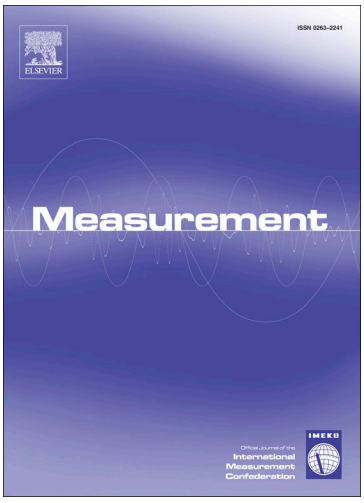

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Abstract

This study focuses on the acquisitions of vibration and torque signals of a ball screw drive system in upward-downward reciprocating motion and data processing techniques in order to identify the longest running distance under normal operation without lubricant replenishment. The Fast Fourier transform (FFT) spectra were used to determine the approximate frequency ranges of vibrations due to the friction and wear arising in the upper and lower nuts of the duel ball-screw design. Fractal theory was applied to the vibration signals to determine fractal dimension (D) and topothesy (G) values varying with distance. G is an efficient parameter for evaluating approximate lubrication degradation. A running distance of 90 to 100 km was roughly estimated to be the starting point of lubrication degradation. The vibration signals associated with the upper and lower nuts were classified using support vector machine