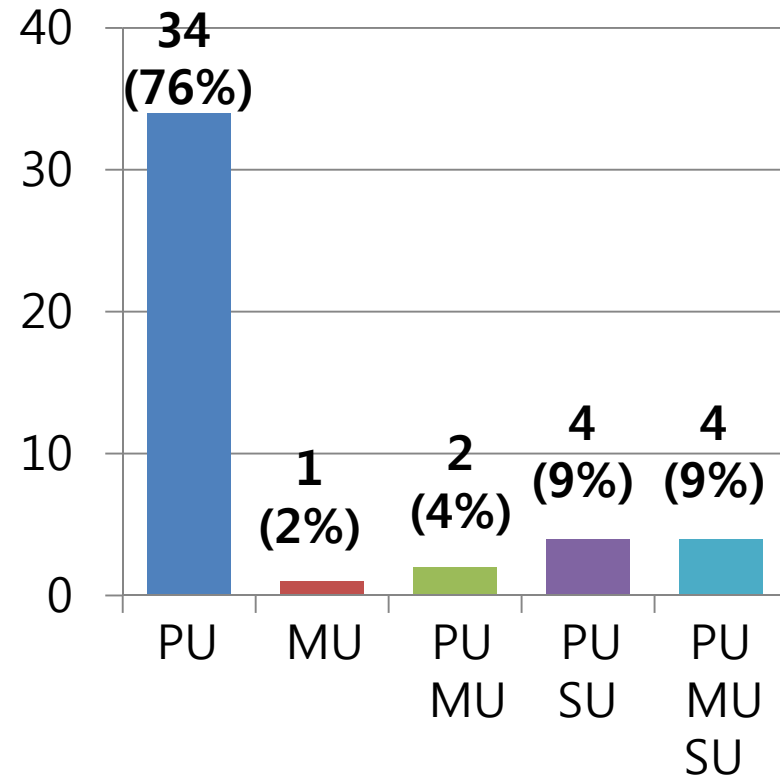
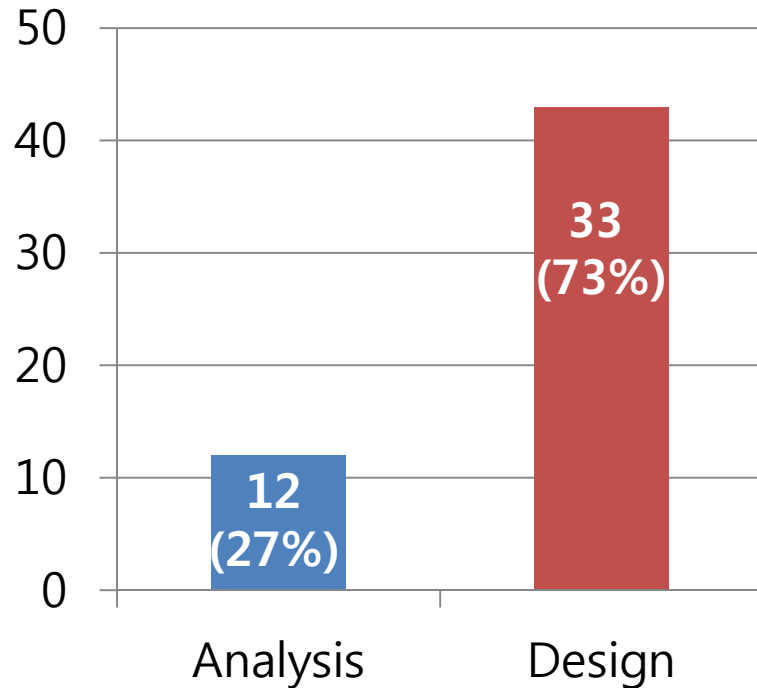
Continental Distribution



