

SOP Project – Lessons Learned

Jérémie Gremaud

Group Name: 404ErrorNotFound

System-Oriented Programming 2025
BSc Course, 2nd Semester

University of Fribourg

May 21, 2025

Introduction

Despite prior experience with languages like Java and Python, C was a new venture into low-level programming, particularly direct memory address and pointer manipulation, which I hadn't encountered since a brief RISC-V assembly introduction. The course was engaging, although theoretically demanding weekly. The exercises and project were instrumental for learning.

Technical Lessons Learned

This course introduced me to C programming, enhancing my grasp of pointers and memory management, such as understanding memory fragmentation. My Linux terminal skills, including tools like Git (learning merges and conflict resolution), GCC, and Make for manual compilation, have greatly improved, moving beyond abstracted high-level tools.

While I learned to use C libraries, I often found them unintuitive without external references. Understanding pointer usage (variables vs. pointers, double pointers, the '&' operator) remains a challenge.

Teamwork and Collaboration

This project marked my first collaborative software development experience, applying C and Git concepts, including managing merge conflicts and task distribution. Explaining code to teammates reinforced the necessity of well-structured, commented code. I also benefited from the expertise of group members, particularly in areas like data processing.

Coding on Microcontrollers

Coding on microcontrollers was initially challenging, starting with Arduino IDE setup. We encountered IDE issues like outdated binaries, lack of WSL support, and breaking changes from M5Stack library updates. Despite these hurdles, creating a functional product was rewarding. Implementing multithreading for bidirectional communication was surprisingly manageable, though I acknowledge some functions are not thread-safe.

Integrating teammates' functions into libraries deepened my understanding of header files, includes, and the incompatibility between 'char*' and 'String'.

Conclusion

In conclusion, I valued learning C fundamentals and new concepts. Despite the theoretical depth and application challenges, I've acquired skills beneficial for future studies and beyond.