

# Applications

Note Title

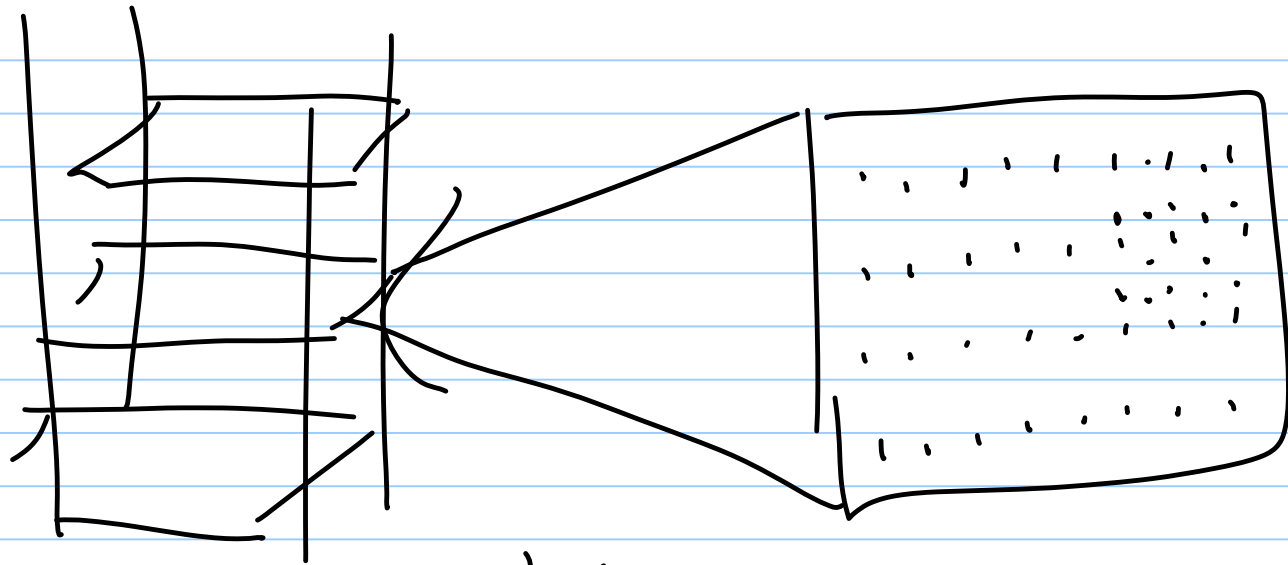
2/5/2009

Logic Simulation

Ocean Sim

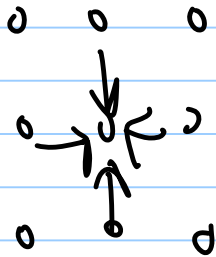
Evolution of Galaxies

Rendering Scenes via Ray Tracing



discretize in time & space

start w/ 2-d version of problem



$$A(i, j) \leftarrow f(A(i, j), A(i-1, j), A(i, j-1), A(i+1, j), A(i, j+1)))$$

Gauss-Jacobi

$$A^{t+1} \leftarrow A^t(i-1, i+1, j-1, j+1)$$

for  $i=1, \dots, n$

for all  $j, j$

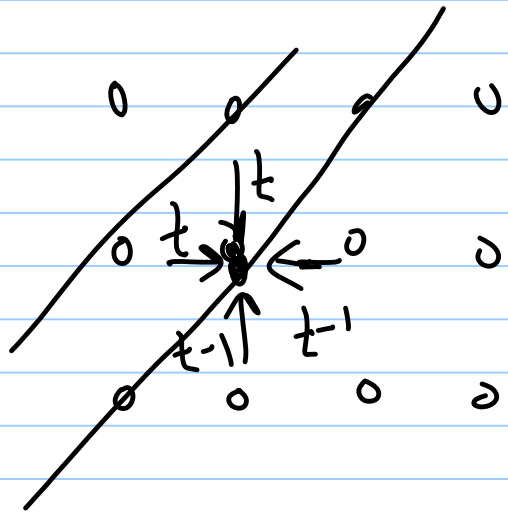
update  $A$  in parallel

endfor (barrier)

