Flexibel Fluorosence Intensity Measurement Platform

RESEARCH PLAN [DRAFT]

within the lecture of
UppSense

at Uppsala University
in the Departement of Information Technology

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System Architecture

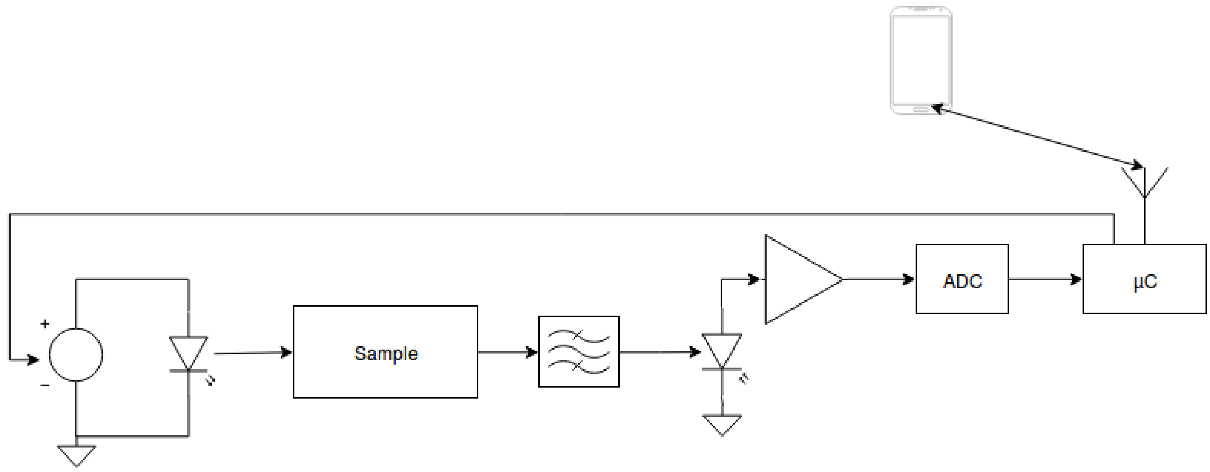

Figure 1.1: Rough sketch of the system architecture.

In figure 1.1 one can see a rough sketch of the system architecture, which is planned. The signal flow is from the left to the right. First the assay has to be excited, which is done by a voltage source connected to a light emitting diode (LED). This can also be another voltage controlled source of light. Hence this has TBD. The light source however is controlled by software (Microcontroller, µC), which is done by a simple e.g. transistor circuit. Using this approach has the advantage, that one can mix up the received signal to a higher band by switching the light source on and off with a sine wave of e.g. 1 kHz. By doing so one can suppress noise. In this case a simple mixer implemented in software can be used for instance to mix down the signal again and to process it.

The emitted light has to be filtered. As the wavelengths in this case are in the nm region, a optical filter is needed. Behind the filter a photo diode is located, which converts the light signal to an electrical signal. This signal probably has to be processed in a analog way (e.g. amplification and filtering) before it is transfered in the digital world (analog-digital converter, ADC). In the digital world one has a lot of possibilities. The signal will anyways be transfered to a phone via bluetooth. Moreover the phone provides huge computing capacities, which is one reason why the data should be transmitted.

Realization

The idea is to have a printed circuit board (PCB). On this board the light source as well as the sink shall be placed on the bottom side. Ont he top side one can mount the µC and a bluetooth infrastructure. So far, a bluetooth standard shall be used to enable communication to the phone. Multiple PCBs shall be ordered, which either are having different light sources and sinks or which enable the attachement (soldering) of different light sources ands sinks. A rechargeable battery (e.g. phone battery) shall be the power source.

The optical filter can be mounted with epoxy resin on the PCB. Spacing bolts can be used to attach the PCB on a plate, where one can find a mechanism to easily fix the blood probe chip with that sample. Futhermore a black box which one can put over the so far depicted structure, has to be designed. This black box supresses light (noise) from the environment. Mechanical sketches have to be provided in a later revision of this document.

Frabrication

The PCBs can be fabricated in China. This is an example of a manufacturer: `https://www.elecrow.com/10pcs-2-layer-pcb.html`. The lead time until one can actually work with designed PCBs is roughly three weeks including the assembling and soldering, which has to be done by the egineering subgroup.

2 Budget

Prototype

Item	Costs	Description
PCBs	50 $	5 cm x 5 cm, cheapest option, which still has an acceptable quality
Components	100 $	one needs to order components for the PCBs (diodes, ICs, µCs, resistors, etc.)
Soldering	0 $	can done by the engineering subgroup
3D printing	0 $	for the mechanical stuff, can probably be done by Uwe
Assembling	0 $	can be done by the engineering subgroup
$\sum$	150 $	

Table 2.1: Rough budget estimation for one prototype.

In table 2.1 one can see the rough costs estimation to build one prototype. This one prototype, however, subsumes multiple PCBs, which can be used for multiple assays, which have the common denominator of using a fluoresence technique.

Estimation Of Product Price

3 Gantt