#ASLI ENGINEERING

Writing Good Multi-threaded Programs

SWIPE

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Writing good multi-threaded programs

Writing concurrent programs is easy,
but things become tricky when we have
to ensure correctness and optimality

Ensuring correctness : locking and atomic instructions

Ensuring optimality : fairness, efficient logic

Counting prime numbers till 100 million

1. Sequential approach (3 min 49 sec)

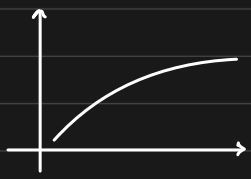
For each number, check if it is divisible by any of its prev

2. Add threads (42 seconds)

10 threads, each handling an equal range of ≈10 million

We did speed up, but was it fair?

1. Smaller numbers can be checked quickly
1 to squareroot(n)



2. more prime numbers in the smaller range

* Some threads finish early and wait for others to complete

3. Threading with fairness (35 seconds)

10 threads, each thread picks up the next unprocessed number and checks if it is prime

global variable currentNum

loop until all num processed {

each thread

1. increment currentNum atomically ← correctness

2 check prime

}

* all threads end at nearly the same time and do nearly the same work ← maximizing optimality