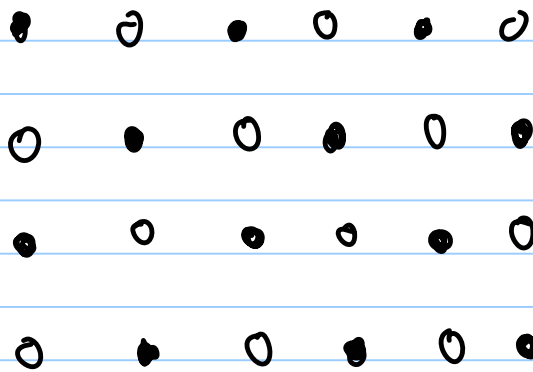
endfor

Gauss-Jordan

$$A^{t+1} \leftarrow A^t(i+1, j+1) \text{ and } A^{t+1}(i-1, j-1)$$



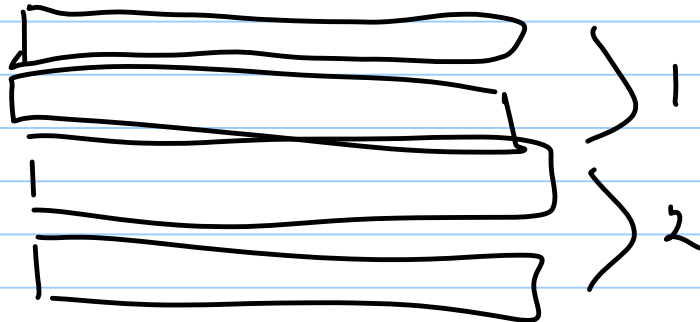
## Red-Black



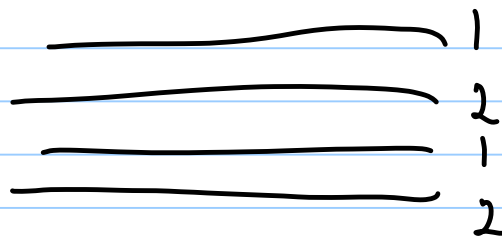
update black elements w/ "old" red values  
" red " w/ "new" black v

