Submission Title

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Abstract

The research problem we are trying to solve is the structural assessment of aging concrete bridges, targeting concrete cracking and degradation. The research objective is to develop a remote radar sensor for the electromagnetic characterization of corroded reinforced concrete structures by studying concrete cover cracking and chloride-induced steel rebar corrosion. For these purposes, 2 sets of laboratory concrete specimens were cast: 1) Ten 12x12x2 in^3 concrete panels were cast with artificially implemented rectangular cracks of various dimensions; And 2) three 12x12x5 in^3 RC specimens (with a No.6 rebar at their mid-height) were cast and two of them were subjected to accelerated corrosion test to achieve stage 2 and 3 corrosions respectively. The laboratory specimens were then scanned with a 1.6GHz GPR to characterize and correlate the effects of isolated, controlled cracks, as well as the combined effects of corrosion and cracking. Our results show that corrosion and cracking result in reduced signal travel time and amplitude, while also creating hyperbolic anomalies along the air-concrete interface signal (i.e., direct-coupling).

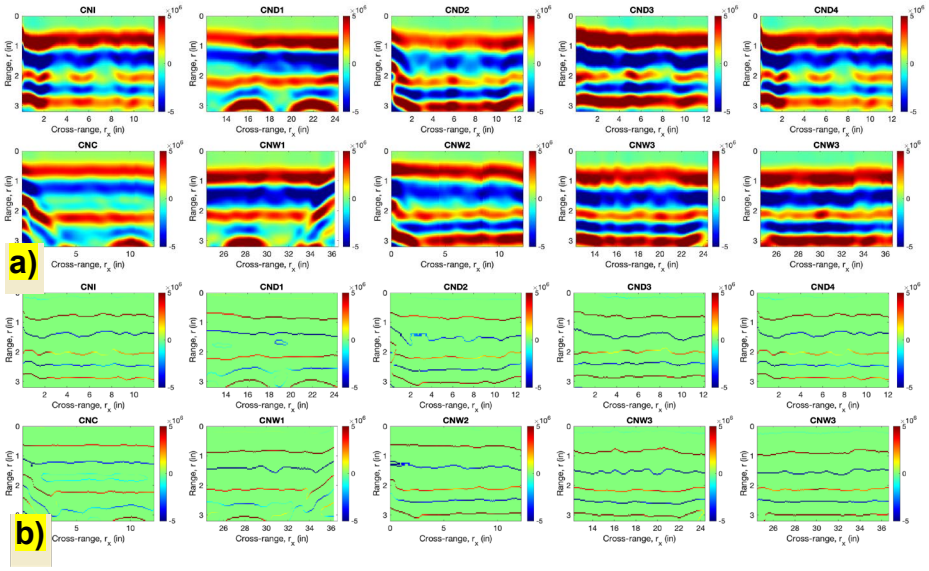

Fig. 4. a) B-scan images of CN specimens; b) Feature-extracted B-scan images to spot signal irregularities by mapping the local minima and maxima points.

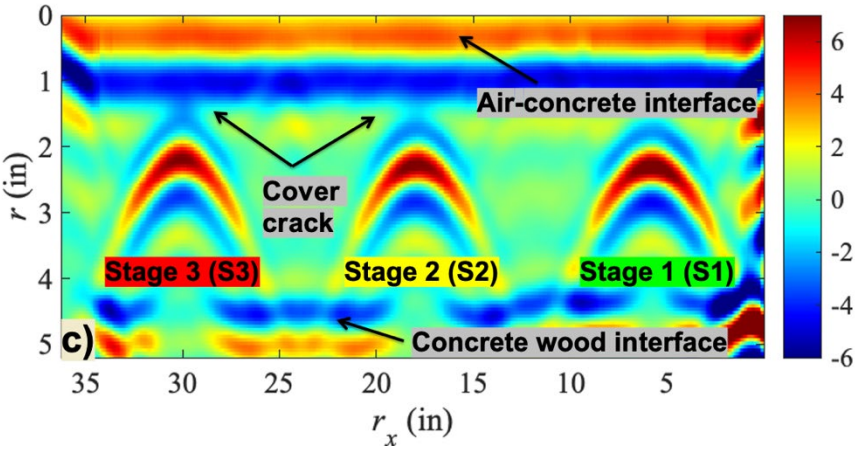

Fig. 2. c); Time-zero corrected B-scan image of the RC specimens.

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References

- K. Raisi, N.N. Khun, and T. Yu (2022), SPIE, DOI: 10.1117/12.2613083
- K. Raisi, R. Batchu, and T. Yu (2023), SPIE, DOI: 10.1117/12.2657731
- R. Batchu, K. Raisi, and T. Yu (2023), SPIE, DOI: 10.1117/12.2658173
- T. Yu, K. Raisi, and R. Batchu (2023), SPIE, DOI: 10.1117/12.2657741
- N.N. Kulkarni, K. Raisi, N.A. Valente, J. Benoit, T. Yu, and A. Sabato, (2023), AIC, DOI: 10.1016/104784