PeriCam PSI System

Real-time microcirculation imaging

In many application areas, the need for rapid, high resolution blood perfusion images is crucial for understanding the physiology or pathophysiology in the tissue or organ of interest. Laser Doppler imaging is commonly used to obtain this sort of data, with the drawback that the scanning procedure is time consuming. This has limited the imaging technique to only providing static information about the microcirculation in the given region.

Perimed AB has now developed the PeriCam PSI System, a blood perfusion imager based on the laser speckle technique developed in the 1980s.[1-4] This technique opens up the possibility to:

Laser Speckle technique

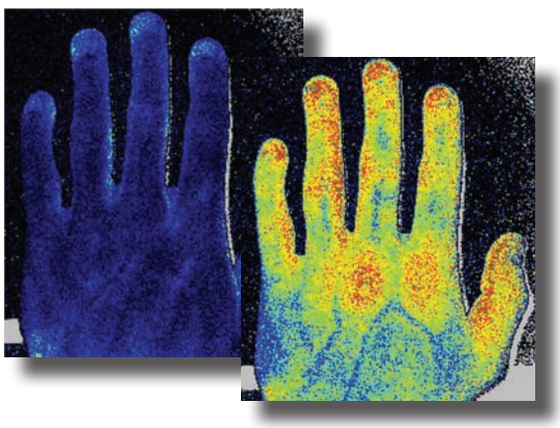
Tissue illumination by laser light produces a random interference pattern, a speckle pattern, on the tissue surface. When the illuminated object is static, the speckle pattern is stationary. However, when moving particles, such as blood cells, are present, the speckle pattern will fluctuate over time. By analyzing these intensity fluctuations, information about the blood perfusion in the tissue is obtained.

Monitor dynamics in real time

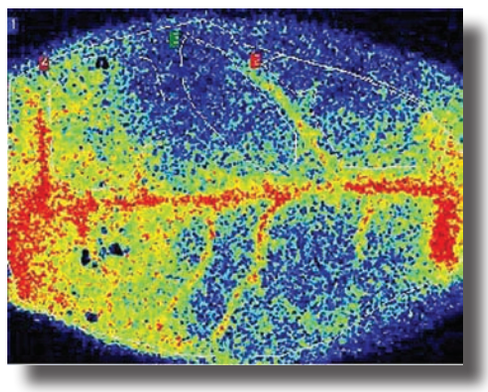
The CCD camera captures blood perfusion images at speeds of up to ~100 images per second. This allows you to not only study the spatial distribution of the blood perfusion, but also the dynamics. Real- time graphs and the possibility to view the final recording at ¼ - 64x the original speed further facilitates data interpretation.

Study details in high resolution

Areas ranging from a few square millimeters to 15x15 centimeters may be analyzed. To control measuring precision, a fixed focal length is used as well as automatic background compensation once every second. The PeriCam PSI System is available in normal and high resolution versions.



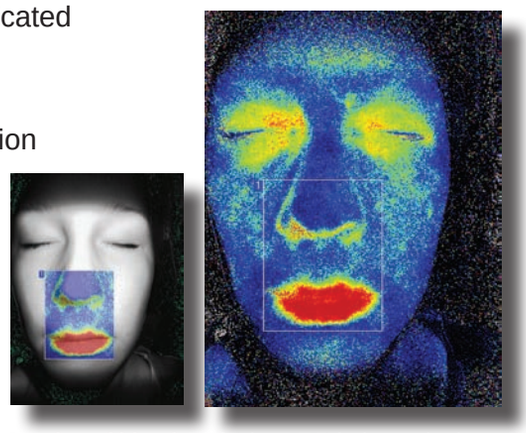
Blood perfusion images taken before and after an occlusion (0.1s apart).



Mouse brain during cortical spreading depression.

PeriCam PSI System is operated using the sophisticated PIMSoft software, which includes:

- Real-time graphs of ROI (Region Of Interest) blood perfusion
- Advanced ROI editing
- Video playback at 1/4 - 64x original speed
- Saved settings and templates for repeated use
- TOIs (Time period Of Interest) that allow evaluation of mean blood perfusion during specific time periods



Overlay of blood perfusion ROI in intensity image

PeriCam PSI System Specifications

Measurement Principle:	LASCA (LAser Speckle Contrast Analysis)
Image Size:	Normal Resolution model: ~5.9 x 5.9 cm – 15 x 15 cm High Resolution model: ~25 x 34 mm
Image Acquisition Rate:	50 Hz: 94, 47, 23, 18, 8, 3, 2, 1, 0.5, 0.2 images per second 60 Hz: 112, 55, 28, 22 10, 3.5, 2, 1, 0.5, 0.2 images per second
Image Resolution:	Maximum 1386 x 1034 measurement points
Camera Resolution:	Measurement Camera: 1388 x 1038 pixels Documentation Camera: Color, 752 x 580 pixels
Pixel/Measurement Point Resolution:	Normal Resolution model: ~6944 pixels per cm^2; 120 µm/pixel (at closest working distance) High Resolution model: ~169 500 pixels per cm^2; 25 µm/pixel
Laser Specifications:	Measurement laser: 785 nm, 70 mW, Class 1 per IEC 60825-1:2001 - Safe to use without eye protection Area indicator laser: 660 nm, 5mW, Class 1 per IEC 60825-1:2001 - Safe to use without eye protection
Dimensions and Weight:	Scanner head: 22 x 15 x 20 cm, 2.0 kg

Due to Perimed's commitment to continuous improvement of our products, all specifications are subject to change without notice.

References

1. Laser Doppler, speckle and related techniques for blood perfusion mapping and imaging. Briers, J. D. Physiological measurement 22(4), p. R35-R66, 2001
2. Linear response range characterization and in vivo application of laser speckle imaging of blood flow dynamics. Nelson, J. S. et al. Journal of Biomedical Optics 11(4), p. 1, 2006
3. Dynamic imaging of cerebral blood flow using laser speckle. Boas, D. A. et al. Journal of cerebral blood flow and metabolism 21(3), p. 195-201, 2001
4. Development of a laser speckle imaging system for measuring relative blood flow velocity. Sowa, M. G. et al. International Society for Optical Engineering, Bellingham WA, WA 98227-0010, United States, p. 634304, 2006

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