Sources of Error in ODS Videos

Errors can occur from several sources during the processing of any acquired vibration data. Using Optical Flow to extract vibration time waveforms from successive frames of a video adds more sources of error.

When recording a high-speed video, two fundamental rules apply,

Recording Frequency (fps)

1) The maximum frequency to be expected from the video recording should be less than one half the camera fps rate.
2) Any higher frequency higher than one half the fps will be aliased in the time waveform and its frequency spectrum as a lower frequency
3) There is no anti-aliasing protection in a video recording

Recording Time Length (T)

1) The frequency resolution of any frequency spectrum extracted from a video is the inverse of the recording time length (T) of the video
2) For example, a recording time length T= 2 seconds will yield a frequency spectrum with resolution 1/2 Hz (or 30 RPM) between samples

Optical Flow Error

MEscope uses an industry-standard optical flow algorithm to extract meaningful motion data from high-speed videos. The algorithm is capable of extracting motion smaller than a single pixel by detecting slight changes in pixel color. Optical flow and video motion estimation are currently hot topics and are evolving rapidly, and we will continue to monitor new developments and update our methods to make MEscope Optical Flow as accurate and fast as possible.

Video Camera Accuracy

An important issue effecting accuracy in a video recording is the number of bits (each computer word length) used by the high-speed camera to record the video. The mp4 video format is commonly used for saving videos. That format uses only 8 bits. Most high-speed cameras use more than 8 bits to record a video.

Specs for the Chronos 1.4 camera:
1.4Gpx/s, 1.3 megapixel image sensor captures 1280x1024 @ 1057fps, and up to 38500fps at lower resolution. Available in color and monochrome. The monochrome option has higher effective resolution and is twice as sensitive as color.

Chronos Datasheet

Useable Results

We have obtained useable results for a cell phone video recording. See Application Note 57.

In Application Note 58 it is shown that a video recording on a rotating machine and accelerations acquired from its bearing blocks give nearly the same results.