Functional Infrared Imaging: New Approaches and Applications of Thermal Imaging to Medicine and Neuro-Psychology

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Infrared imaging allows the representation of the surface thermal distribution of the human body. Several studies have been performed so far to assess the contribution that such information may provide to the clinicians. The skin temperature distribution of the human body depends on the complex relationships defining the heat exchange processes between skin tissue, inner tissue, local vasculature, and metabolic activity. All of these processes are mediated and regulated by the sympathetic and parasympathetic activity to maintain the thermal homeostasis. The presence of a disease can locally affect the heat balance or exchange processes, resulting in an increase or a decrease of the skin temperature. Such a temperature variation can be better estimated with respect to the surrounding regions or the unaffected contralateral region. The dynamics of the local control of the skin temperature should be influenced by the presence of the disease as well. Therefore, the characteristic parameters modelling the activity of the skin thermoregulatory system can be used as diagnostic parameters. The functional infrared (fIR) imaging is the study for diagnostic purposes, based on the modelling of the bio-heat exchange processes, of the functional properties and alterations of the human thermoregulatory system.

In this paper, I will review some of the most important recent clinical applications of the fIR imaging of my group. In addition, I will describe some innovative applications of thermal imaging to psychometrics, stress measurements and psycho-neuropsychology.

About the author

Arcangelo Merla is the Director of the Infrared Imaging Lab at the ITAB – Institute for Advanced Biomedical Technology at the University of Chieti – Italy. He holds a Ph.D. in advanced biomedical technologies and bioimaging from the University of Chieti (Italy) and a M.S. (laurea) in physics from the University of Bologna (Italy). Dr. Merla has been visiting professor at the Computer Science Department of University of Houston, Houston, TX, and is Professor of Medical Physics at the School of Medicine of the University of Chieti. His expertise is in the area of biomedical imaging and modelling, with special reference to biomedical and clinical applications of thermal and infrared imaging. He is author of more than 50 international publications on such topic.