CLAIMS

1. A system for imaging of vibrations in a scene, the system comprising:

at least one coherent light source configured to illuminate the scene comprising multiple scene elements,

an optical unit in association with a pixelated detector comprising multiple pixels and a specified field of view that at least partly overlaps with the scene, wherein the optical unit is configured to focus light scattered from the multiple scene elements in the scene onto the pixelated detector such that light scattered from each scene element of the multiple scene elements is focused on a corresponding pixel of the multiple pixels on the pixelated detector, and wherein the detector is configured to provide, for each pixel of the multiple pixels, a pixel intensity signal of the pixel thereof, to thereby yield corresponding multiple pixel intensity signals, and

a processing unit configured to analyze each pixel intensity signal of the multiple pixel intensity signals and to derive, for each pixel of the multiple pixels and based on the respective pixel intensity signal, a vibration spectrum of the scene element in the scene that corresponds to the pixel thereof, to thereby yield corresponding multiple vibration spectrums,

wherein the optical unit further comprises a spatially patterned mask configured to enhance a modulation of the pixel intensity signals and to increase a ratio between the modulation of the pixel intensity signals and a DC thereof, and wherein the processing unit is further configured to optimize the spatial pattern of the mask according to specified criteria.

2. The system of claim 1, wherein the processing unit is configured to analyze the pixel intensity signals by analyzing respective temporal and frequency characteristics of the pixel intensity signals and to identify at least one region of interest (ROI) according to the analyzed temporal and frequency characteristics, and wherein the optical unit is further configured, upon a specified condition, to de-focus the scattered light and the processing unit is further configured to perform speckle interferometry on a received defocused signal, with respect to the identified at least one ROI.

3. The system of claim 2, wherein the at least one coherent illumination source comprises a plurality of coherent illumination sources which are not coherent with each other and have different directions of illumination with respect to the elements in the scene.

4. The system of claim 2, wherein the at least one coherent illumination source is configured to sequentially illuminate the elements in the scene from different directions.

5. The system of claim 1, wherein the processing unit is further configured to derive a vibrations' image from the analyzed pixel intensity signals.

6. The system of claim 5, wherein the processing unit is further configured to enhance the vibrations' image with speckle interferometry data.

7. The system of claim 5, wherein the processing unit is further configured to fuse the vibrations' image with a visual range and/or infrared image of the scene.

8. The system of claim 1, further comprising a vibrations inducing module configured to induce vibrations in at least one object in the scene, wherein the processing unit is further configured to correlate the analyzed pixel intensity signals with characteristics of the induced vibration and to identify the at least one object according to vibration patterns across a surface of the at least one object, which are characterized according to the correlation.

9. A method of imaging vibrations in a scene, the method comprising:

illuminating the scene comprising multiple scene elements by at least one coherent light source;

focusing light scattered from the multiple science elements in the scene onto corresponding multiple pixels on a pixelated detector having a specified field of view that at least partly overlaps with the scene, wherein light scattered from each scene element of the multiple scene elements is focused on one pixel of the multiple pixels on the pixelated detector;

providing, for each pixel of the multiple pixels, a pixel intensity signal of the pixel thereof, thereby yielding corresponding multiple pixel intensity signals;

analyzing each pixel intensity signal of the multiple pixel intensity signals and deriving, for each pixel of the multiple pixels and based on the respective pixel intensity signal, a vibration spectrum of the scene element in the scene that corresponds to the pixel thereof, thereby yielding corresponding multiple vibration spectrums; and

enhancing a modulation of the pixel intensity signals using a spatially patterned mask and configuring the spatially patterned mask to increase a ratio between the modulation of the pixel intensity signals and a DC thereof.

10. The method of claim 9, wherein the analyzing comprises analyzing respective temporal and frequency characteristics of the pixel intensity signals, identifying at least one region of interest (ROI) according to the analyzed temporal and frequency characteristics and de-focusing the scattered light upon a specified condition, and performing speckle interferometry on a received defocused signal, with respect to the identified at least one ROI.

11. The method of claim 10, wherein the illuminating is carried out by a plurality of coherent illumination sources which are not coherent with each other and have different directions of illumination with respect to the elements in the scene.

12. The method of claim 10, wherein the illuminating is carried out sequentially from different directions.

13. The method of claim 10, further comprising providing, simultaneously, a vibrations image of the scene based on the analyzed pixel intensity signals and speckle interferometry data concerning specific points in the scene.

14. The method of claim 13, further comprising scanning a plurality of points in the scene and applying speckle interferometry thereto, according to vibrations characteristics derived concurrently from the vibrations' image.

15. The method of claim 13, further comprising using the speckle interferometry data to improve the vibrations' image.

16. The method of claim 9, further comprising fusing a vibrations image based on the analyzed pixel intensity signals with a visual range image of the scene.

17. The method of claim 9, further comprising inducing vibrations in at least one object in the scene, and correlating the analyzed pixel intensity signals with characteristics of the induced vibration.

18. The method of claim 9, further comprising correlating analyzed pixel intensity signals from different parts of at least one object in the scene to characterize a vibration pattern of the at least one object and identifying the at least one object according to the characterized vibration pattern across a surface of the at least one object.