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# Low-cost miniaturized algae detection module

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## Abstract

We are currently developing a miniaturized low-cost device for detecting algae species based on their pigmentation. In contrast to existing technology, our device is modular and can integrate up to 8 different excitation wavelengths and 4 different emission channels. The device is operated in a flow-through mode similar to a flow-cytometer, however, using only low-cost equipment such as photodiodes and LEDs. With a sampling frequency of ~500 Hz we are able to detect single particles or cells passing the illumination chamber. Our goal is to achieve single cell sensitivity similar to laser driven flow-cytometers. First results showed that we are able to obtain signals down to concentrations of about 2 cells per 10 microliters, i.e. the illuminated volume. Using multivariate data analysis we try to develop algorithms for classifying algae passing through the device. Although the device will certainly not be able to compete with submersible imaging devices, we believe that it will be a valuable addition to existing technology considering its price of less than 200 EUR. The flexibility in choosing excitation and emission wavelengths and the high sampling rate will even enable laboratory applications, such as measuring induction kinetics. Most importantly, the ability of the device to detect and classify algae will improve with the amount of data collected. The more know samples we can analyse, the better we can train the algorithm for classification. As the first application of the device, it will act as fully integrated early warning system for harmful algae blooms in the submersible probe for the FP7 project “SChEMA”.

**Keywords:** harmful algae blooms, algae detection, fluorescence, low cost

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