

# Finite Element Variational Multi-scale Method with Coarse-scale Global Residual-free Meshfree Enrichments for Acoustics

**\*C.T. Wu<sup>1</sup> and Wei. Hu<sup>1</sup>**

<sup>1</sup>Livermore Software Technology Corporation,  
7374 Las Positas Road, Livermore, CA USA.

\*Corresponding author: ctwu@LSTC.COM

In this paper, a multi-scale meshfree-enriched finite element formulation is presented for the analysis of acoustic wave propagation problem. The scale splitting in this formulation is based on the Variational Multi-scale (VMS) method. While the standard finite element polynomials are used to represent the coarse scales, the approximation of fine-scale solution is defined globally using the meshfree enrichments generated from the Generalized Meshfree (GMF) approximation. The resultant fine-scale approximations satisfy the homogenous Dirichlet boundary conditions and behave as the “global residual-free” bubbles for the enrichments in the oscillatory type of Helmholtz solutions. Numerical examples in one dimension and two dimensional cases are analyzed to demonstrate the accuracy of the present formulation and comparison is made to the analytical and two finite element solutions

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