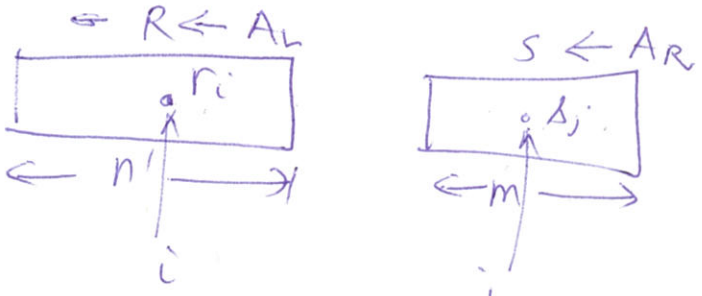
Nov 10, 2014



(i,j) inv if $r_i > s_j$

MERGE-COUNT(R,S)

$i, j \leftarrow 1$

$c \leftarrow 0$

While $i \leq n' \;\&\; j \leq m$

If $r_i \leq s_j$

Output r_i

i++

Else

c += $n' - i + 1$

Output s_j

j++

If one list is not empty output that list

$O(n)$

Ex: Proof of correctness

Closet Pair of Points

Input: n 2D-pts $P = \{P_1, \ldots, P_n\}$

$P_i = (x_i, y_i)$

Output: Pair p, q s.t $d(p,q)$ is min

$$d(P_i, P_j) = \sqrt{(x_i - x_j)^2 + (y_i - y_j)^2}$$

Assumptions (i) ↙ can be computed in $O(1)$ time.

i) x_i's are distinct . Ael y_i's are distinct

→ Rotate all ~~set~~ pts

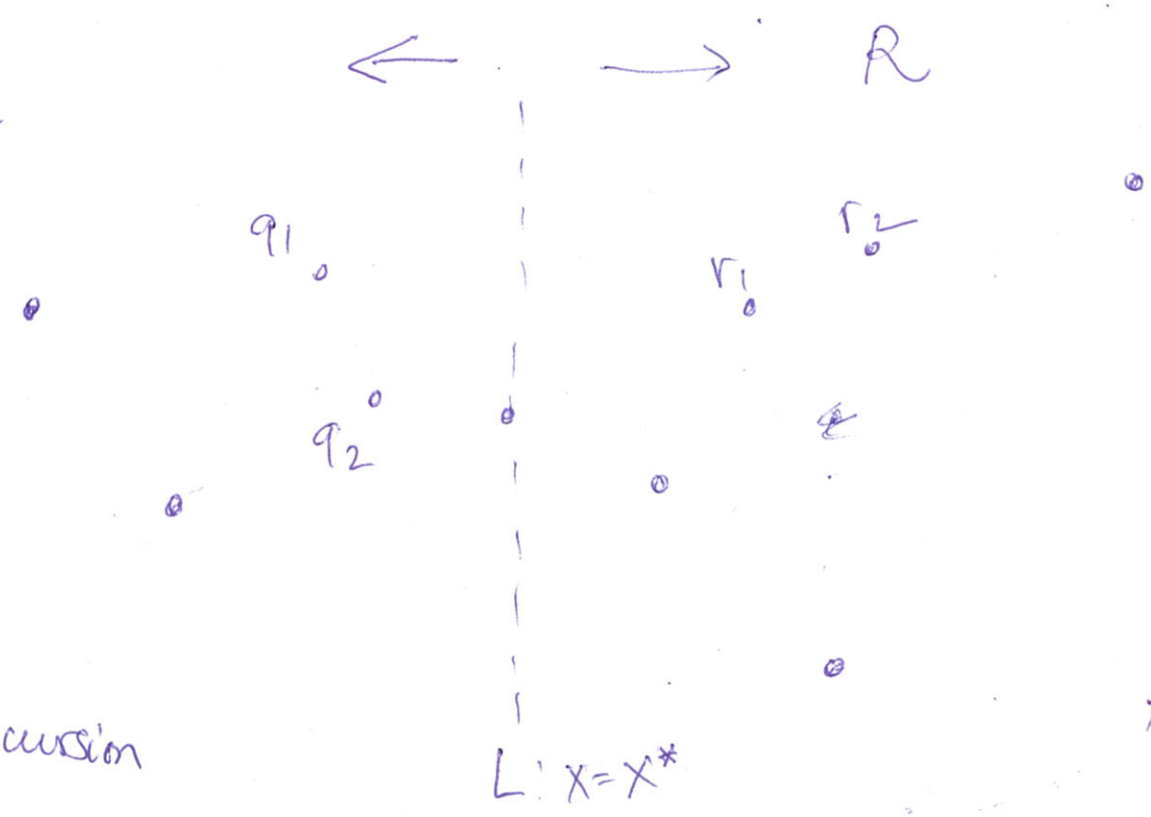
→ Subsequent algo can be modified

Notation: Given a set of pts P

$P_x \rightarrow P$ sorted by x-values

$P_y \rightarrow$ ——— y ———

Note: Compute P_x, P_y from P in $O(n \log n)$ time



$x^* = P_x[\lfloor \frac{n}{2} \rfloor]$

By recursion

(q_1, q_2) closest pair of pts in Q

(r_1, r_2) ——— R

$\delta = \min(d(q_1, q_2), d(r_1, r_2))$

Q: Compute Q_x, Q_y, R_x, R_y in $O(n)$ time from P_x & P_y.

A: $Q_y : R_y \rightarrow$ Scan P_y & check if $(x_i, y_i) \in Q_y \Leftarrow \leq x^* \Rightarrow R_y$.