Time planning thesis work – Love Arreborn, Nadim Lakrouz

The plan below is a loose plan for out thesis work.

Update 2025-04-28

Timeplan updated with checkboxes for completed tasks.

Risk assessment

- As it stands right now, it's unclear whether we'll be able to connect our device to the actual OQRNG-device before end of project. However, the implementation of our firmware and the evaluation of it should prove sufficient for our thesis. Should the OQRNG-device not be connected to our microcontrollers, we'll revise the thesis body to reflect that – however, the main text should not require significant overhauls.
  - One alternate test instead of using the OQRNG-device is to use a separate microcontroller that can 'simulate' the OQRNG-device by outputting a stream of pseudo-random bits for our MCU to process. This allows us to stress-test the system.
- Our iterations are proceeding slightly faster than expected, however, none show significant improvements over the first naive implementation. While this in and by itself is a result in some aspect and not something we can control or impact, it's worth mentioning.
- A lot of the practical work has gone towards developing a suitable test script which currently is detailed far too little. We'll consider adding more details about this to the main thesis body or to an appendix text.
- Deploying this code to other MCUs has proven challenging, not due to the hardware constraints but rather due to the fact that they are significantly harder to flash to and work with than Teensy 4.1. We can't adjust much to this risk, but need to be aware of it going forward as to not cause undue problems down the line.

Week 14

☒ Planning seminar 1/4
☒ Potentially book a meeting with the customer for ADC discussion / order
☒ Finalize setting up development environment

Week 15

NOTE: At some point before the half time seminar, we should get access to the ADC and should be able to attempt connecting the ADC to the live equipment and get real samples. As it's difficult to say exactly when the ADC is delivered and how much effort it will take to interface with the OQRNG-device, it's hard

to say when we'll work on this. Assume that work before the corresponding deadline will be added.

- ☒ Proceed with first iteration, or the baseline (naive) implementation, potentially run it on local hardware first before deployment to MCU
- ☒ Generate some first instances of test data (at least one set of test data is needed at this point)
- ☒ If time allows, deploy naive implementation on MCU and set up time measurement code
- ☒ If not, test the baseline on local hardware with generated test data to verify functionality
- ☒ Investigate feasibility of ESP32

Week 16

NOTE: To consider an iteration complete at this point (e.g. when it's to be finalized) the code should be deployed to Teensy 4.1 and time should be measured. Experiments should be summarized to easily fit them into the thesis.

- ☒ **DEADLINE**: Naive implementation deployed on MCU and time measurement set up
- ☒ **DEADLINE**: Sets of test data finalized
- ☒ Proceed with second iteration (e.g. efficient data structures)
- ☒ Create and populate external document with test results (to be filled with all coming iterations)
- ☒ Investigate feasibility of Pico 2

Week 17

- ☒ **DEADLINE**: Finalize second iteration
- ☒ **DEADLINE**: Decide whether ESP32 and Pico 2 are viable candidates for comparison (to allow for time to solder parts)
- ☒ Proceed with third iteration (e.g. bitshifting)
- ☒ **DEADLINE**: Preparation for half time seminar
- ☒ Ensure completed experiments are detailed in the thesis, discussion started

Week 18

- ☐ Half time seminar 30/4
- ☐ **DEADLINE**: Finalize third iteration
- ☐ **DEADLINE**: Teensy 4.1 connected to OQRNG-device to sample real data (Started 2025-04-25, almost finalized)
  - *NOTE*: This heavily depends on when the ADC is delivered, but should be done here at the latest!
  - *NOTE*: Currently, we're holding off on using an external ADC at all, possibly going for the internal ADC on our MCU instead.
- Extra time alloted for finishing up trailing tasks

Week 19

- ☐ Proceed with fourth iteration (e.g. batching) (Preliminarily started 2024-04-25)
- ☐ **DEADLINE**: Go over potential feedback from half time seminar, adjust content accordingly

Week 20

NOTE: At this stage, we should have four iterations completed that (theoretically) should be MCU agnostic, which we can then deploy to other MCUs as well. As the last iteration is **not** hardware agnostic, this is the iteration that might not be deployed to all MCUs as this requires a full rewrite of all code.

- ☐ **DEADLINE**: Finalize fourth iteration
- ☐ **HARD DEADLINE**: Iterations 1 - 4 finalized!
- ☐ **DEADLINE**: Experiments detailed in the thesis, discussion started
- ☐ Begin work of deploying iterations 1 - 4 on the MCUs that were deemed feasible
- ☐ Begin rewrite of code for Teensy 4.1 for the fifth iteration (e.g. ARM hardware instructions)
  - ☐ *NOTE*: The ARM instructions, e.g. the fifth iteration, might be too time consuming to actually finish. It's hard to know beforehand whether this is the case.

Week 21

- ☐ Begin fifth iteration (e.g. ARM hardware instructions – *NOTE*: This iteration may be too time consuming, and we will have to investigate the feasibility of this during the project)
- ☐ Begin preparation for opposition presentation
- ☐ Connect Teensy 4.1 to OQRNG-device and operate on real data

Week 22

- ☐ **DEADLINE**: Deploy iterations 1 - 4 on weaker MCUs (e.g. ESP, Pico) and summarize results in our table
- ☐ **DEADLINE**: Experiments and discussions finished before opposition
- ☐ Opposition presentation 28/5
- ☐ Begin work on opposition feedback as soon as possible after the seminar
- ☐ **DEADLINE**: Fifth iteration finalized

Week 23

- ☐ **HARD DEADLINE**: All iterations should be finalized on all MCUs during this week!

- ☐ **DEADLINE**: Opposition comments should be adjusted in the thesis at the end of this week
- ☐ Prepare for final presentation

Week 24

- ☐ Exact work that needs to be done before the final presentation is a bit vague, and will be populated over time as we realize what needs to be finished before the final presentation
- ☐ Final presentation 10/6
- ☐ **DEADLINE 13/6**: Finalize report for publishing

Week 25

- ☐ **HARD DEADLINE 16/6**: Publishing
- ☐ **DEADLINE 17/6**: Reflection document