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# DEVELOPMENT OF AN EFFICIENT ANALYSER FOR MICRO-VIBRATION DISTURBANCES EMANATING FROM SPINNING ACTUATORS

**Abstract**

In order to prevent the introduction of inaccuracies in data acquired from sensitive payload, many satellites need very quiet electronic and physical environments. Micro-vibrations are generated in satellites that contain on-board devices with moving or rotating masses that could include spinning actuators. A vital matter for spacecraft with payloads that require very high pointing or measuring accuracy is the mastering of micro-vibrations. Therefore, for a sound comprehension of micro-vibrations, their sources must be identified, characterised, confined, and controlled. The identification and characterisation of micro-vibrations emanating from spinning actuators can be done through physical testing of the actuator on a Kistler platform, a reasonable industry standard tool for disturbance testing in the space sector. Raw measured data of a Kistler platform test of a spinning actuator requires dedicated processing techniques to be converted to the frequency domain for post-test analysis that consequently leads to the characterisation of the disturbances originating from spinning actuators. Therefore, this necessitates the development of a complete micro-vibration analyser that efficiently processes the acquired raw data and generates output data in the frequency domain that is worthy of being able to be utilized for clear identification and characterisation of the micro-vibration disturbances emanating from spinning actuators. This study focuses on the development of a generic code that could be used as an efficient micro-vibration analyser. Thus far, an in-depth literature review of digital signal processing theory has been conducted in order to find appropriate and efficient anti-aliasing techniques, window functions, and 'time-domain to frequency-domain' techniques that could be employed to develop the various stages of the micro-vibration analyser. Following the literature analysis, the next phase of this study entails translation of the appropriate processing techniques for the micro-vibration analyser into MATLAB code. Debugging and testing of the code is performed using a data sample of accelerations measured during a spin-up of a gearbox. A data sample from a gearbox test is utilized for the code development of the micro-vibration analyser as it was difficult to obtain a data sample from a Kistler platform test of a spinning actuator. As with a spinning actuator, a gearbox is also comprised of rotating masses.