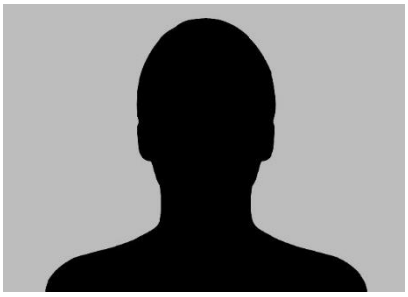
Zurich University
of Applied Sciences

School of
Engineering

ICP Institute of
Computational Physics

Numerical thermal model of the human skin



Skin cancer is one of the most common cancer in Switzerland. An early detection can significantly increase the chances of finding a cure and prolonging the individuals' life expectancy. Active thermal imaging is a well-known medical procedure in finding human skin based diseases. The surface of the skin is thermally irritated in this process by cold or warm air and with the help of an infrared camera, the skin surface is constantly monitored for any temperature changes on the targeted area. This procedure requires an appropriate skin model for its interpretation. In this thesis three numerical thermal models of the human skin are programmed and compared. The first model is based on a horizontal and constant perfusion of the skin, the second model is based on a horizontal and temperature dependent perfusion and the third on a vertical perfusion. The validation is based on data from a clinical study by the Geneva University Hospital. The result is an optimal model of the human skin. It provides values for relevant parameters for future skin cancer diagnosis. The model provides good results for healthy skin as well as malignant and benign lesions. The average difference between the simulation data and the validation data is between 0.05% and 0.2%.

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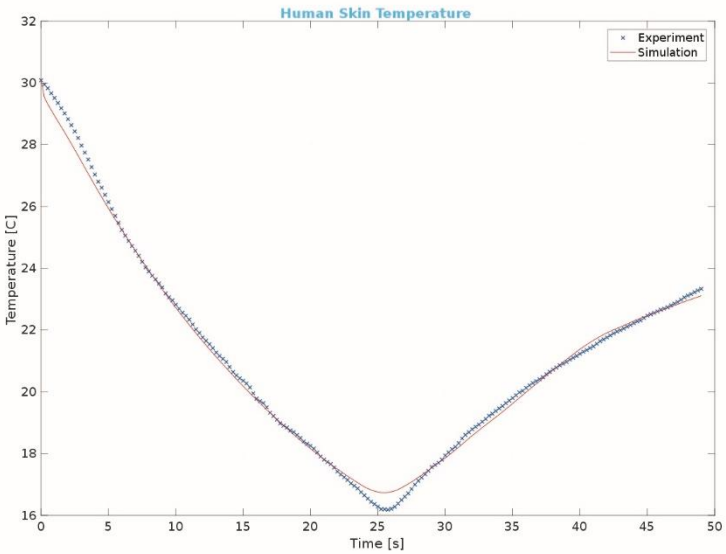

Comparison of the surface temperature of the human skin as simulation with experimental data. The simulation was performed with the numerical thermal model. The Experiment was realised during a clinical study at Geneva University Hospital.