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Viktor Baldin

First year MIPT student

About Me I am undergraduate MIPT student. Currently I am learning low-level programming because it is interesting for me to know how actually hardware work. For the last year I have been mastering skills of C (with a little C++) and assembly programming. My hobbies are: sports (running), chess, cooking, volunteering.

Education

Bachelor, MIPT

Bachelor in Applied Mathematics and Physics, Department of Radio Engeneering and Cybernetics (2023 - present)

Educational courses

- I. R. Dedinsky's "Introduction to Computer System emulation, compiler technologies and industrial programming" (2023 - 2024)

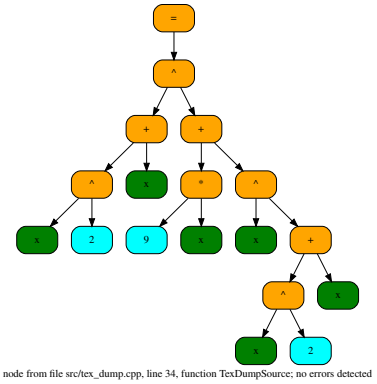
Projects

Processor

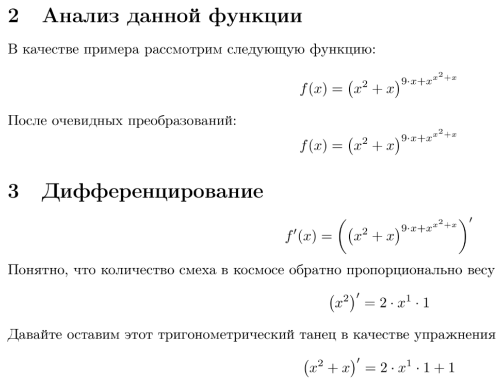
Simple CPU emulator with its own stack-based architecture. Numeric calculations implemented as floating point arithmetic only.
Link: https://github.com/victorbaldin56/processor

Differenciator

Derivative calculator with step-by-step solution. Creates AST for math expression using recursive descent and evaluates a derivative by transforming AST. Supports output as PDF using LaTeX, also uses GraphViz package to dump the input AST. Additionally, annotates PDF with solution using random ChatGPT-generated phrases.



(a) Dumped AST



2 Анализ данной функции

В качестве примера рассмотрим следующую функцию:

$$f(x) = (x^2 + x)^{9 \cdot x + x^{x^2 + x}}$$

После очевидных преобразований:

$$f(x) = (x^2 + x)^{9 \cdot x + x^{x^2 + x}}$$

3 Дифференцирование

$$f'(x) = \left((x^2 + x)^{9 \cdot x + x^{x^2 + x}}\right)'$$

Понятно, что количество смеха в космосе обратно пропорционально весу

$$(x^2)' = 2 \cdot x^1 \cdot 1$$

Давайте оставим этот тригонометрический танец в качестве упражнения

$$(x^2 + x)' = 2 \cdot x^1 \cdot 1 + 1$$

(b) LaTeX PDF output

Link: https://github.com/victorbaldin56/differenciator

DOS Tasks

Relatively small pure assembly programs for MS-DOS. The main purpose of this part was to get general understanding of x86 assembly and hardware interrupts handling.
Link: https://github.com/victorbaldin56/dos-tasks

Miniprintf

Simplified implementation of `printf` function in pure NASM assembly for x86-64 Linux.
Link: https://github.com/victorbaldin56/miniprintf

Mandelbrot

Mandelbrot fractal renderer built with use of SFML. The main goal of this project was the research of SIMD instructions to speed up calculations up to several times. On my machine I have reached 7.4 times acceleration with use of AVX2 instructions.

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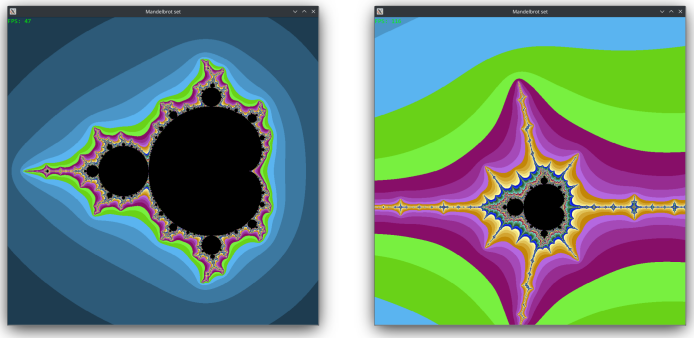

Figure 0.2: Rendered Mandelbrot fractal

Link: https://github.com/victorbaldin56/mandelbrot_fractal

Hash Map

Accelerated implementation of hash map. The first part of this work was to compare hash functions by their distribution. The second part was to master skills of agressive platform-dependent optimizations with intrinsics and assembly. As the result, search by key has been speeded up by 2.8 times.
Link: https://github.com/victorbaldin56/hashmap

Binary Translator

Translates my CPU emulator's bytecode to native x86 instructions. Supports generating NASM assembly or JIT. Has extensible architecture and internal intermediate representation (IR), that allows to create backends for multiple target architectures. This is the same principle that underlies the work of GCC and LLVM infrastructures.
Link: https://github.com/victorbaldin56/binary_translator

Soft Skills

Languages

- Russian (native)
- English (Intermediate)

Personal Qualities

- Purposeful
- Sociable
- Creative
- Punctual
- Hard-working
- Reliable
- Quick learner
- Critical thinker

Hard Skills

Programming

- C
- C++
- x86 Assembly
- Unix Shell
- Python
- LaTeX
- Make
- CMake

Toolchain

- Compilers (GCC, Clang)
- Debuggers (GDB)
- Assemblers (NASM)
- Disassemblers (objdump)
- Profilers (Perf, Valgrind)
- Version control (Git)

Grades

GPA Overall

7.5/10

GPA for Programming

7.5/10

Awards

Olympiads

- Phystech Olympiad in Physics, 2nd degree (2023)
- Kurchatov Olympiad in Physics, 2nd degree (2023)
- Rosatom Olympiad in Physics, 3rd degree (2023)
- Regional Russian Olympiad in Physics, 1st degree (2023)