

# Approach to Data-Oriented Design

Omid Shahbazi

<https://omidshahbazi.github.io>

# Agenda

- Problem Statement
- Discussion About Possible Solutions
- What's the actual problem?
- Go Over the Problem
- Studing Better Impl.
- Q/A

# Problem Statement

- Simulate behavior of, and Render massive ants crawling on a map
  - Each ant is a pixel
  - We're going to benchmark and impl. some solutions
- Do you need more to know?

# Let's Discuss

- What is our data?
- What is our behavior(s)?
- How do we render?

Ant 1			Ant 2			Ant ...n		
Position	Target	StepCount	Position	Target	StepCount	Position	Target	StepCount
8bytes	8bytes	4bytes	8bytes	8bytes	4bytes	8bytes	8bytes	4bytes

# Let's see the impl.

- How long should it take?
- Give me some solutions

# Optimize

- Are we happy?
- Any other solution?

Ant 1			Ant 2			Ant ...n		
Position	Step	StepCount	Position	Step	StepCount	Position	Step	StepCount
8bytes	8bytes	4bytes	8bytes	8bytes	4bytes	8bytes	8bytes	4bytes

# What's the actual problem?

- Cost of Abstractions
- Branch (mis)predictions
- Cost of hitting RAM
- Cache Misses
- So what have to do?

# Benchmark Memory Access



# Studying better impl.

Ant 1			Ant 2			Ant ...n		
Position	Step	StepCount	Position	Step	StepCount	Position	Step	StepCount
8bytes	8bytes	4bytes	8bytes	8bytes	4bytes	8bytes	8bytes	4bytes



8bytes	Position	Position	Position	Position	Position	Position
12bytes	Step	StepCount	Step	StepCount	Step	StepCount

# Data-Oriented Design Principles

- If you don't understand the data you don't understand the problem.”
- Different problems require different solutions.
- If you have different data, you have a different problem.
- If you don't understand the cost of solving the problem, you don't understand the problem.
- If you don't understand the hardware, language, compiler, OS you can't reason about the cost of solving the problem.

# Thank You!

- References

- Anger Fog, Optimization Manuals <https://agner.org/optimize>
- Richard Fabian, “Data-Oriented Design”  
<http://dataorienteddesign.com/dodbook>
- Yaser Zhian, Data Oriented <http://yzt.github.io/>

- Any Questions?

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