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Engineering & Scientific Consulting

Brett R. Davis, Ph.D., P.E.

Senior Engineer | Mechanical Engineering
149 Commonwealth Drive | Menlo Park, CA 94025
(650) 688-7085 tel | bdavis@exponent.com

Professional Profile

Dr. Davis specializes in fracture mechanics and has a strong background in computational mechanics and finite element analysis (FEA). His work has spanned a variety of materials, including experience with delaminations in carbon fiber composite laminates. Other areas of expertise include structural mechanics and mechanics of materials. Dr. Davis is also interested in leveraging state-of-the-art, multi-scale experimental observations with computational methods to improve fracture and fatigue analysis.

Dr. Davis was a member of the Cornell Fracture Group, where his doctoral research aimed to develop computational tools to simulate and predict fracture and damage in structural components. His novel simulation technique included generating complex cracked models, computing accurate fracture mechanics parameters, and employing a new formulation to calculate explicitly 3-D, crack-front evolution. Dr. Davis has extensive experience with commercial finite element software (Abaqus) and fracture analysis software (FRANC3D).

While at Cornell, Dr. Davis served as a Teaching Assistant for structural modeling and behavior classes, as well as providing formal mentorship for undergraduate research related to damage tolerance of composite materials. He has also collaborated with the Durability, Damage Tolerance and Reliability Branch at NASA Langley Research Center, and been involved in organizing a conference session for the Society of Experimental Mechanics.

Academic Credentials & Professional Honors

Ph.D., Civil and Environmental Engineering, Cornell University, 2014

B.S., Civil and Environmental Engineering, University of Virginia, 2008

Licenses and Certifications

Licensed Mechanical Engineer, California, #38378

Professional Affiliations

Society for Experimental Mechanics

Publications

Davis BR, Wawrzynek PA, Hwang CG, Ingraffea AR. Decomposition of 3-D mixed-mode energy release rates using the virtual crack extension method. *Engineering Fracture Mechanics* 2014; 131:382-405.

Davis BR, Wawrzynek PA, Ingraffea AR. 3-D simulation of arbitrary crack growth using an energy-based formulation - Part I: Planar Growth. Engineering Fracture Mechanics 2014; 115:204-220.

Davis BR, Wawrzynek PA, Ingraffea AR. Simulation of arbitrary mixed-mode crack growth using an energy-based approach. Society for Experimental Mechanics Annual Conference, Greenville, SC, June 2014.

Davis BR, Wawrzynek PA, Ingraffea AR. Simulation of arbitrary delamination growth in composite structures using the virtual crack extension method. American Society for Composites 27th Technical Conference, Arlington, TX, October 2012.

Presentations

Hudgins A, Davis B. A metallurgical and fracture mechanics approach to understanding crack-like defects. American Gas Association Transmission Integrity Management Workshop, Pittsburgh, PA, June 14, 2017.

Davis BR. Three-dimensional simulation of arbitrary crack growth. Durability, Damage Tolerance and Reliability Branch, NASA Langley Research Center, Hampton, VA, June 2014.

Davis BR. Simulation of arbitrary mixed-mode crack growth using an energy-based approach. Society for Experimental Mechanics Annual Conference, Greenville, SC, June 2014

Davis BR. 3-D simulation of arbitrary crack growth using a new energy-based formulation. SES 50th Annual Technical Meeting, ASME-AMD Annual Summer Meeting, Brown University, Providence, RI, July 2013.

Davis BR. Simulation of arbitrary delamination growth using a new energy-based formulation. American Society for Composites 27th Technical Conference, Arlington, TX, October 2012.

Davis BR. Computational simulation of delamination growth in composite structures. Durability, Damage Tolerance and Reliability Branch, NASA Langley Research Center, Hampton, VA, December 2011.

Davis BR. DDSim: Damage and durability simulator. NASA CUIP and ACT Initiative Annual Report, NASA Marshall Space Flight Center, Huntsville, AL, January 2010.

Davis BR. Damage and durability simulator (DDSim). NASA CUIP and ACT Initiative Annual Report, NASA Langley Research Center, Hampton, VA, January 2009.