

Lecture 28

CSE 331

Nov 7, 2016

Mini project video due next Mon

note ☆ stop following **126** views

Actions ▾


Mini project video

Sorry for the delay in posting this information. For the basics, please see the [mini-project page](#).

Below are the main logistics. **IT IS IMPORTANT TO READ THESE CAREFULLY SINCE NOT FOLLOWING INSTRUCTION COULD LEAD TO LOSS OF ALL POINTS.**

- The deadline is **Monday, November 14, 11:59pm**. You can start submitting on Autolab anytime from now till the deadline.
- You will need to need to form your group on Autolab again for this submission. See [@304](#) for instructions on how to do it.
 - **Very important:** Please make sure you submit your group's submission **after** the group has been formed. If this is not done, the entire group will get a zero.
 - No excuses on this-- make sure you do this group formation well in advance. If you cannot reach one of your group members at the last moment, then that is your problem.
- You will need to submit a **PDF** with the following information:
 - Link to the your group's video on Youtube
 - The video has to be for **AT MOST FIVE (5) MINS**. While grading anything beyond the 5 min mark will be completely ignored. Of course a shorter video is fine!
 - If you would prefer your groups video to be not listed on [this page](#), please add in an explicit sentence saying so. By default, all videos will be linked to on the above page.
 - If you submit in a format other than PDF then your group will get a zero. Also make sure to preview the submitted PDF to double-check that Autolab can actually read your submitted file.

Anonymous feedback

 note ☆ 0 views
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Anonymous CSE 331 feedback

Hi all,

Sorry for delay in getting this out. Please fill in this form to give feedback:

https://docs.google.com/forms/d/e/1FAIpQLSfa9DR2IVPMvADC-GVhtZ_mhinVMwQmgil1sua-bxfQQtnUYg/viewform

Few remarks:

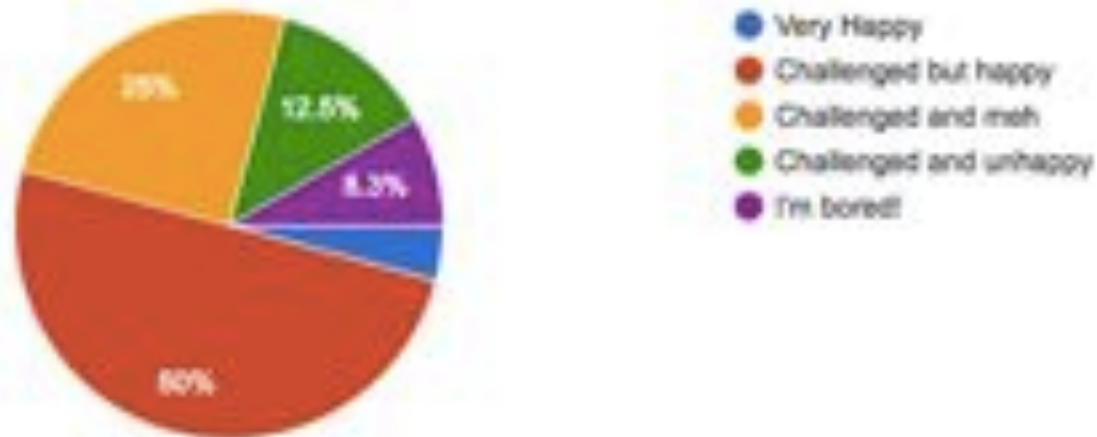
- Filling in the form is **optional** and **completely anonymous**.
- I would however, encourage you to fill in at least part of the feedback form, I'll try my best to incorporate your feedback as best as we can.
- The form is on the longer side but there are no required questions: so feel free to answer as little (or as much!) as you feel like.

logistics

edit | good note | 0 Updated Just now by Abhi Rudra

Thanks for responses so far!

Overall your feeling about CSE 331 (24 responses)



Detailed response at the end of the week

Allowed Sources

note ☆ stop following 6 views

Allowed source for Prim's algorithm

Since one of you asked, the [Wikipedia page on Prim's algorithm](#) is now an allowed source. The page with online sources has also been updated:

<http://www-student.cse.buffalo.edu/~atri/cse331/fall16/policies/allowed-sources.html>

algorithms

edit good note 0 Updated 6 minutes ago by Atri Rudra

Divide and Conquer

Divide up the problem into at least two sub-problems

Recursively solve the sub-problems

“Patch up” the solutions to the sub-problems for the final solution

Improvements on a smaller scale

Greedy algorithms: exponential \rightarrow poly time

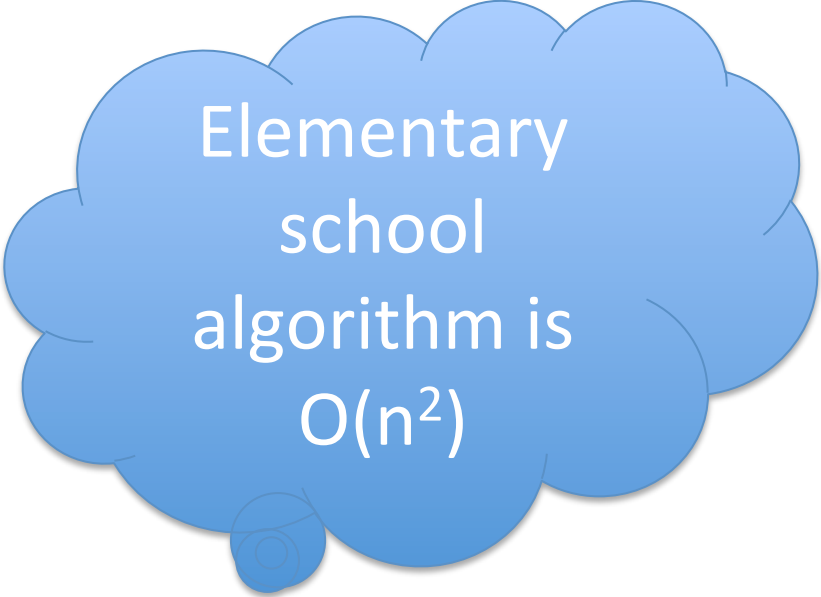
(Typical) Divide and Conquer: $O(n^2)$ \rightarrow asymptotically smaller running time

