# SA: Optimizing a UV radiation sensor for a medical application

This document describes the subject and the general time schedule of the semester thesis of Tobias Wenger in the spring term 2011. Adaptations or changes can be agreed upon by the advisers.

## Subject

Sunlight is a driving force for life and, amongst others due to its role in the production of vitamin D, indispensable for our health. However, over the past decades an increasing number of studies warned against the risks of excessive sunlight exposure. Long-term damage, such as premature skin aging and skin cancer are severe implications that can result from an overexposure to sunlight, even if no immediate signs of sunburn are visible.

Both, sunburn as well as the mentioned long-term damages are caused by the ultraviolet (UV) radiation contained in the sunlight. Therefore, we have developed a prototype of a wearable system that tracks the wearer's sunlight exposure in real-time. The proposed system is designed in a modular fashion and consists of two parts: (1) A small sensor unit that measures the UV radiation and is equipped with a Bluetooth module. (2) A smartphone application that collects and processes the sensor unit's measurements.
This system can be used for a variety of medical application scenarios. Examples include the different use cases in the context of photodynamic therapy, UV induced immunosuppression, and the treatment of light allergies. In particular, a wearable UV sensing device could help both, physicians as well as patients to monitor the irradiation and user activity over a longer period of time, thereby facilitating a more precise treatment at lower cost, as part of the monitoring task is shifted from the physician to the patient.

Currently a new version of the sensor module is being built, that will be much smaller and less energy consuming than the first version.

The goal of this thesis is to optimize the software on this new sensor module and on the smart phone to make it usable for a medical application. The software on the sensor will have to be designed to work with the new Bluetooth Low Energy profile and has to be optimized for energy consumption. On the smart phone, Tobias will develop a software that can be used for a specific medical application, which will be defined together with a dermatologist from the university hospital Zurich. The focus of this software should lie on stability and ease of use.

## Time schedule (Total: 280h)

- Discussion with dermatologist and study of related work [**]
- Design smart phone software [*]
- Implement smart phone software [***]
- Design sensor software [**]
- Implement sensor software [***]
- Evaluate the system (e.g energy consumption) [**]
- Write the report [**]

## The Students' Duties

- Regular check-ins of the progress using the Subversion system
- One meeting per week with the advisor.
- One final presentation (15 min).
- A final report (20 to 60 pages, English or German), presenting work and results.
- Two copies of the report (each containing a CD with relevant code, etc.) should be handed in in the end.

## General

- Independent working is expected
- A possibility to work in the ETZ is provided. It is also possible to work at home

## Contacts/Advisers

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