Country Distribution



Classification in Design under Uncertainty

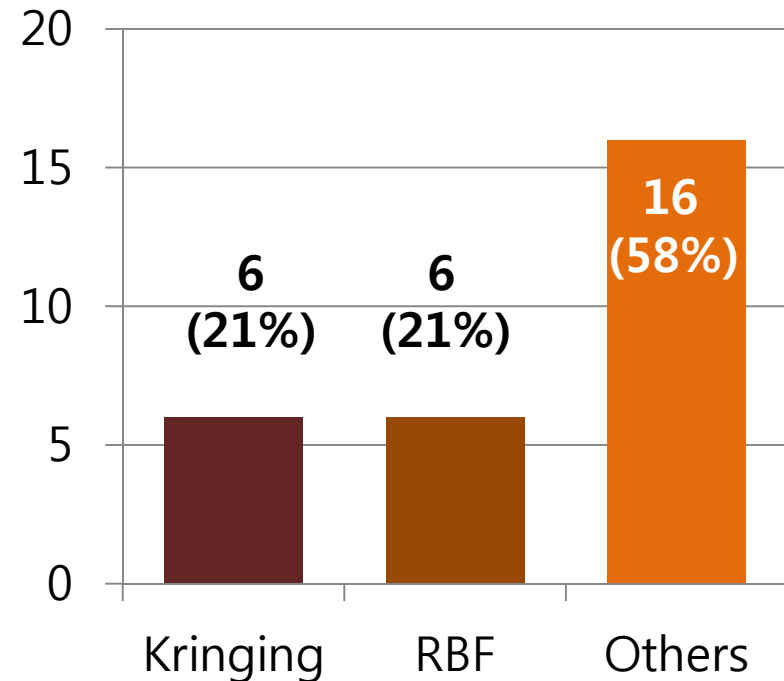
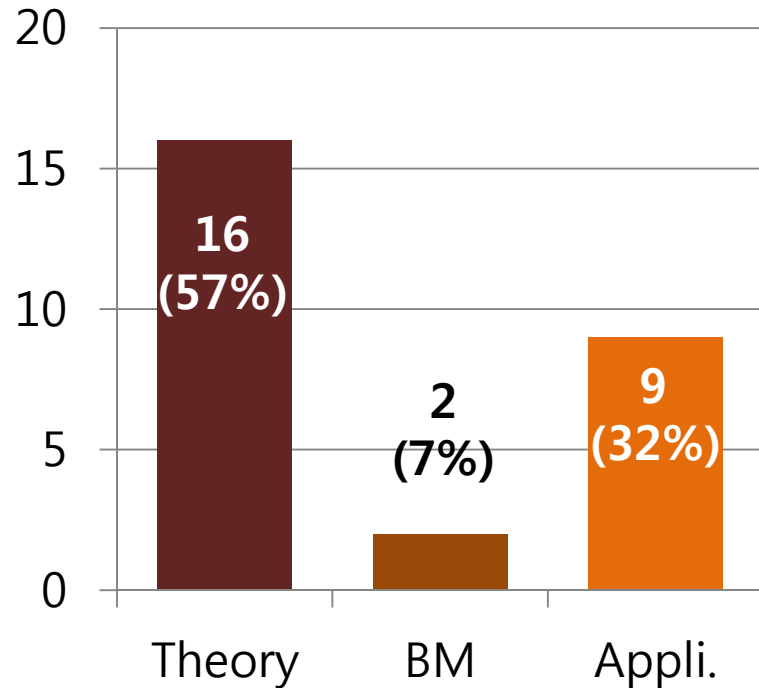


Physical uncertainty : Actual variability of physical quantities, such as loads, material properties, and dimensions.

Statistical uncertainty : As a result of the lack of information about uncertainty.

Model uncertainty : As a result of simplifying assumptions, unknown boundary conditions, etc.