Multiplying two numbers

Given two numbers a and b in binary

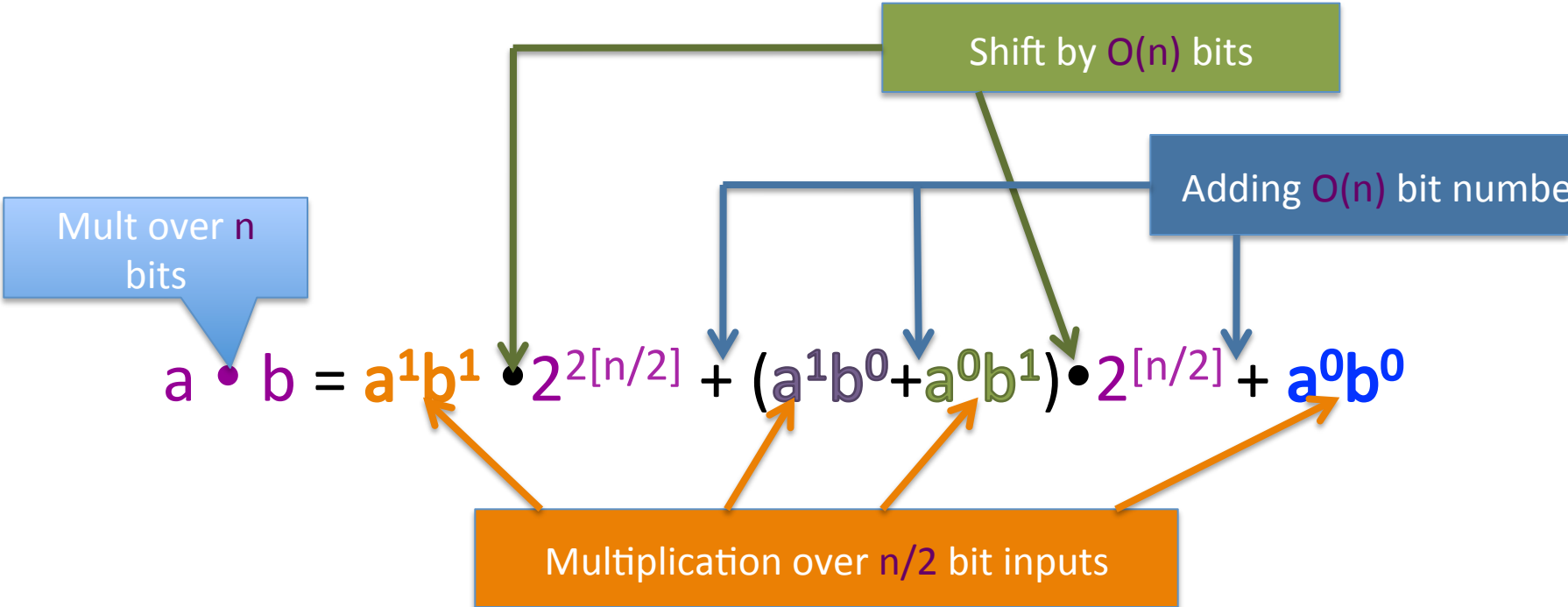
$$a = (a_{n-1}, \dots, a_0) \text{ and } b = (b_{n-1}, \dots, b_0)$$

Compute $c = a \times b$



Elementary
school
algorithm is
 $O(n^2)$

The current algorithm scheme



$$T(n) \leq 4T(n/2) + cn$$

$$T(1) \leq c$$

$T(n)$ is $O(n^2)$

The key identity

$$a^1b^0 + a^0b^1 = (a^1 + a^0)(b^1 + b^0) - a^1b^1 - a^0b^0$$

The final algorithm

Input: $a = (a_{n-1}, \dots, a_0)$ and $b = (b_{n-1}, \dots, b_0)$

Mult (a, b)

If $n = 1$ return $a_0 b_0$

$a^1 = a_{n-1}, \dots, a_{\lfloor n/2 \rfloor}$ and $a^0 = a_{\lfloor n/2 \rfloor - 1}, \dots, a_0$

Compute b^1 and b^0 from b

$x = a^1 + a^0$ and $y = b^1 + b^0$

Let $p = \text{Mult}(x, y)$, $D = \text{Mult}(a^1, b^1)$, $E = \text{Mult}(a^0, b^0)$

$F = p - D - E$

return $D \cdot 2^{2\lfloor n/2 \rfloor} + F \cdot 2^{\lfloor n/2 \rfloor} + E$

$$T(1) \leq c$$

$$T(n) \leq 3T(n/2) + cn$$

$O(n^{\log 3}) = O(n^{1.59})$
run time

All **green** operations
are $O(n)$ time

$$a \cdot b = a^1 b^1 \cdot 2^{2\lfloor n/2 \rfloor} + ((a^1 + a^0)(b^1 + b^0) - a^1 b^1 - a^0 b^0) \cdot 2^{\lfloor n/2 \rfloor} + a^0 b^0$$