Lecture 16

Floating Stability / Condition # of a function:

Yes!

Stay tuned!

Is there a condition Condition #?

Maybe!

Check Nick Higham

FLOP Count Argument?

↳ Was done the ✓ method.

↳ Quote age: ✓

Memory Utility vs. FLOP Counter

- How important work on accurate choices?

- If a matrix is ill-cond, we could use iterative refinement. Still tolerable?

OR:

- ~~How to fix~~ Use pivot to make $f(x)$ is okay. ✓

Chopping measurement bounds is bad.

Condition #:

How much $\Delta x$ change if $\Delta b$ change?

How does Julia/Matlab handle ill-conditioned matrix:

↳ Eg Hilbert matrix.

Memory vs time: ✓ Example.

Old book gaussian bounds + bad condition #s?

Yes!

Yes! Yes!

Reasoning on Computer

| Memory | Time |
|---|---|
| - Hard limits | - Soft limit. |

Are FLOPS always the bottleneck?

- Dense Computation ⇒ yes!
- Sparse Computation ⇒ No.

Loop Nests

for i=1 to n

for j=1 to n

for k=1 to n

Source

↳ Loop in order: ✓ O.K.

↳ Loop in order: around from algo to Jim Demmel.

Energy in Computer.

Polynomial vs. Matrix Multiplication.

Approx $f(x)$ by $p(x)$ (a polynomial)

⇒ Well-conditioned.

$$\int_0^1 |f(x) - \tilde{f}(x)|\,dx \le \varepsilon$$

⇒

$$\int_0^1 |f(x) - \tilde{p}(x)|\,dx \le \underbrace{O(\varepsilon)}_{\text{or Smooth Smoothness}}$$

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