Comparison between Contact and Remote Crack Detection using GPR and SAR

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Abstract:

Concrete cracking is a commonly seen durability issue of concrete bridges in U.S and around the world. The size and the location of cracks on a concrete bridge indicate their structural significance and are vital to the structural health of a concrete bridge. One of the most critical challenges for the durability and life expansion of concrete highway bridges is crack detection and quantification. While crack length and crack width can be statistically measured on the surface of concrete bridges through visual inspection, crack depth usually remains unknown without the use of destructive testing. With the use of nondestructive evaluation (NDE) techniques such as microwave and radar sensors, subsurface sensing can be achieved in concrete structures. In this poster, a quantitative comparison in detection and quantification of cracks using ***contact*** ground penetrating radar (GPR) and ***remote*** synthetic aperture radar (SAR) images on artificially cracked concrete panels is presented. Three concrete panels (CNC, CNCD, and CNCW) of dimensions 30x30x4 cm^3 were manufactured with artificial cracks introduced at the center of each concrete panel. Dimensions of three artificial cracks were 10x0.5x0.5 cm^3 (panel CNC), 10x0.5x1.5 cm^3 (panel CNCD), and 10x2x0.5 cm^3 (panel CNCW). Meanwhile, an intact concrete panel (CNI) was prepared as a reference to three other damaged concrete panels. These panels were scanned using a 1.6 GHz GPR and 10.5 GHz SAR sensors. From our results, it was found that artificial cracks can be detected and quantified (e.g., depth) nondestructively both by contact and remote methods using GPR and SAR respectively.

Cracks on concrete abutments

Contact GPR inspection

Remote SAR inspection

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References:

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