VANDERBILT
School *of* Engineering

DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING

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FGH 306

"SIMULATING RESIDUAL STRESS & DISTORTION IN PART-SCALE – FUSION WELDING & METAL ADDITIVE MANUFACTURING"

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ABSTRACT

The estimation of thermomechanical residual stress and distortion in part-scale during fusion welding and metal additive manufacturing has been an ever challenge due to demanding computational resources, yet these predictions are needed to help prevent failures, enhance dimensional consistency, and improve manufacturing reliability. Several analytical and finite element method based numerical modelling attempts are presented in the literature to handle part-scale residual stress and distortion simulation in fusion welding and metal additive manufacturing. These modelling strategies tread a fine line between the simplifying assumptions and computational accuracy. Many of the simplifying modelling approaches are fairly successful but depend on calibration based on reliable experimental results since the nature of evolution of the residual stress and distortion in part-scale is complex and a fit-for-all generalization remains dificult. This work will present a broad overview of some of the recently reported analical and numerical modelling strategies, and their competitive computational successes for fast, full-field estimations of residual stress and distortion in fusion welding and metal additive manufacturing.

BIOGRAPHY

Amitava De completed his B.Engg degree from Indian Institute of Engineering Science and Technology (formerly known as B E College), Shibpur, West Bengal, India, and M. Tech and PhD degrees from Indian Institute of Technology, Kharagpur, India respectively in 1989, 1991 and 1996. Next, he has spent two years at the Institute of Joining and Coating Technology, Technical University, Berlin, Germany under DAAD fellowship. He joined Indian Institute of Technology (IIT) Bombay, India as assistant professor in May'1998, and continued there to become associate professor and professor in 2005 and 2009, respectively. He has served in several departmental and Institute level committees at IIT Bombay such as the Vice-Chairperson, Gate-JAM in 2011-2012, the convenor of the post-graduate academic performance committee (PGAPEC) from Jan, 2015 to March, 2017, the Dean of Academic Programmes from March, 2017 to June, 2021, and the Chairperson, JEE (Advanced) 2024. Till date, he has guided sixteen Ph.D. students and over sixty masters' students. His research area includes joining science and technology, additive manufacturing and numerical modelling of manufacturing processes. He regularly serves as the key / principle reviewers, associate editor(s) and editor(s) for several journals in the broad area of joining science and technology, and metal additive manufacturing.