Optimum Design of Fiber-Reinforced Polymer Composites for Blast Response Mitigation

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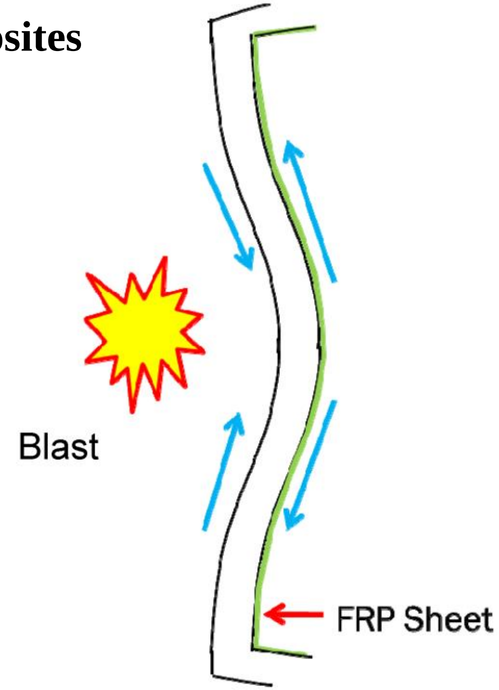

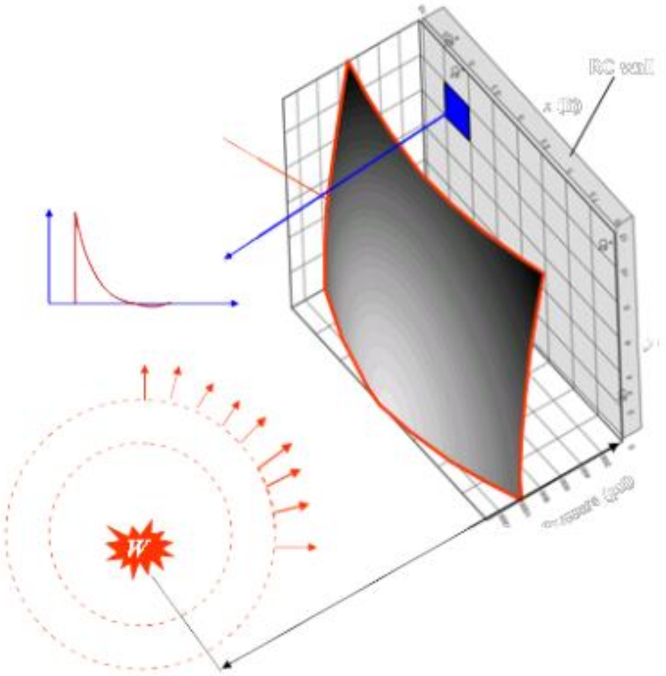

Lightweight and high-strength fiber-reinforced polymer (FRP) composites are useful in enhancing the resistance of reinforced concrete (RC) members subjected to blast loading. A typical challenge for an engineer is to design the RC members applied with the FRP composites from the available materials and options for their placement. Apart from the composite behavior and dynamic loading, uncertainty in material and loading parameters also have a significant influence in the design. The conventional procedure of tackling uncertainty by using partial safety factors yields a non-optimal design. Hence, in the proposed doctoral research, optimum design of the FRP composites under uncertainty for maximized blast response mitigation has been planned. To address the curse of dimensionality associated with uncertainty quantification and optimization under uncertainty problems, machine learning-based efficient methods for solving design under uncertainty problems will be developed. The optimization problem will be treated as a multi-scale optimization problem and will involve design variables from multiple scales. The outcome of this project will be a reliable, uncertainty insensitive FRP composite for blast response mitigation in RC structures.

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