IR imaging as a tool of novel patient driven medicine

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Abstract

The subject of the lecture will concern the use of infrared thermography in medical applications. We will start with the basics of thermography, the principles of conducting a reliable thermographic study on living organisms, and FDA guidelines for conducting research on humans, including screening for the prevention of SARS and COVID-19. Then, examples of the use of thermography in cardiac surgery, burn diagnostics, and screening tests for SARS-CoV-2 will be presented.

The scientific goal of the presented work was the development of algorithms and procedures for thermal diagnostics in non-contact measurements in order to implement them to an objective, quantitative, non-destructive and non-stress assessment of tissue in selected applications of medical diagnostics. The developed method was verified in the following applications: determination of the depth of burns, automatic determination of areas requiring surgical treatment and areas suitable for conservative treatment, evaluation of the cardiac coronary artery bypass by conventional methods as well as off pump coronary artery bypass grafting and other open-heart surgery, assessment of the status and progress of healing of surgical wounds including after cardiac interventions. The result of the work is the development, optimization, and implementation of a prototype equipment and software suitable for applications in clinical settings. The research also includes problems related to image processing and Ambient Assisted Living (AAL).

We will conclude with the latest trends in thermography in medicine, including the use of machine learning and AI.

About the presenter

Mariusz Kaczmarek received his Ph.D. degree in medical electronics in 2003 and a D.Sc. degree in biocybernetics and biomedical engineering in 2017. He has been an investigator in 13 projects and received a number of awards, including four for the best paper, seven medals and awards for practical innovations, the Andronicos G. Kantsios Award, and the Siemens Award. His research interests include various aspects of the active dynamic thermography (ADT) and the use of thermography in medical diagnostics, including cardiosurgery, burns diagnostics, and postoperative wound healing.

Prof. Kaczmarek authored or co-authored over 140 papers (WoS) and several patent applications. For many years, he has been involved in popularization of science among people from outside the academia. Currently he is a Vice-Dean for Organisation of Studies (2020–2024), Chairman of the programme committee of the inter-faculty field of Biomedical Engineering, and Deputy Head of the Department of Biomedical Engineering at the Faculty of Electronics, Telecommunications and Informatics (since 2018). He is also a member of: the Biocybernetics and Biomedical Engineering Committee of the Polish Academy of Sciences (since 2020), the Board of Associate Editors of the International Journal of Quantitative InfraRed Thermography (since 2018), the Polish Society of Biomedical Engineering (since 2005), the Polish Society of Medical Physics (since 2005), and the Industrial Electronics Society of the Institute of Electrical and Electronics Engineers (since 2018).