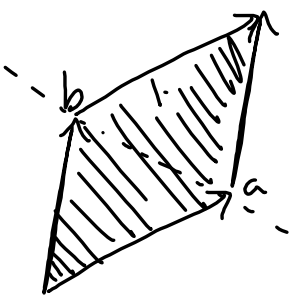
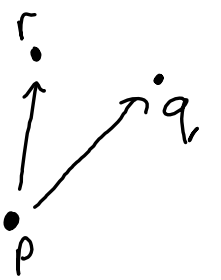
"line side test"

query point



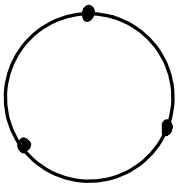
$$\|a \times b\| = -\|b \times a\|$$

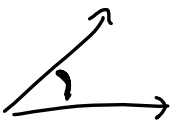


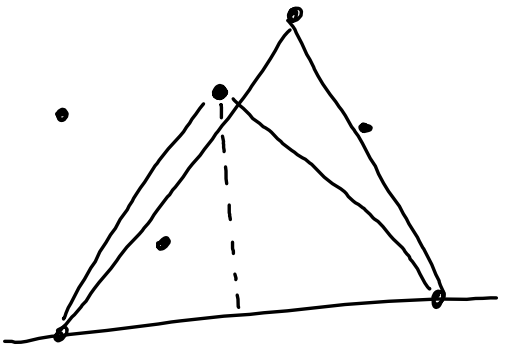
$$\|(q-p) \times (r-p)\| > 0$$

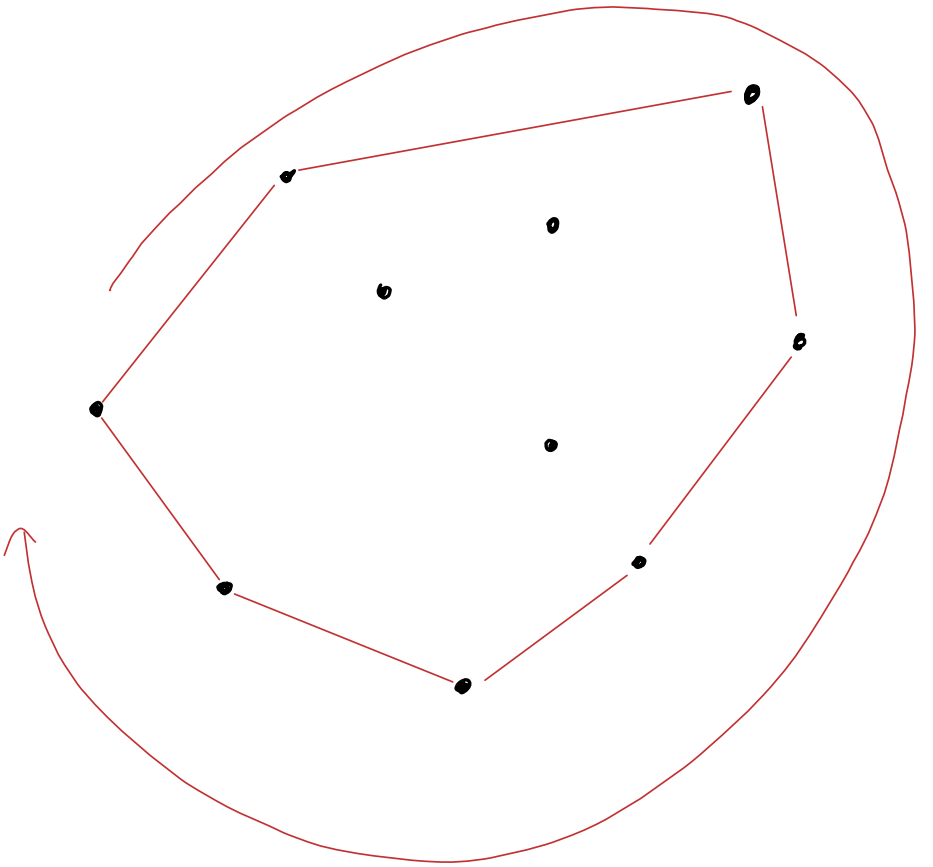
"in-circle" test