assignment

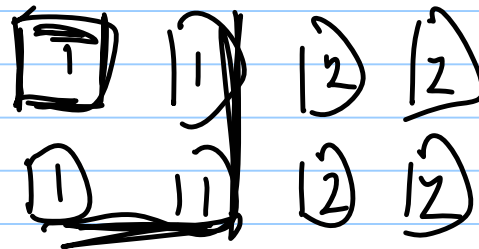
row



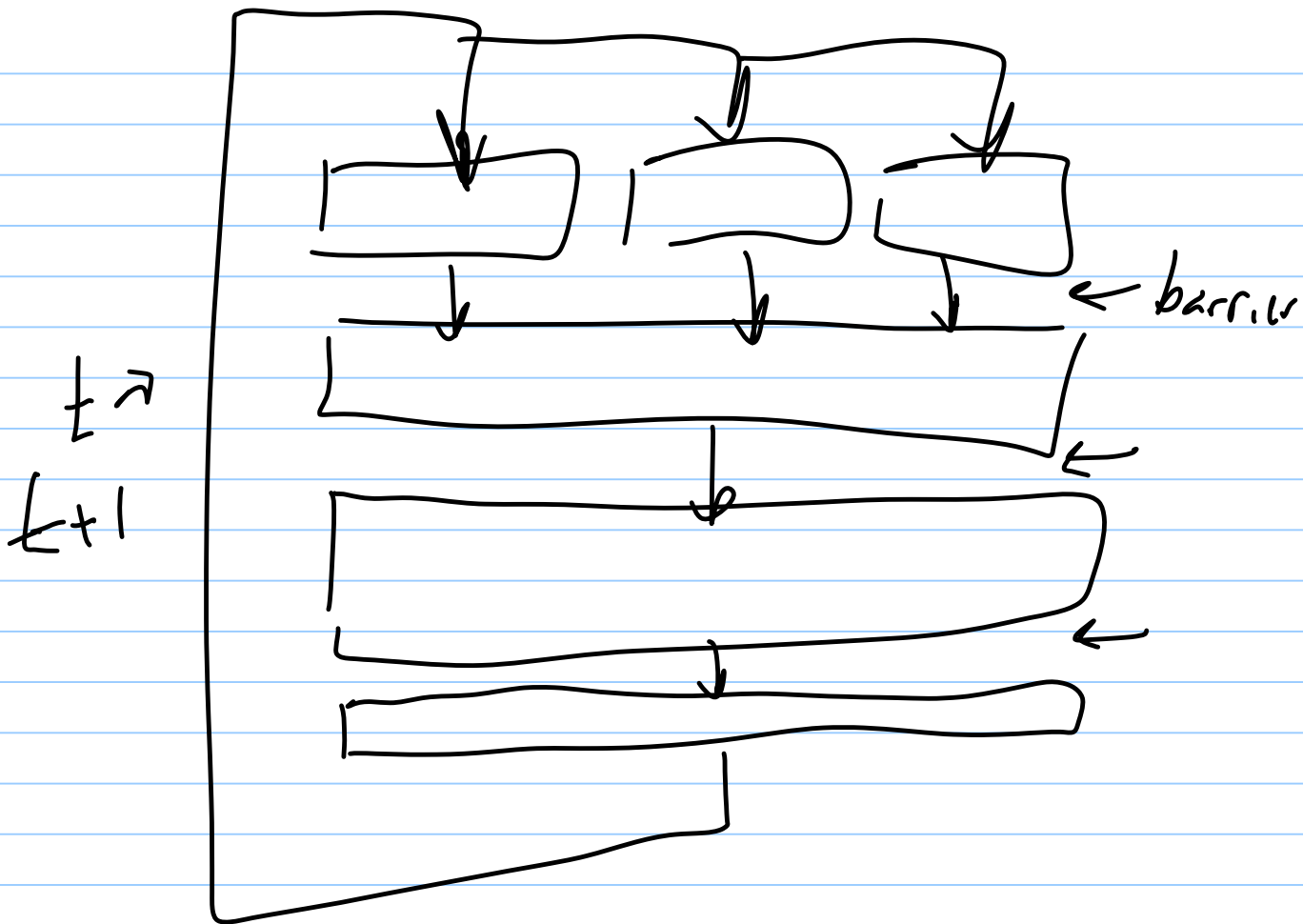
row-cyclic



block

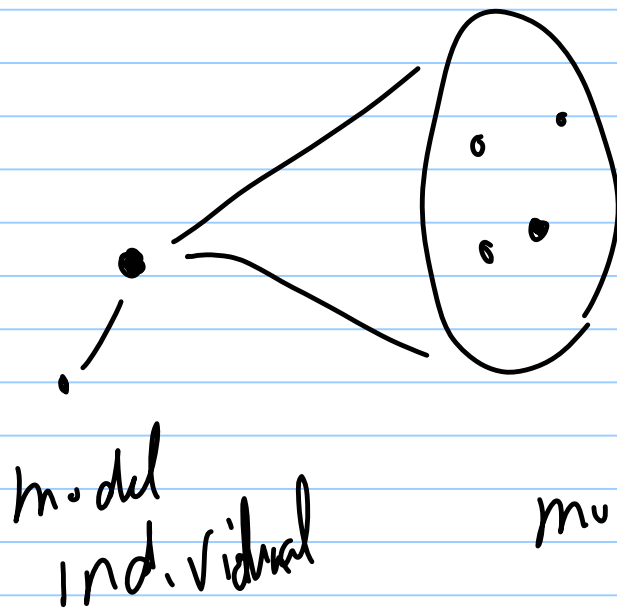


1 2 1 2  
1 2 1 2



data decomposition  
 "owner" computes

# N-body simulation

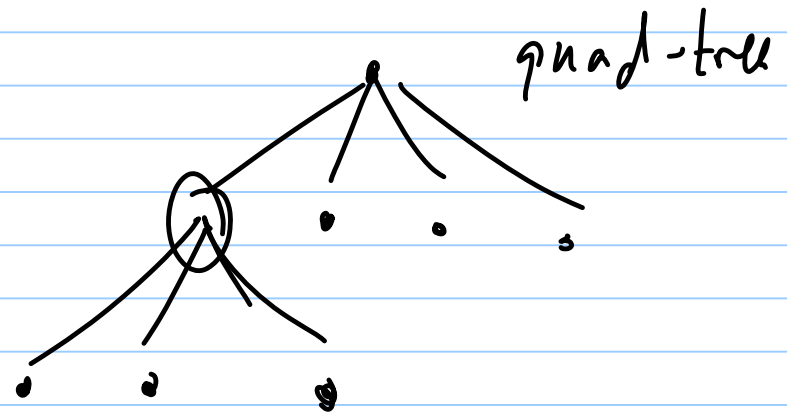
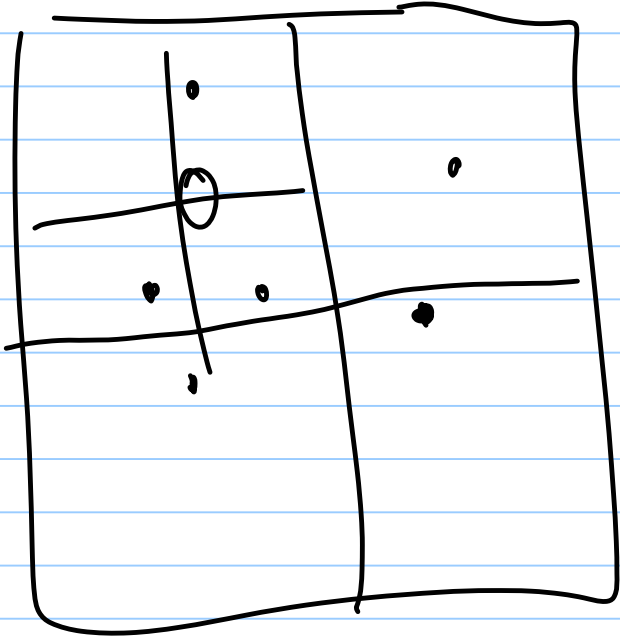