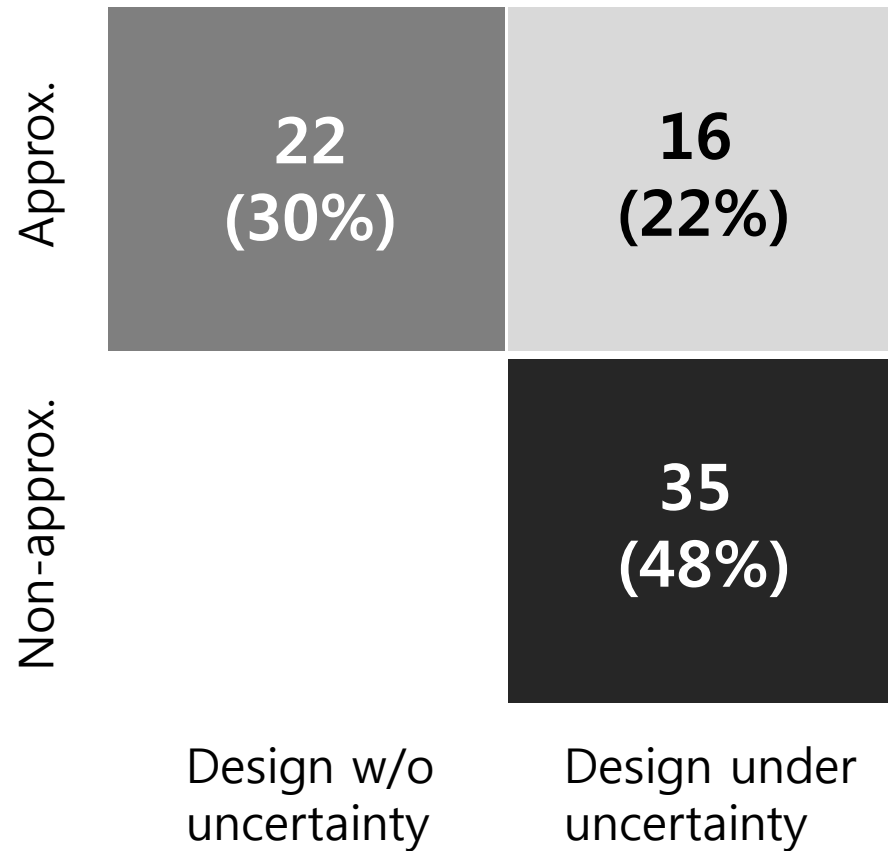
Classification in Approximations



Theory – Issues about stability and efficiency in design, accuracy, model reduction
Benchmarking – Comparing performances of different approximation techniques
Applications – Applications to industrial problems

Others – Moving least squares, Maximum kernal learning, Support vector machine (SVM), Proper orthogonal decomposition (POD), Neural network, etc.

