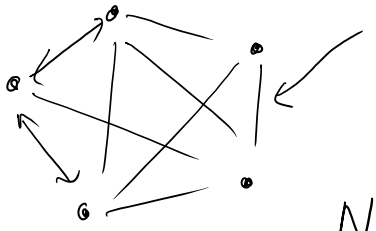
2-D Tree

Monday, October 10, 2016 1:03 PM



$N_{interactions} = \frac{N(N-1)}{2}$ $(F_{ij} = -F_{ji})$

$O(N^2)$

$N = 2 \times 10^{12}$ Teilchen

$O(N^2) \sim 2 \times 10^{24}$ Interactions

20 Flops / Interaction

4×10^{25} Flops

Petaflop Computing $\rightarrow 10^{15}$/s

1 Kräfte berechnen $\rightarrow 4 \times 10^{10}$ s

$\frac{\sim 10^{10.5}}{10^{7.5}} \sim 10^3$ Jahre

$O(N)$ oder $O(N \log N)$

$\nabla^2 \phi = \rho$ — IFFT — FFT $(O(N \log N))$

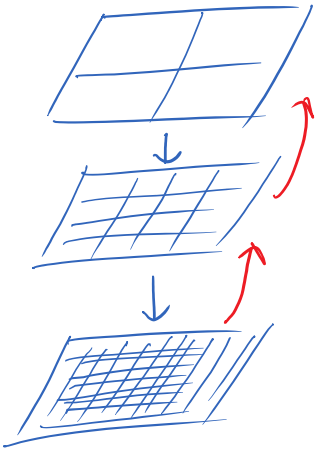
$-k^2 \phi_k = \rho_k$ $\leftarrow O(N)$

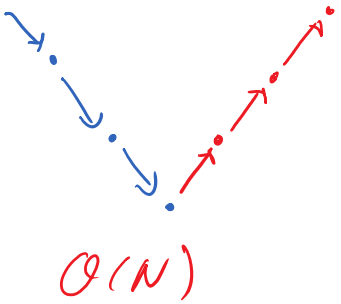
Multipole Method Tree – Baum Struktur

"Tree code" $\rightarrow O(N \log N)$

Fast multipole method (FMM) $\rightarrow O(N)$ ←

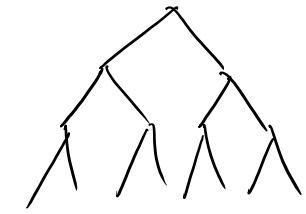
Multigrid Method → S.O.R.





log(N)

$\log_2 N/8$



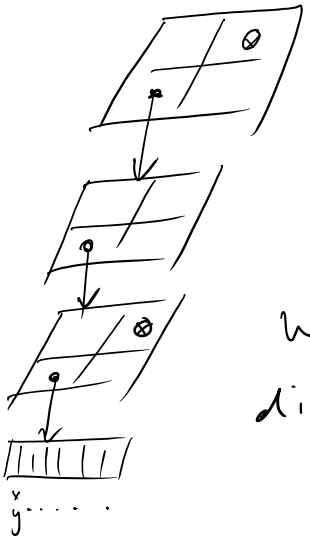
divide - and - conquer

8
Selection

Sortieren →
Quicksort $O(N \log N)$
→ O(N) Radix Sort

1- dimensional

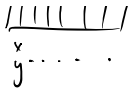
2-D ?

