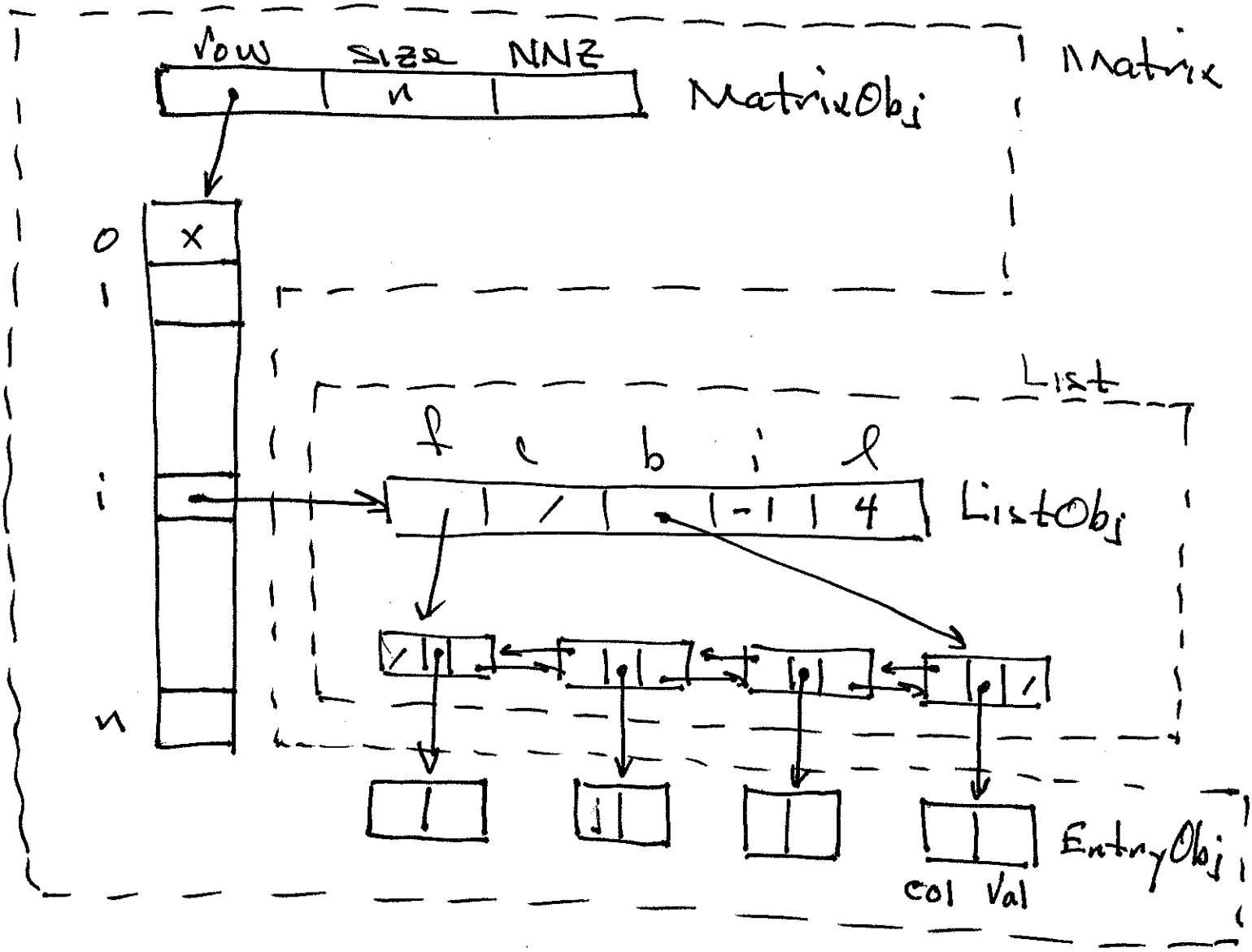
CSE 101-01 5-4-23

- Pa4: ext. 2 more days



Build order for Matrix ops.

- constructor
- makeZero
- destructor
- printMatrix
- changeEntry

easy fcns:

- copy
- transpose
- scalarMult()

helper fcns: →
- dot prod. of 2 lists
- sum of 2 lists
- diff of 2 lists

arithmetic ops:

Product:

Sum:

diff:

changeEntry(i, j, x): $M_{ij} = 0$

Cases:

1. $M_{ij} = 0$, $x = 0$: do nothing
2. $M_{ij} \neq 0$, $x = 0$: delete
3. $M_{ij} = 0$, $x \neq 0$: insert, or append
4. $M_{ij} \neq 0$, $x \neq 0$: overwrite

dot(ListA, ListB) helper fcn

A: (10 .) (30 x) (40) (60 z)

B: (20 .) (30 y) (50) (60 w) (70)

sum = x·y + z·w

add (List A, List B, List S) helper for sum

↑ initially empty List

A: (10, ·) (30, ·) (50, ·) —

B: (20, ·) (30, ·) (40, ·) (60, ·)

S: (10, ·) (20, ·) (30, ·) (40, ·) (50, ·) (60, ·)

copy copy add copy copy copy

Runtime of BFS

let $n = |V(G)|$, $m = |E(G)|$

initialization: $\Theta(n)$

queue ops: $\Theta(n)$

adj list ops: undir. $= 2m$, dir. $= m$ $\Big\}$ $\Theta(m)$

runtime $= \Theta(n) + \Theta(m) = \Theta(n+m)$

↑ size in bytes of adj list representation (up to const. mult.)

Runtime of DFS

$n = |V(G)|$, $m = |E(G)|$

initialize : $\Theta(n)$

main loop (other than visit) : $\Theta(n)$

adj list ops : undir = $2m$, dir = m : $\Theta(m)$

runtime = $\Theta(n+m)$

exercise (7) handout

compare: 2^{3^n} to 3^{2^n}

$$\lim_{n\to\infty}\left(\frac{2^{3^n}}{3^{2^n}}\right) = \infty$$

$$\ln\left(\frac{2^{3^n}}{3^{2^n}}\right) = 3^n\cdot\ln 2 - 2^n\cdot\ln 3$$

$$= 3^n\left(\ln 2 - \frac{2^n}{3^n}\cdot\ln 3\right)$$

$$\frac{2^n}{3^n} \to 0$$

$$\longrightarrow \infty$$

as $n\to\infty$

$\therefore$ $\boxed{2^{3^n} = \omega(3^{2^n})}$