Achievements and Challenges in Audio-Based Modeling of Construction Job Sites

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Abstract: Construction job-sites are noisy workplaces and construction equipment and machines create discrete sound patterns while performing their daily operations. Construction engineers usually considered job site noise as a negative phenomenon, but if processed properly, the generated sound patterns could be used as a rich source of information for analyzing ongoing operations at job-sites.

This paper presents the current research efforts of the authors regarding initiating and developing an audio-based model for analysis and modeling of construction operations. The audio-based model is based on placing single or multiple microphones at the jobsite, recording the developed sounds patterns, and using various techniques for processing the recorded audio files and detecting and recognizing different operations taking place at the jobsite. The implemented techniques include noise removal and signal enhancement, source separation, signal processing and machine learning algorithms. The paper also discusses about the necessary hardware settings (number, type and locations of microphones). The results of using the proposed system can be used by construction managers for several purposes including productivity analysis, project scheduling, differentiating between idle and active times of machine, etc. The authors also present several case studies from construction job sites to illustrate how the system works in real world settings.