**Bachelor’s Thesis**

« Development of a Modular Software Architecture for an Acoustic Underwater Modem Based on a Cortex M4 »

**Motivation**

Low-power, underwater communication is a mandatory prerequisite for swarms of micro AUVs (autonomous underwater vehicles). The latter have recently drawn considerable research attention, as they can be used in scenarios stretching from dam inspections over localization of pollution sources to scientific experiments. In this context an acoustic underwater modem has been developed at our institute. As the modem shall be small and low-cost many of the tasks are implemented in software rather than in hardware. This also allows to quickly change and improve them. For example, the complete modulation and demodulation process is done by an AVR32 microcontroller. As these tasks are computationally complex, there is no computing time on the microcontroller left. At this stage the architecture of the firmware is designed to run on this specific microcontroller, making it hard to replace it with a more powerful one.

**Work Description**

At first you will have to analyze the existing code base of the acoustic underwater modem. Based on your analysis a modular software architecture has to be implemented, allowing to run the code on the existing AVR32, on a simulator and on a new and more powerful Cortex M4.

In particular, the thesis will comprise the following steps:

1. Analysis of the existing code regarding performance and modularity
2. Development of a modular software architecture that is independent from the actual hardware used
3. Implementation of the hardware-dependent firmware part for the Cortex M4
4. Evaluation and performance comparison with the existing solution regarding execution speed
5. Enhancement of implementation by using DSP instructions

**Prerequisites**

For successful thesis completion, you should fulfill the following requirements:

- Practical experience in programming, especially in C/C++
- Knowledge of Software Engineering
- High degree of autonomous working and self-motivation

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