Vibration Analysis with WaveCam

Optical Flow Based Time and Frequency ODS

Highspeed camera Chronos 2.1 with WaveCam software by gfai tech

BENEFITS

- WaveCam makes vibrations visible with motion magnification
- Analyze data in the time, frequency and order domain
- Compatibility with various video formats, regardless of the camera used
- Measurement resolution of 10^{-4} pixel possible with use of artificial intelligence (AI)
- Measurement from small (e. g. circuit board) to large structures (e. g. buildings)
- Cross-validation with finite element analyses and traditional vibration measurement methods

APPLICATIONS

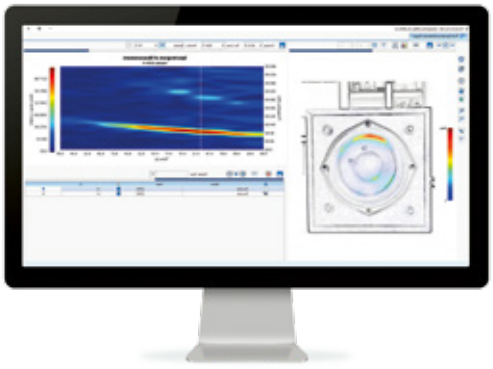
- Operating Deflection Shapes (ODS)
- Natural frequency investigation
- Quality assurance
- Research & development
- Troubleshooting, root-cause analysis
- Predictive maintenance
- Structural vibration
- Transient events

Our video vibration analysis solution WaveCam is the perfect tool for non-contact and high-resolution vibration measurement for experts and beginners in the time and frequency domain. To get started, all you need is a camera and our software to process the data. Save the time to set up individual sensors, or measurement locations.

A frequency ODS can be performed with a single excitation in a wide range frequency range. The dispensation of consecutive excitation for different measurement positions saves measurement and test bench time respectively.

Depending on the frame rate of your camera, a minimum frame rate $FPS = 2 \times f_{max}$ is required to capture the highest frequency of interest f_{max}. For maximum flexibility we recommend employing a Chronos highspeed camera exceeding 1000 fps. Vibration displacements of minimum 100 nm are captured.

Every single pixel serves as an individual sensor allowing you to measure hundreds of thousands of positions simultaneously. Time waveforms and frequency data can be extracted for individual positions. Results were cross-validated with conventional methods namely laser Doppler vibrometer (LDV), accelerometer as well as acoustic holography. Display deflection shapes of structures during operation, manual, ambient or automated excitation e.g. using the impulse hammer WaveHit^{MAX} as well as transient events. Various options to display the data, facilitate interpretation and export vivid and conclusive results.



Software WaveCam – Frequency ODS module

Vibration Analysis with WaveCam

WaveCam Software Specifications	
Frequency range	0 – 20 kHz
Minimum displacement	100 nm (at 1 m with 50 mm lens)
Supported video file formats	avi, m4v, mj2, mov, mp4, mpg, wmv
Supported image file formats	dng, png, jpg, bmp, tif, tiff
Data analysis domains	■ Frequency Operational Deflection Shapes ■ Time Operational Deflection Shapes
Signal analysis	■ Time waveforms ■ Spectra (overall and for each channel) ■ Spectrogram (overall and for each channel) ■ Import of the reference sensor signal (uff)
Frequency filtering	Bandpass in time waveforms and animation
Spectrogram	■ Window type and size ■ Extraction of RPM signal ■ Campbell diagram view ■ Overlap settings ■ Number of lines
Motion visualisation	■ Colorized motion maps ■ Amplitude and phase angle visualisation ■ Overall motion or single frequencies
Data export	■ Waveforms (csv, uff, png) ■ Spectra (csv, uff, png) ■ Mode shapes (uff, avi, mp4) for comparison with simulation results (WaveSim)
Pre-processing of the video	■ Video player ■ Adjustments of the video (cropping, trimming) ■ Component selection ■ Pre validation (heat map view, calculation of local spectrum)
Batch processing	■ User configured analysis ■ Sequential calculation of all batches

Vibration measurement data extraction requires uncompressed video files that can be recorded with all available high-speed cameras as well as smartphone cameras. We recommend using a high-speed camera by Chronos.

Find more about WaveCam & highspeed cameras

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