Trees – building and walking

OCT-Trees: Construct Tree from top down in time proportion to Nln(N)

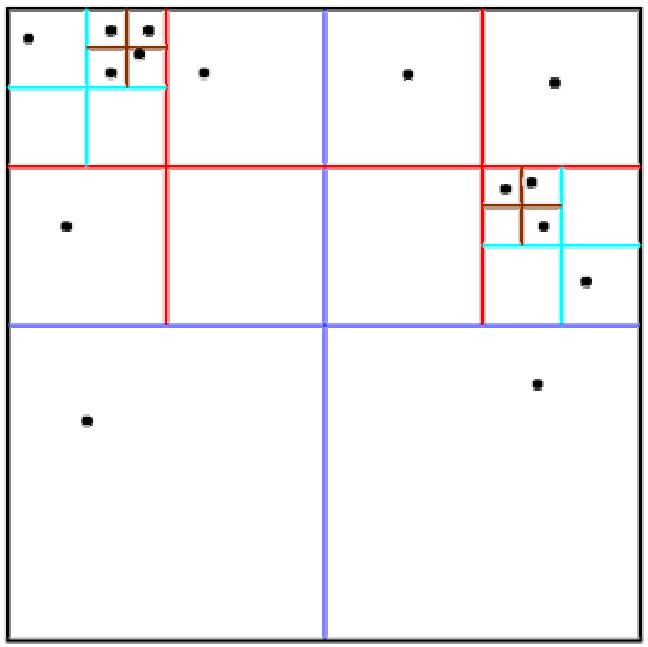
Building

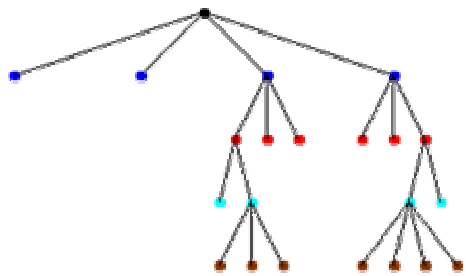
Root node is the entire volume of the simulation
Split volume in 8
Loop over all particles and sum mass in each quadrant
If octant has > 1 particles, create new node
If octant has =1 particle, create pointer
If octant has =0 particles, create null pointer
Repeat until no active quadrants with >1 particle

Walking

For a given particle, walk down the tree to determine the interaction list
Open cells according to theta criteria
Sum up the accelerations and multipoles

Each node of the Tree has:
Pointers to 8 children in 3D (node, particle or null)
Pointer to the parent node
Position of the centre of mass and physical centre
Mass
Higher order multipoles of the node

