

Project

Algorithm Engineering

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Vectorization

Where we are

Vector Extensions

- ▶ Shift from x87 FP instructions
- ▶ Use chip space to exploit parallelism
- ▶ SSE (128 bit registers)



- ▶ AVX (256 bit registers)



Vector Extensions (cont.)

- ▶ 16 B alignment (for aligned loads)
- ▶ Speed up near vector length
- ▶ Typically used for 32 bit integers, floating point (single/double)
- ▶ Instruction set reference ([Intel Instruction Set Reference](#))
- ▶ Vectorized libraries, assembly code, intrinsics, compiler vectorization

Vectorizing Compilers

- ▶ `icc -vec`
- ▶ `gcc -ftree-vectorize`

Difficulties

- ▶ Memory aliasing
- ▶ Unaligned memory access
Peel off first iterations or use unaligned memory access

Write Vectorized Code

Homework

- ▶ Vectorize your loops
- ▶ Measure and compute CPE