A LASER DOPPLER IMAGING SYSTEM FOR CLINICAL DIAGNOSIS APPLICATIONS

The laser Doppler perfusion imager (LDPI, Fig. 1) is a recent development in the field of laser Doppler flowmetry. It has great potential in many medical applications for the non-invasive diagnosis of problems based on microvascular perfusion. Established applications include assessment of breast skin blood flow, wound healing, skin burn, and Systemic Sclerosis. This work aims to enhance the usability of LPDI for diagnostics testing through the examination of two major issues.

The first issue deals with the performance of the LDPI technique. Two case studies are used not only to highlight the potential applications of LDPI, but also to illustrate the general procedure/precautions needed for ensuring the consistency and quality of the captured perfusion images. The first case study deals with the perfusion across the proximal interphalangeal joints of patients with Osteoarthritis (Fig. 2). The results showed that LDPI could provide an objective and specific assessment of hyperaemia over the interphalangeal joints in patients with rheumatoid arthritis [1-3]. The second case study deals with the blood flow on the stomach region during menstruation (Figs. 3 and 4). The results indicated that cold stressing was able to bring out distinct differences in the LDP images before and during menstruation [4]. The issues discussed in these case studies would be useful for the evolution of other novel LDPI applications and the standardization of the proper clinical procedure for the capturing of the LDP images. This is important, as a proper standard procedure would ensure the consistency and quality of the captured LDP images.

The second issue deals with the intelligent management of the LDPI results to facilitate the prescription of treatment based on the analysis of similar cases previously encountered. The framework of an intelligent diagnostics assistant is proposed to automate the search and retrieval of relevant past cases based on the LDPI diagnosis. The work uses skin burn as an example to discuss the considerations and techniques for the implementation of the proposed intelligent diagnostics system. This work constitutes initial efforts to increase the productivity of the doctors in diagnostics testing. Future work will involve the development of the case library and the implementation of the proposed framework.

Related References:


Fig. 1 MoorLDI laser Doppler imager in DRC
Fig. 2  Laser Doppler images of the left and right hands (dorsal aspect).
(i) and (ii) are hands of the normal control. (iii) to (vi) are hands of the OA subjects.
Red circle indicates deformed joint.
Fig. 3  Patient lying down with stomach region exposed bare

(a) Photo image
(b) Flux image (1st bare scanning)
(c) Flux image (60s after 1st cold test)
(d) Flux image (60s after 2nd cold test)

Fig. 4 Photo and Flux Images of Stomach Region during Menstruation (LDPI of Menstrual Symptoms)

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