1.4.1 Scaled Vector Addition (AXPY)

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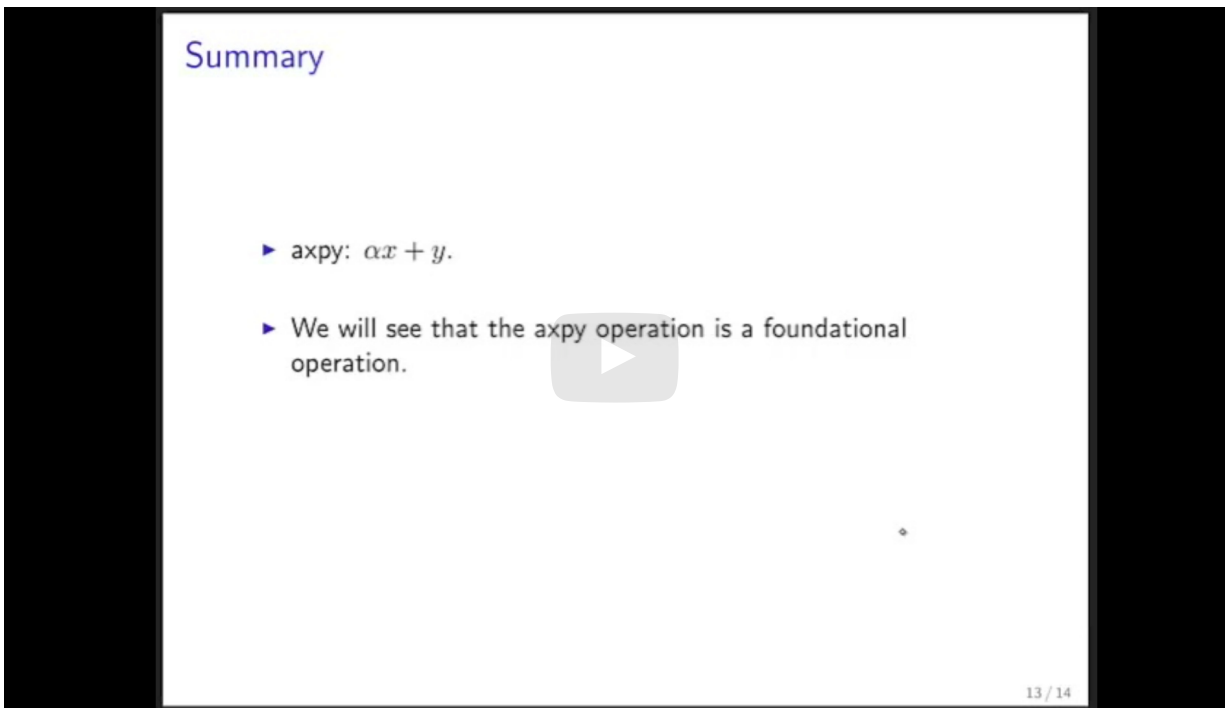

3:49 / 3:49 2.0x

And as usual, we need to put a loop around that so this is done for all

components zero to n minus 1.

In summary, we just introduced the axpy operation, alpha times x plus y.

And we will see that the axpy operation is going to be a

foundational operation.

It will recur over and over and over again as we go through our course.

End of transcript. Skip to the start.

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Reading Assignment

0 points possible (ungraded)

Read Unit 1.4.1 of the notes. [LINK]

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it's been easy so far

Thank you so much, I didnt know anything about vectors

2

AXPY = Slope

Calculator

The equation of axpy is a slope of a line. Conceptualizing this I will say it can be use to construct a diagonal line which is vector addition, horizo...

? Linear algebra for Computer Science — 2
Hi, I find the LAFF is more CS based. Learning the algorithm and cost is fun, and I am fine with these temporarily. I am wondering if I have no CS ...

? MATLAB — 3
I want to make sure I am not missing anything. At what point in the course will we use MATLAB? Should I be following up in MATLAB?

? mempos — 4
regarding the mempos of axpy, why is this 3n + 1, not 4n + 1 ? I assumed that reading x and y (2n), then the operation α*x stores one tempora...

☑ Unit 1.4.1 Video 1 at 3:05 - 4

How to count flops and memops

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Homework 1.4.1.1

2/2 points (graded)

What is the cost of axpy operation?

How many memops?

(a) $3n+1$ (b) $3n^2+n$ (c) $2n^3+n$ (d) $3n^2-2n-1$

a ✔ Answer: a

How many flops?

(a) $2n-2$ (b) $2n^2+n$ (c) $2n+3$ (d) $2n$

d ✔ Answer: d

Answer:

The AXPY operation requires $3n+1$ memops and $2n$ flops. The reason is that α is only brought in from memory once and kept in a register for reuse. To fully understand this, you need to know a little bit about computer architecture. (Perhaps a video on this?)

- By combining the scaling and vector addition into one operation, there is the opportunity to reduce the number of memops that are incurred separately by the SCAL and ADD operations

Calculator

- "Among friends" we will say that the cost is $3n$ memops since the one extra memory operation (for bring α in from memory) is negligible.
- For those who understand "Big-O" notation, the cost of the AXPY operation is $O(n)$. However, we tend to want to be more exact than just saying $O(n)$. To us, the coefficient in front of n is important.

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