Composites Manufacturing & Simulation Center

WENBIN YU

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Dr. Wenbin Yu is a Professor in the School of Aeronautics and Astronautics at Purdue University. He also serves as the Director for the Composites Design and Manufacturing HUB (cdmHUB) and as the Associate Director for the Composites Virtual Factory HUB (cvfHUB), as well as the CTO for AnalySwift LLC. His expertise is in micromechanics and structural mechanics with applications to composite/smart materials. He has developed seven computer codes which are being used in government labs, universities, research institutes and companies. His research has been funded by both federal agencies and private industry. He discovered the Mechanics of Structure Genome (MSG) which provides a unified approach for modeling of advanced materials and structures. MSG is implemented in SwiftComp, a general-purpose multiscale constitutive modeling code recently commercialized by Purdue Research Foundation. He is an ASME Fellow and AIAA Associate Fellow.

Research Interests

- Multiscale Modeling
- Structural Mechanics
- Micromechanics
- Composites/Smart Materials/Structures
- Multiphysics Modeling
- Composites Processing Modeling
- Computational Mechanics

Current Research Focus

Mechanics of Structure Genome: A major research focus of Prof. Yu's group is to establish the newly discovered mechanics of structure genome (MSG) as a new paradigm of composites modeling for possible unification of structural mechanics and micromechanics and provided a novel approach for multiscale structural modeling. MSG not only formulates structural mechanics as a special application of micromechanics, but also provides a rigorous approach to elegantly handle complex buildup structures with heterogeneities from the micro scale all the way to macroscopic scale. This unified formulation has been implemented into a general-purpose multiscale modeling code called SwiftComp which is recently commercialized by Purdue Research Foundation and licensed by AnalySwift. This code can be used as a standalone code for virtual testing of composites or as a plugin module to power conventional FEA codes with efficient high-fidelity composites modeling capabilities. SwiftComp takes a block of material to compute the constitutive models for the macroscopic structural model including beam/plate/shell and 3D structural model. SwiftComp is freely accessible in the cloud at cdmhub.org/resources/scstandard.

Publications

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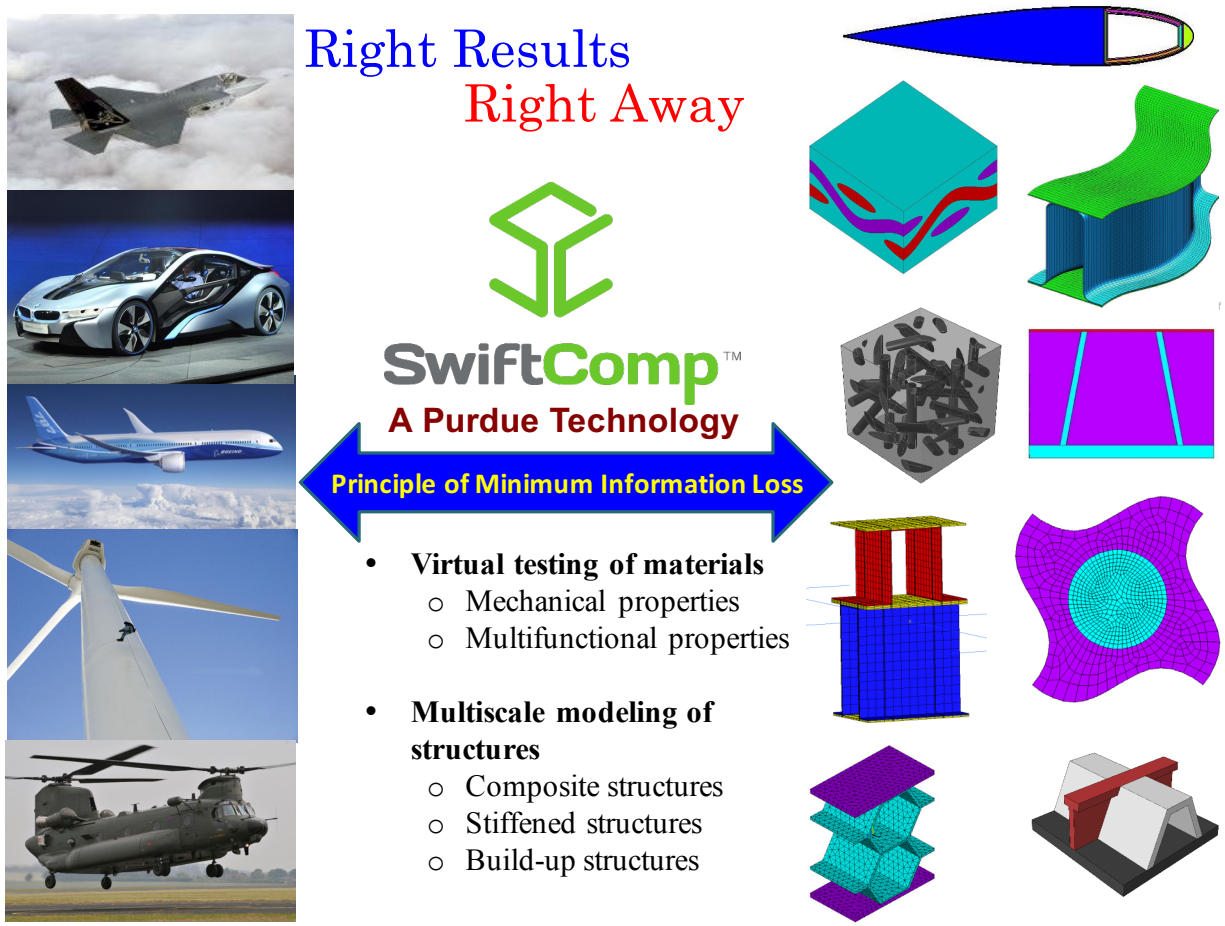
Figures



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Liu, X. and Yu, W.: "A Novel Approach to Analyze Beam-like Composite Structures Using Mechanics of Structure Genome," Advances in Engineering Software, vol. 100, 2016, pp. 238-251.

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Liu, X.; Rouf, K.; Peng, B.; and Yu, W.: "Two-Step Homogenization of Textile Composites Using Mechanics of Structure Genome," Composite Structures, vol. 171, 2017, pp. 252-262.

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Zhang, L.; Gao, Z.; and Yu, W.: "A string-based cohesive zone model for interlaminar delamination," Engineering Fracture Mechanics, vol. 180, 2017, pp. 1-22.