Lecture 28

CSE 331

Nov 7, 2016

Mini project video due next Mon

note

stop following 126 views

Actions

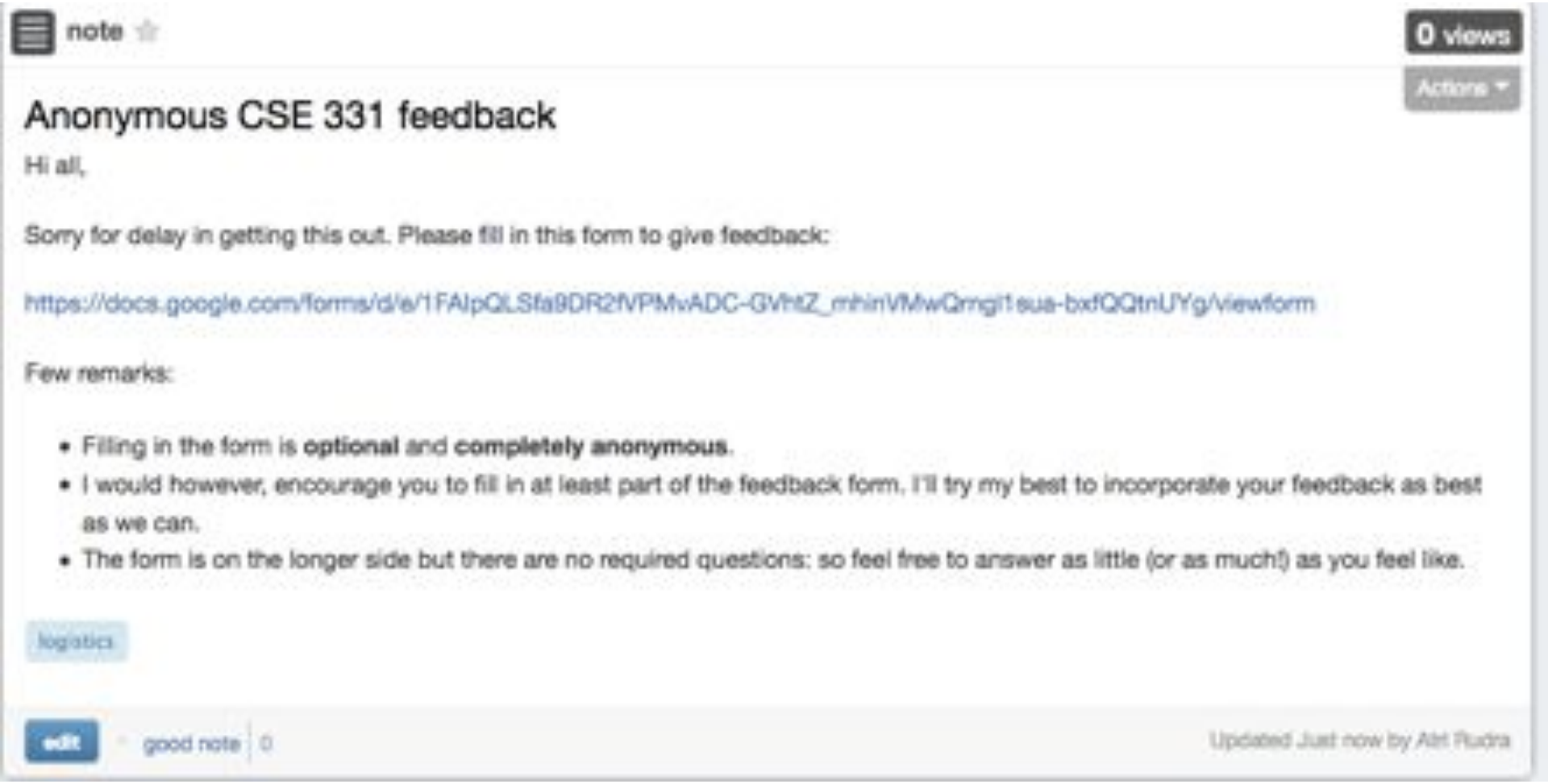
Mini project video

Sorry for the delay in posting this information. For the basics, please see the mini-project page.