angle test



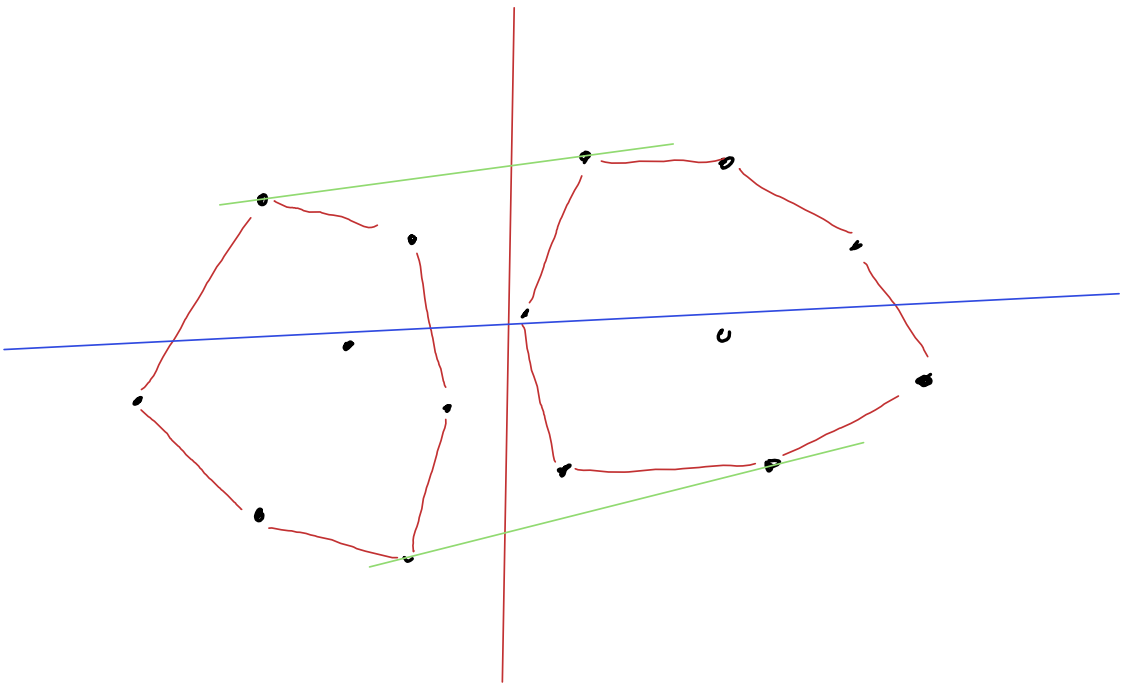


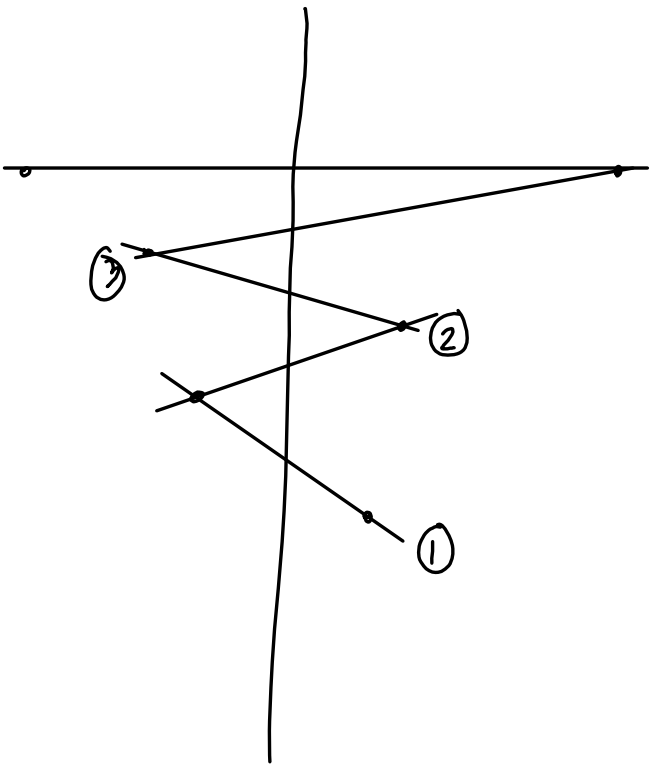


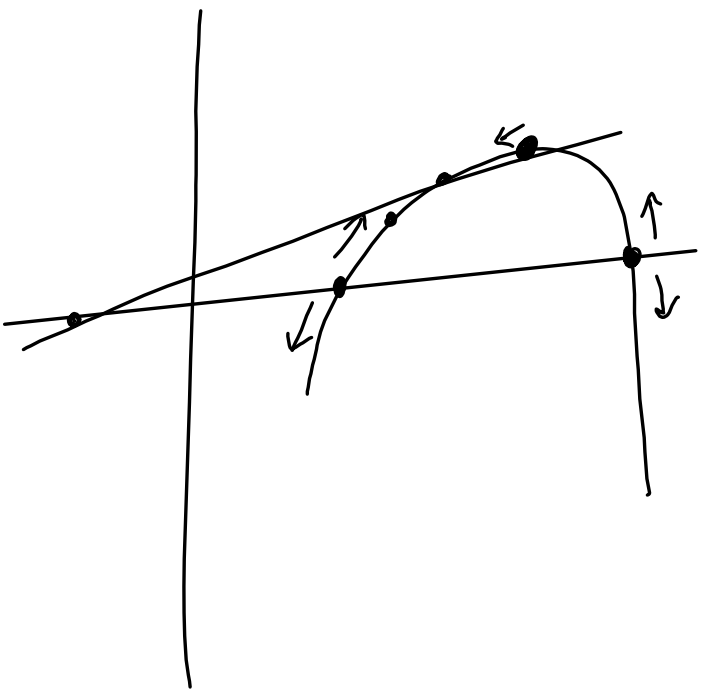


elems : $\mathbb{R}$ seq

"semi-hull" $\cap$ $\cup$




3
2
1



budget

$$W(n) = 2 \cdot W(n/2) + O(n)$$

$$\in O(n \log n)$$

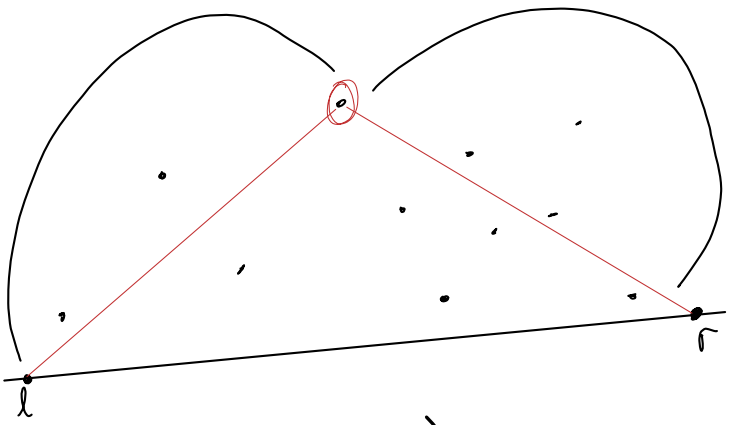
$O(\text{polylog}(n))$

$$S(n) = S(n/2) + O(\text{polylog}(n))$$

