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Analysis of the feasibility of an array of MEMS microphones to machinery condition monitoring or fault diagnosis

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ABSTRACT

During the last decades, vibration analysis has been used to evaluate condition monitoring and fault diagnosis of complex mechanical systems. The problem associated with these analysis methods is that the employed sensors must be in contact with the vibrant surfaces. To avoid this problem, the current trend is the analysis of the noise, or the acoustic signals, which are directly related with the vibrations, to evaluate condition monitoring and/or fault diagnosis of mechanical systems. Both, acoustic and vibration signals, obtained from a system can reveal information related with its operation conditions. Using arrays formed by digital MEMS microphones, which employ acquisition/processing systems based on FPGA, allows creating systems with a high number of sensors paying a reduced cost. This work studies the feasibility of the use of acoustic images, obtained by an array with 64 MEMS microphones (8x8) in a hemianechoic chamber, to detect, characterize, and, eventually, identify failure conditions in machinery. The resolution obtained to spatially identify the problem origin in the machine under test. The acoustic images are processed to extract different feature patterns to identify and classify machinery failures.


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