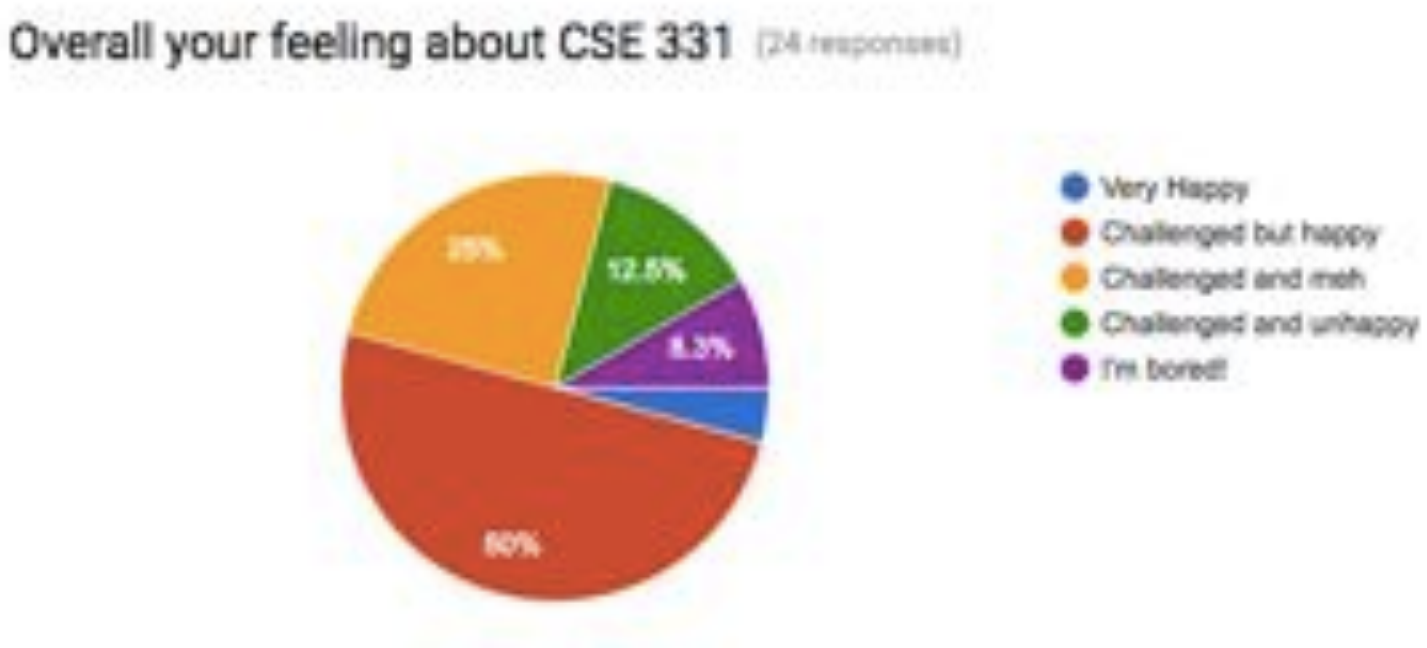
Below are the main logistics. **IT IS IMPORTANT TO READ THESE CAREFULLY SINCE NOT FOLLOWING INSTRUCTION COULD LEAD TO LOSS OF ALL POINTS.**

- 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



Thanks for responses so far!



Detailed response at the end of the week

Allowed Sources

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 → poly time

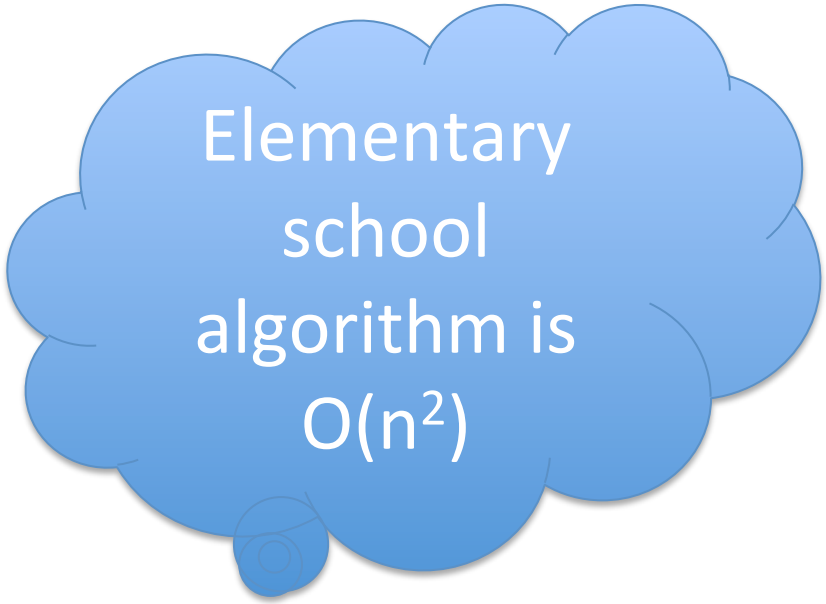
(Typical) Divide and Conquer: $O(n^2)$ → asymptotically smaller running time