$n \log h$

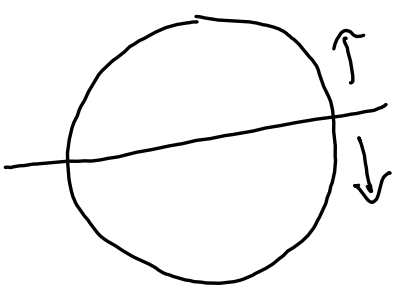
output size

quickhull

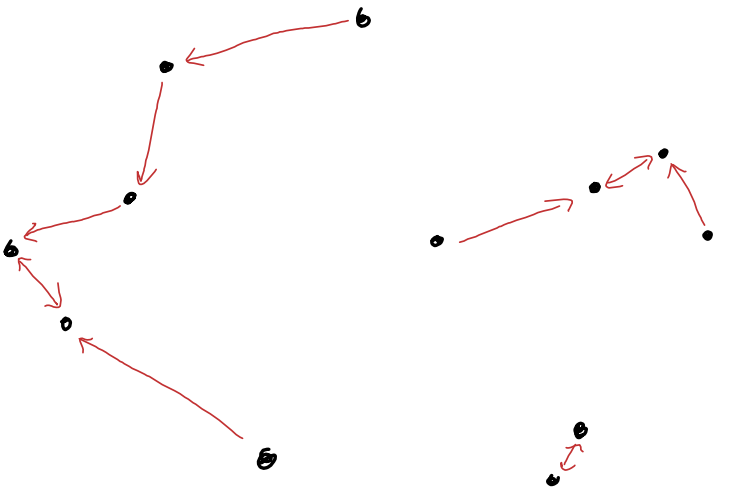


semihull (quickhull)

```
SH(P, l, r)
  let m = furthest point from (l, r)
      LP = filter (above line (l, m)) P
      RP = filter (above line (m, r)) P
      (LH, RH) = par (SH(LP, l, m),
                      SH(RP, m, r))
  in LH ++ [m] ++ RH
```

