The objective of the proposed research is to advance the state-of-the-art in Non-Destructive Evaluation (NDE) of concrete and composite structures by developing analytic techniques to jointly process data from complementary sensor sources. This objective pursued through signal level data fusion is expected to lead to improved prognostic and diagnostic information. Two methodologies, i.e., ground penetrating radar (GPR) and Impact-echo (IE), are selected which are complementary technologies that provide reflector depth and location information.

**Simulation package for IE and GPR**

A simulation package involves Finite Difference in Time Domain (FDTD) models for Acoustic wave (IE) and Electromagnetic wave propagation (GPR) which has been developed as part of this work.

**Features of the package are:**
- Single platform to support the simulation of acoustic and electromagnetic wave propagation.
- Modeling tool for the simulation of heterogeneous infrastructure systems such as bridge decks made of concrete with steel reinforcement, aggregate, and an asphalt top layer.
- Feature tool enabling modeling of scattering by various defects with different shapes, sizes, and material properties.

**Simulation Examples**

**Determination of the Elastodynamic Transfer Function of an Air Void Point Scatterer**

**Application of Scatterer Transfer Functions to Reconstruction of Scattered Field in a Bridge Deck**

**Discussion and Future Work**

**References**

1. Abhijit S., Sara F., and C. M. Rappaport, "Time domain inverse scattering using the local shape function method," The University of Texas at Austin, 1999.