Multiplying two numbers

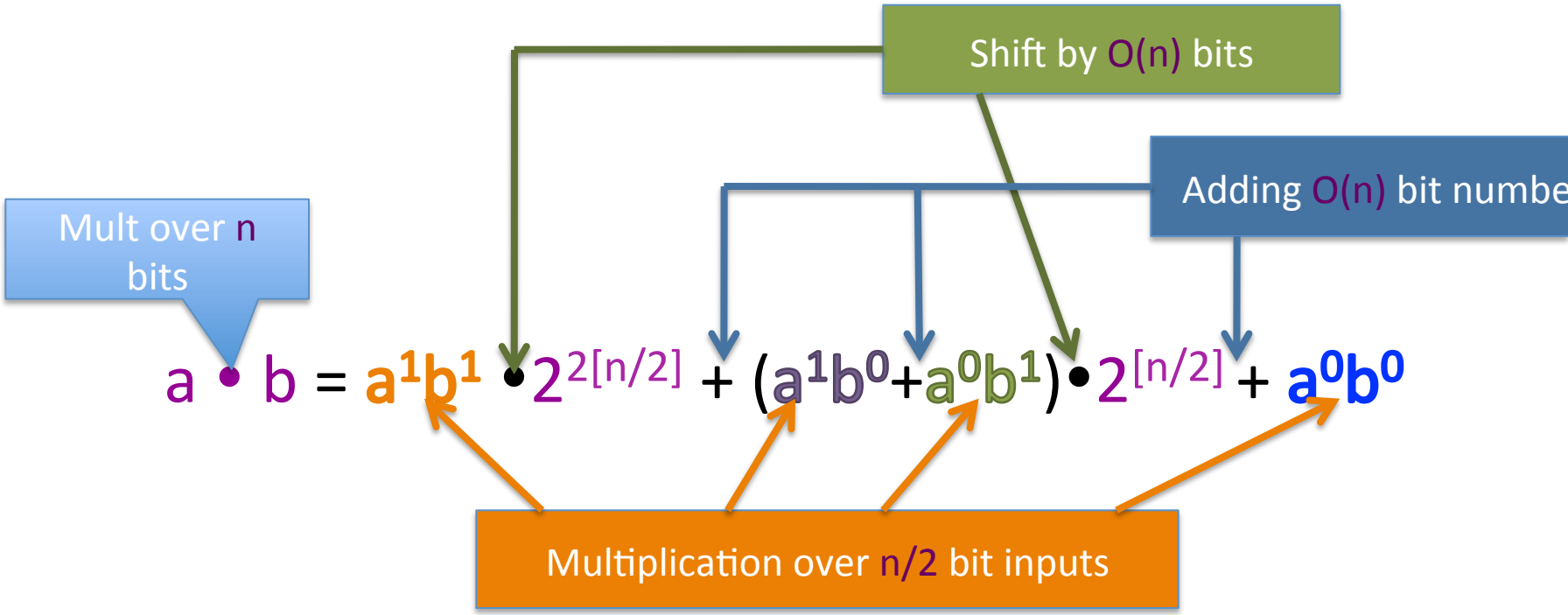
Given two numbers a and b in binary

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

Compute c = a x b



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

Mult (a, b)

If $n = 1$ return $a_0 b_0$

$a^1 = a_{n-1},\ldots,a_{[n/2]}$ and $a^0 = a_{[n/2]-1},\ldots, a_0$

Compute b^1 and b^0 from b

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

Let p = Mult (x, y), D = Mult (a^1, b^1), E = Mult (a^0, b^0)

$F = p - D - E$

return $D \bullet 2^{2[n/2]} + F \bullet 2^{[n/2]} + E$

$T(1) \le c$

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

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

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

$$a \bullet b = a^1b^1 \bullet 2^{2[n/2]} + ((a^1+a^0)(b^1+b^0) - a^1b^1 - a^0b^0) \bullet 2^{[n/2]} + a^0b^0$$