model  
individual

model as aggregate

$$f = G \frac{m_1 m_2}{r^2}$$

Barnes-Hut



$\approx$  unif dist of particles  
 $\Rightarrow O(n \log n)$

update  
time

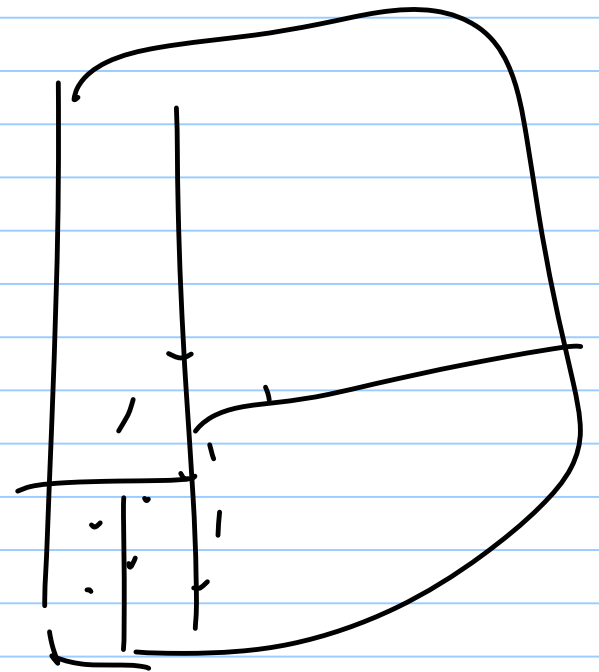
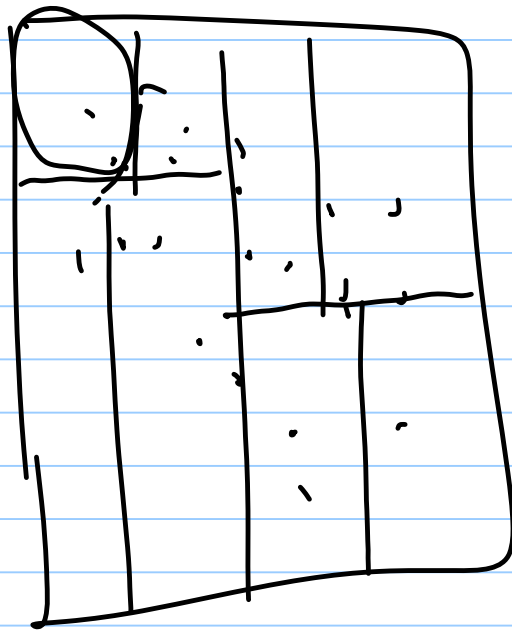
build tree

comp. moments for each cell

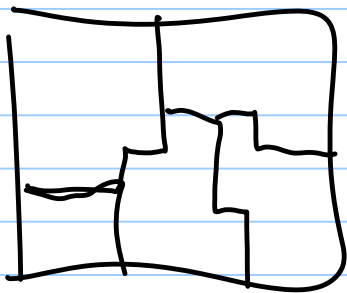
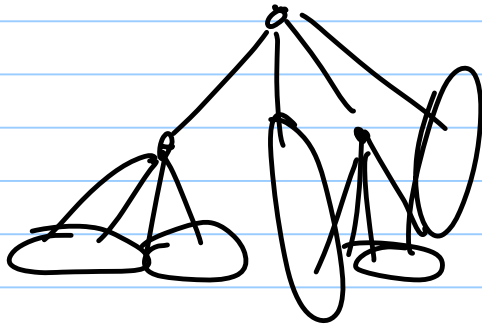
traverse tree comp. forces

update state

orthogonal recursive bisection



# Cost Zones



more common

