NOISE REDUCTION METHODS FOR HAMMERING IMPACT ACOUSTIC INSPECTION: AN EXPERIMENTAL COMPARISON

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Aging of infrastructures is now a challenging problem to the world. To effectively manage risk of aging infrastructures, hammering impact acoustic inspection has been widely applied due to its low cost and efficiency. However, there is a major drawback that condition assessment is performed based on subjective ‘feeling’ of field worker and the results are not accurate. To tackle such problem, computerized hammering acoustic inspection using signal processing pattern recognition and techniques has been an active research topic for a decade. For those systems, one critical problem is that hammering inspection is always performed under noisy environments and thus impact echo signal is always polluted by environmental noise. It is necessary to add a preprocessing stage to retrieve clean echo signal that carries rich information of structure health condition. This paper conducts experimental comparison on various modern noise reduction techniques for segregating hammering echo signal from background (traffic) noise. Proper metric has been established to evaluate performance of those methods quantitatively. Based on validation on real-world data, we present comparison results for all methods and the result can be applied as practical guide for selection of noise reduction methods for computerized hammering acoustic inspection.

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FULL TEXT:
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Noise Reduction Methods for Hammering Impact Acoustic Inspection: An Experimental Comparison. Conference Paper. Full-text available. Impact-echo’s history is an interesting story of how a real need for nondestructive test methods for flaw detection in concrete structures led to a systematic and sustained basic and applied research effort to develop such a method, beginning in 1983, at the National Bureau of Standards, and continued since 1987 at Cornell University. This paper discusses the contributions of the people and the organizations who carried out the theoretical, numerical, laboratory, and field studies that established the method and who developed the software and instrumentation that gave rise to a patented i...