

## A new hand-held imaging device to investigate the thermal properties of the human skin

The early detection of skin cancer is the decisive factor to prevent its spread to surrounding organs and to increase the chances of recovery. To define the stage of this disease and to ensure an effective therapy, data on the location, size and spread (due to the presence of metastases) are required. These data are often obtained through invasive, painful and expensive examinations.

A promising new technology, which enables a non-invasive and absolutely painless analysis of tissue, is based on dynamic thermography. With this examination technique, the skin is thermally stimulated. During this process, an IR imaging device records the skin transient temperature.

This bachelor thesis describes the development of a new prototype, which implements the method of dynamic thermography for the thermal analysis of the skin surface. An existing prototype developed by Dermolockin GmbH already implements this type of technology for the thermal analysis of the human skin. The main requirements of this new prototype are the size reduction and the extension of its functionalities.

The thermal excitation has a central role in the thermographic analysis of the skin surface. For this reason, the focus of this work lies on the investigation of the most suitable excitation method including its implementation in the new prototype.

Two cooling methods are implemented in the new prototype to stimulate the skin surface. The analysis of the skin surface temperature is performed during the excitation phase and the subsequent recovery phase using an infrared camera. The detection of abnormal thermal patterns can be attributed to local skin alteration.

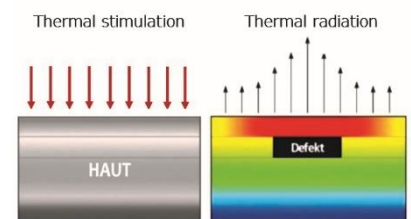
The prototype is produced by an additive manufacturing process. The control of the components is centralized in one program on Linux with a Raspberry Pi 3B. A practical and user-friendly application of this new dermatological device is assured by the careful selection of components and the reliable implementation of the software.

The correct functionality of the components was tested during the development phase. A subsequent test phase must be planned to validate the thermographic examination procedure with the new prototype.



Diplomierende  
Andreas Bachmann  
Giaele Quadri

Dozierende  
Martin Loeser  
Mathias Bonmarin



Concept of dynamic thermography. The skin is thermally stimulated. The surface transient temperature is recorded by an infrared camera. The figure on the right shows the influence of skin lesions on thermal radiation.



Developed prototype. With this handheld device it is possible to perform a thermographic examination.