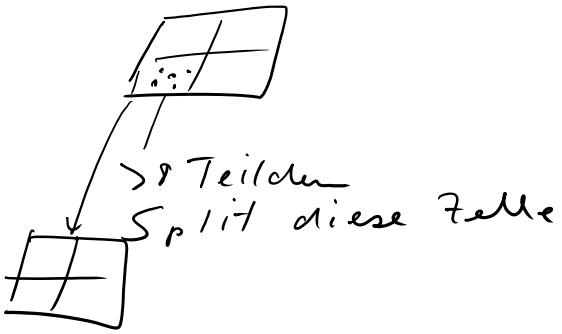


Quad tree

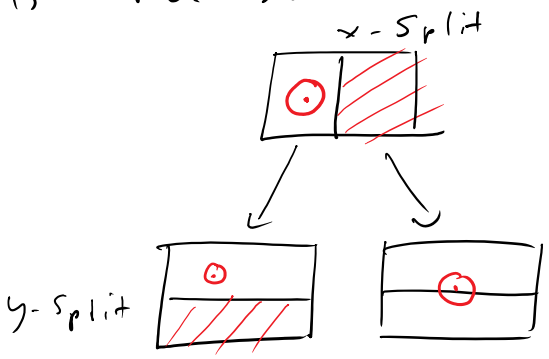
~~Balanced tree~~

Wie baut man diese Struktur

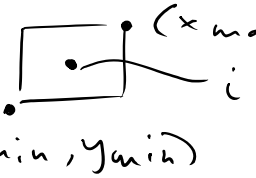


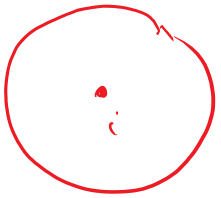


Binären Baum



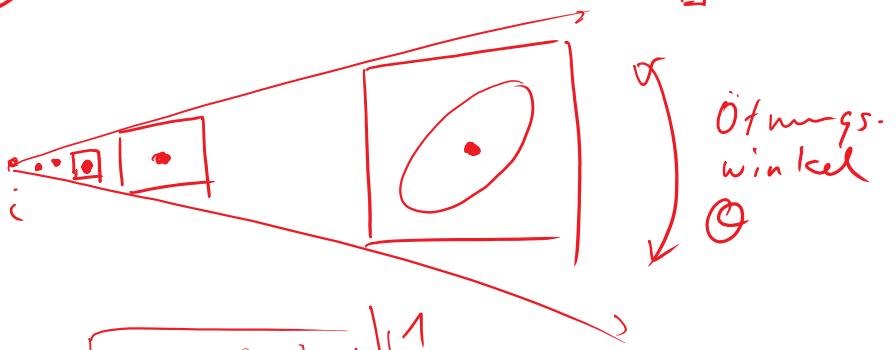
Finde alle Teichen (oder Zähle sie) im einen Kasten



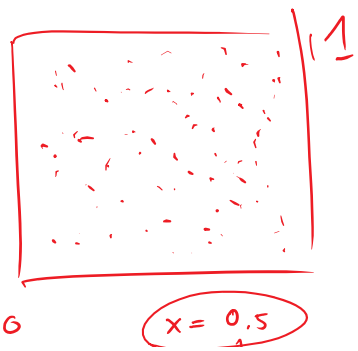


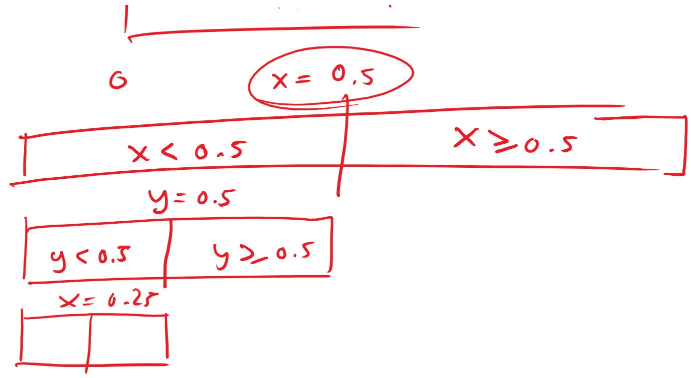
besser

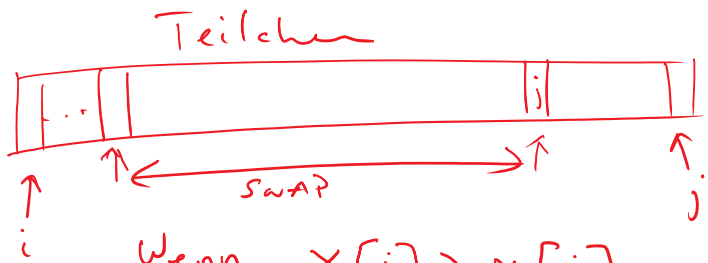
$$\rho_i = \frac{\sum_{i \in \square} m_i}{V_\square}$$



Aufgabe:







Wenn $x[i] > x[j]$
dann SWAP(i, j)

Zwei Verfahren versucht!

1. Kompakteste Code (Minimale Zeiten)
2. Schnellste Code → Zähle
   - Anzahl SWAPs
   - Anzahl Vergleiche

4 Zeilen?

$s = \text{partition}(A, i, j, v, d)$

- A: pointer to Array of particles.
- v: Wert (0.5)
- d: Dimension
- s: Index vom ersten Element wo $A.r[d] \geq v$ ist!