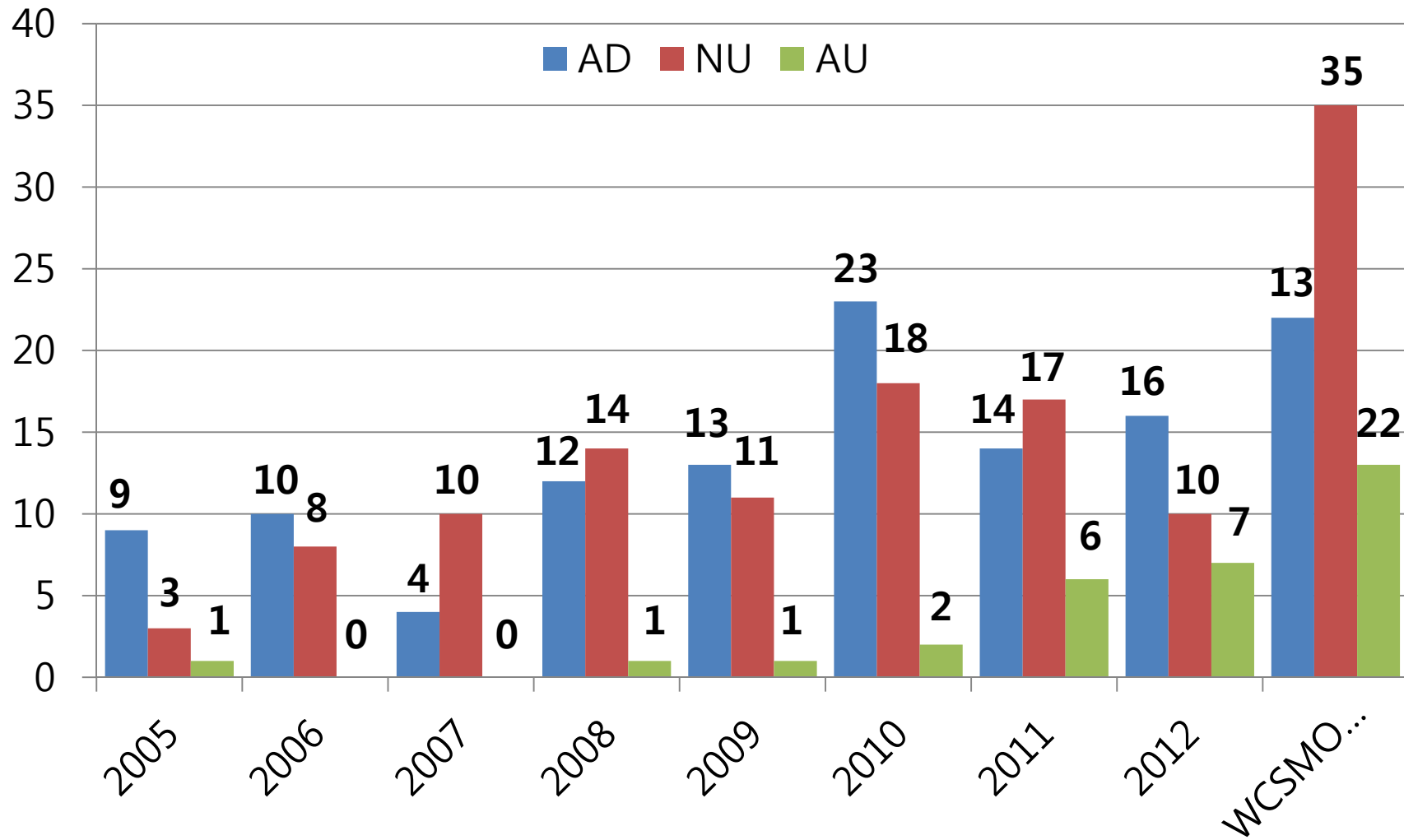
Topical Interaction



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Interaction in SMO (2005-2012)



Challenging Issues – Design under Uncertainty

- Database for physical uncertainty
 - Material data and geometric tolerance data
 - Load characterization
- Dearth of data!
 - Statistical uncertainty
- Model uncertainty
 - Model verification and validation
- Time-dependent reliability
- Successful story in industrial applications

Challenging Issues – Approximations

- Curse-of-dimensionality
 - Variable screening
 - Model reduction
- Fidelity (or model error) characterization in 'Approximation'
- Global vs local in design optimization ?
- General guidelines for use of approximations
 - Selection of approximation methods, optimal parameters, and DOEs

Visions in 2015 and Beyond

- Design under uncertainty :
- Approximations :

Acknowledgements

Special thanks for the inputs to :

Shapour Azarm

Hector Jensen

Wei Chen

Dong-Hoon Choi

K. K. Choi

Raphael Haftka

Namho Kim

Michael Kokkolaras

Ikjin Lee

Tae Hee Lee

Gyung-Jin Park

Palaniappan Ramu

Pingfeng Wang

Ren-Jye Yang

Please download the material at

<http://shrm.snu.ac.kr>

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