

Training Diary: Lucas Chapart & Mathéo Morin

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February 9, 2025 – March 8, 2025

Overview

This diary documents our progress through Phases 1, 2, and 3 of the Multiprocessor Programming course. Work was conducted collaboratively with Mathéo Morin, focusing on environment setup, OpenCL basics, and sequential implementation of the ZNCC algorithm.

Phase 1: Environment Setup & OpenCL Basics (Feb 9–15)

Total Hours: 12 hours

- **Feb 9–10 (4 hours):**

- Formed a group and registered via email.
- Installed Visual Studio Code and configured C/C++ compiler (GCC).
- Downloaded OpenCL SDK (NVIDIA/Intel) based on hardware.

- **Feb 12–14 (8 hours):**

- Resolved OpenCL configuration errors (driver compatibility issues).
- Tested "Hello World" kernel. Verified GPU device detection.
- Integrated LodePNG library for basic image I/O.

Phase 2: Matrix Operations & Image Processing (Feb 16–28)

Total Hours: 22 hours

- **Feb 17–19 (8 hours):**

- Exercise 1: Matrix addition in C and OpenCL. Profiled execution times.
- Debugged OpenCL kernel memory leaks (improper buffer release).

- **Feb 20–23 (8 hours):**

- Implemented grayscale conversion and image resizing (1/16 scale).
- Developed 5x5 Gaussian filter in C (edge handling via zero-padding).

- **Feb 24–28 (6 hours):**

- Ported image pipeline to OpenCL. Optimized filter kernel with local memory.
- Submitted Phase 2 code and profiling data.

Phase 3: SequentialZNCC Implementation (Mar 1–8)

Total Hours: 18 hours

- **Mar 1–4 (10 hours):**

- Switched to stb_image.h for simplified image I/O.
- Implemented ZNCC algorithm with 9x9 window. Reduced to 5x5 for testing.
- Precomputed window means to reduce redundant calculations.

- **Mar 5–7 (6 hours):**

- Added cross-checking (threshold=8) and occlusion filling (nearest-neighbor).
- Generated disparity map with visible depth layers but noisy edges.

- **Mar 8 (2 hours):**

- Finalized code and report. Emailed deliverables to the teacher.

Summary

- **Total Hours:** 52 hours

- **Key Achievements:**

- Functional OpenCL environment and image processing pipeline.
- Sequential ZNCC with post-processing (cross-checking, occlusion filling).

- **Challenges:**

- OpenCL kernel debugging (buffer mismanagement).
- ZNCC's high computational complexity.

- **Next Steps:** Begin multithreaded implementation (Phase 4) using OpenMP.

Signed:

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March 8, 2025