

Sparv Embedded thesis ideas

Thesis fair at LiU 2026-09-30

Axel Hammarberg axel@sparv.io, Johan Gustafsson johan@sparv.io

We develop advanced weather measurement solutions for the atmosphere, using weather balloons and drones. We help to advance geophysical sciences, weather-related preparedness and national defence.

We accept thesis students and internships in Swedish and English to our spacious office in Ebbepark between LiU campus Valla and Linköping city center.

Website: <https://sparv.io>

“Windsond Online” website

Skill: Web Programming

Develop a prototype for a cloud-based site that can gather and show data from Windsond systems. It should be based on our existing Windsond Web view, but hosted remotely and able to gather data from multiple radio receivers at once. It should be able to establish a connection to RR4 radio receivers through some IoT solution. It should also be able to handle multiple organizations that can all share access to the data, and protect from unauthorized access.

Implement temperature calibration in range -90 to +50 C.

Skill: Physics

Develop the practical method of doing calibration of many thermistors, using our calibration baths with water and ethanol. Calculate the uncertainty budget. Test the repeatability. Achieving high calibration accuracy over a wide temperature range presents an interesting problem. We will take help from the experts at Pentronic in Västervik.

Develop product enclosure in styrofoam for 30 km altitude

Skill: Mechanics / product design

For high-altitude measurements, we need to design a styrofoam enclosure to insulate the electronics and battery from the cold. Design the enclosure, considering both thermal properties, low weight, ease of use and how to produce it.

Optimize the performance of a radiosonde battery

Skill: physics

Our current radiosondes can reach an altitude of about 10 km before the cold temperature causes the battery to shut down. For developing higher altitude sondes, up to 30 km, we need to be able to handle much colder temperatures, and run for a longer time. This requires insulation and we may also heat the sonde interior. Exactly to what temperature to heat the sonde is not obvious: while higher temperatures consume more energy to heat the sonde, lower temperatures also reduce the battery capacity. As the air pressure drops, the temperature lost through convection also decreases, affecting the power needed to keep the sonde at a given temperature. Develop a solution for keeping the sondes at a temperature that maximizes the battery life.

Prototype a balloon autolauncher

Skill: Mechatronics

Design and build a barrel-size device that can inflate and release a helium balloon with an attached radiosonde. This is a novel product that can make a big difference for weather measurements around the world. Ideally the device should be able to stand ready for long periods of time without human interaction.

Telemetry web view for drone system

Skill: Webb

Build a webpage that replaces our current stack for gathering / visualising drone sensor data. It has two main use cases: viewing live telemetry data from a drone as it is flying and importing and analyzing log files after a flight is completed. The site should show plots / tables with data and allow configuring sensors / other connected devices. The work does not include designing the telemetry link, just the site itself. The page might be hosted on ESP32 devices with a few megabytes flash, so the bundle size needs to be kept reasonably small.

Battery tester

Skill: Electronics and embedded programming

Task: Design and build a circuit and controlling program to test the performance of up to 100 small batteries in parallel. Control the charging and discharging currents and measure the voltage. This is useful for characterizing battery models and for battery quality control. We have a design idea how to do this but you can also make your own design choices to get more impressive performance.

UART multiplexer

Skill: Embedded programming

The main MCU in Sparv's drone sensor logger has limited IO for peripheral sensors. A secondary MCU can add 6 UARTs to greatly expand its flexibility. The logger already supports plug-in modules and we designed a clean M2M API. The thesis would create a compatible PCB, program a MCU for parallel IO tasks and make a C/C++ client library.
