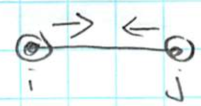
Force Directed

Nodes should attract but also repel ...

F_{ij}^{r} = force on i due to j (magnitude)

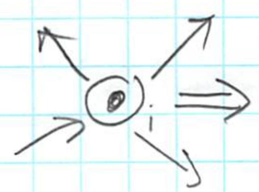
$= \text{const} \cdot \frac{1}{d_{ij}^2} = \frac{k_r}{d_{ij}^2}$



F_{ij}^{a} = force on i due to neighbor j

$= \text{const} \cdot d_{ij} \cdot A_{ij} = k_a \cdot d_{ij} \cdot A_{ij}$

need net force on all nodes.



dumb: F_{ij}^{r} for all i, j

F_{ij}^{a} for all $(i,j) \in E$ (edges)

Initial positions random in $[0,1]$

update positions: $\vec{P}_i(t+1) = \vec{P}_i(t) + \text{const} \cdot \vec{F}_i^{net}$

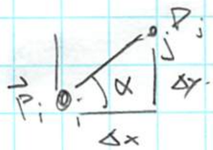
$= \vec{P}_i(t) + k_n \cdot \vec{F}_i^{net}$

(re)compute forces.

→ continue until total change "small" ....

Update:

normal vector between points → angle. F_{ij} (above) is magnitude



$\Delta y = y_j - y_i$

$\Delta x = x_j - x_i$

$\tan \alpha = \frac{\Delta y}{\Delta x}$ $\quad \alpha = \tan^{-1} \frac{\Delta y}{\Delta x}$

attraction → direction is this angle

repulsion → direction 180° opposite ...