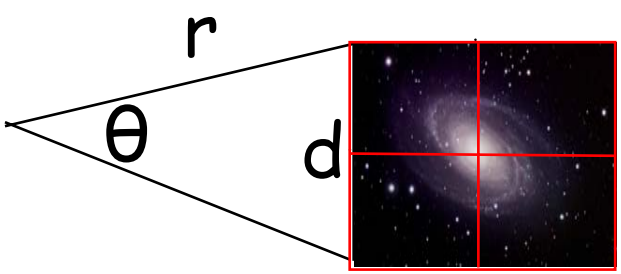




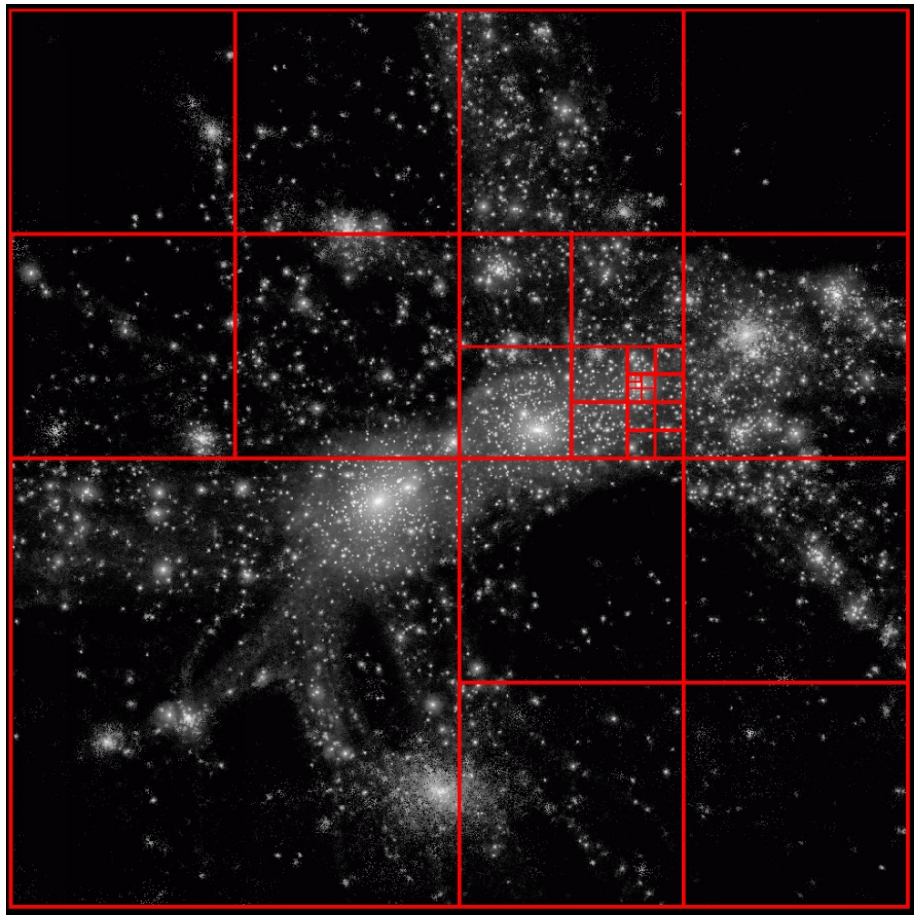
The active tree on a single particle

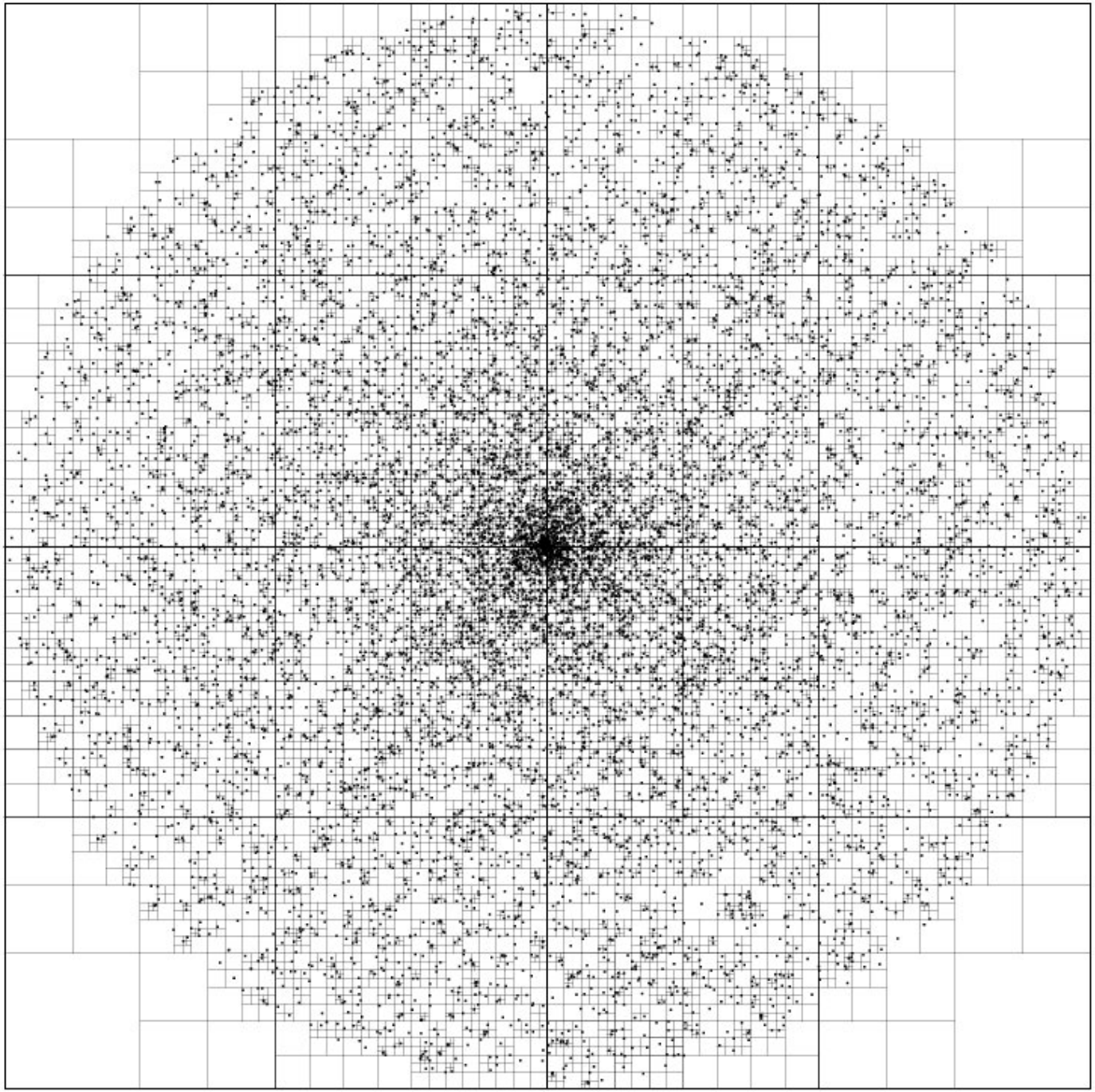
Hierarchical methods (TREES)

The force on a given particle is calculated by moving up the tree, opening cells according to a simple opening angle criteria.



If r/d<0.5 then open the cell and sum the contributions to the force from the particles within the subcells, otherwise do not open the cell.





This is the entire two dimensional tree for a system modelled with 1000 particles.

Next we will look at the "active" tree for a single particle.