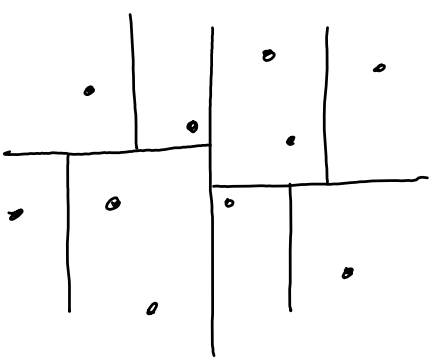


Nearest Neighbors

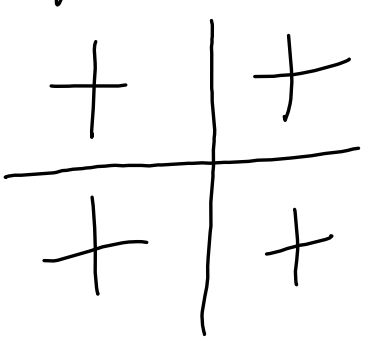


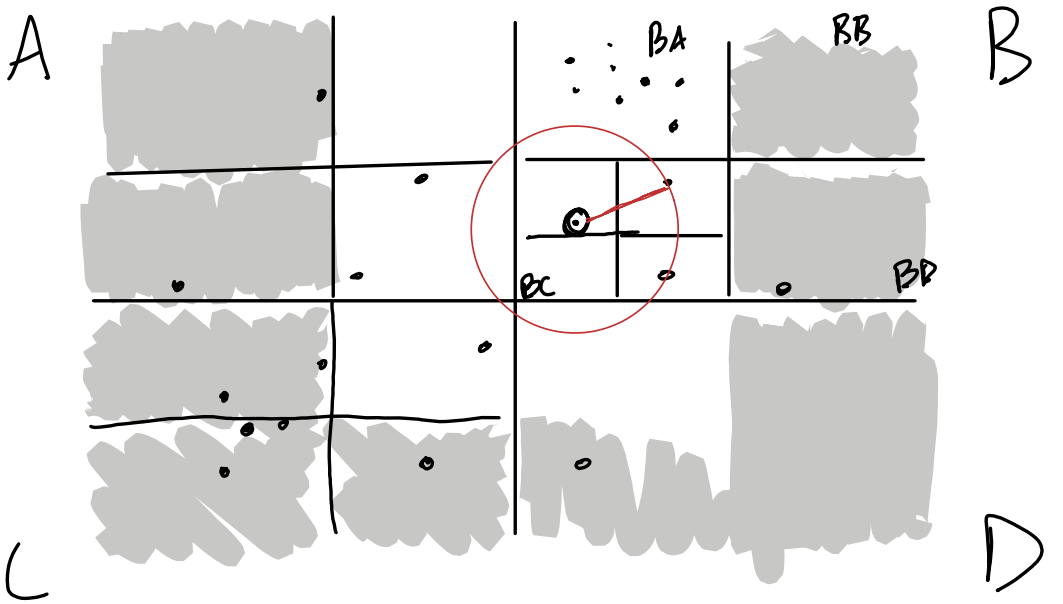
"spatial partitioning"

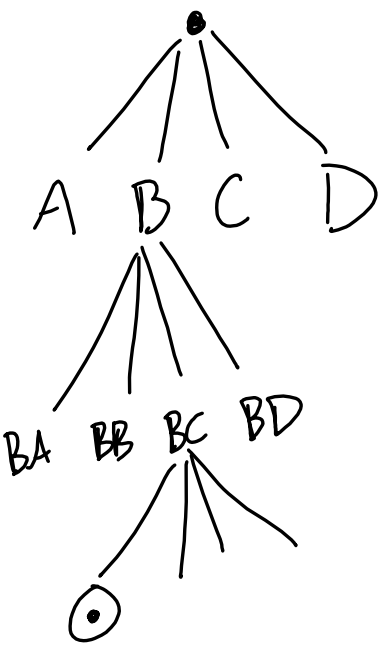
K-d tree



quad tree




A
BA
BB
B
BC
BD
C
D


A B C D
BA BB BC BD