



TTK4550 SPECIALISATION PROJECT ASSIGNMENT

Name: Vetle Berg Abrahamsen
Program: Cybernetics and Robotics
Title: Realisation of an ultra-low power LPWAN embedded buoy controller
Title (Norw.):
Credits: 7.5 SP

Project description:

This project concerns the hardware and software realisation of an embedded computer for a marine buoy concept with LPWAN connectivity. The marine buoy is designed for carrying a specific acoustic telemetry receiver and relaying data received underwater from acoustic transmitters to an Internet backend. The objective of the buoy is to enable remote and near real-time acquisition of underwater telemetry data and the operational state of the receiver/buoy system, while preserving the desirable properties of current off-line stand-alone logging receivers. These include ease of deployment, long operational life, and low cost. The buoy should thus be lightweight and allow deployment for several months in a remote fjord or coastal site consuming minimal amounts of power, while still being capable of transferring receiver detections and other relevant data wirelessly to a shore-based gateway/base station in near real time. The goal of this project is to bring the current multi-board prototype version of the buoy controller (cSLIM) into a practical and robust single-board embedded computer solution ready for field testing in the ocean environment. The project includes the following tasks:

- Survey of technical literature on concepts and components relevant for the existing prototype (MSc Thesis report, NB-IoT, LoRa, nRF9160, Zephyr RTOS, acoustic telemetry etc.)
- Work out requirements and design a single-board buoy controller PCB using a suitable EDA tool
- Work out and acquire the BOM, populate the PCB and verify the design through incremental bring-up and testing
- Adapt the existing buoy controller firmware to the new design
- Write a technical report describing the development process and design choices made through the project assignment, including detailed technical documentation of the buoy controller

Project start: 20 September 2021
Project due: 24 January 2022
Host institution: NTNU/Department of Engineering Cybernetics
Supervisors: Jo Arve Alfredsen, NTNU/DEC

Trondheim, 22 September 2021
Jo Arve Alfredsen