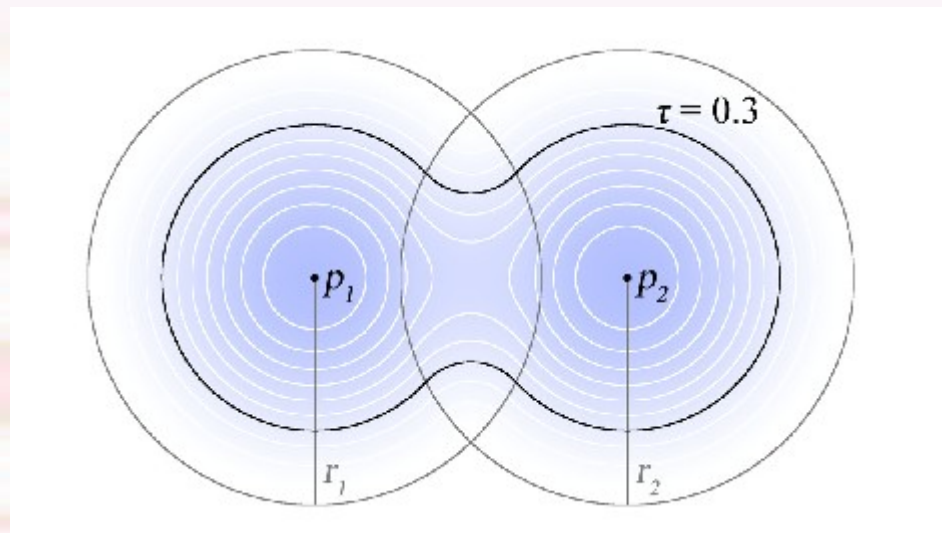# *Surface of the Week*

Implicit Surface of Foliage

Grace Yao

How to Generate?

◆ Use a set of generator points P to describe implicit surface.

$$\mathscr{D}_i(q) = \begin{cases} \left(1 - \left(\frac{\|q - p_i\|}{r_i}\right)^2\right)^2, & \text{if } \|q - p_i\| < r_i \\ 0, & \text{if } \|q - p_i\| \geq r_i \end{cases}$$
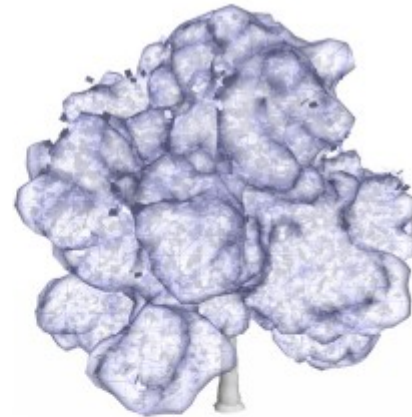
$$\mathscr{F}(q) = \sum_i \mathscr{D}_i(q) - \tau$$
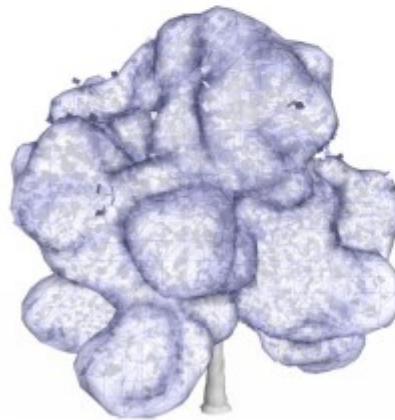
The Result

(a) given foliage geometry   (b) $\rho = 18, \tau = 7$

(c) $\rho = 25.5, \tau = 20$ (d) $\rho = 33.5, \tau = 50$

Density-based ambient reflection

$$k_{a_v} = \begin{cases} 1, & d_v \leq 0 \\ k_{a_{min}} + \left(1 - k_{a_{min}}\right)\left(1 - \frac{d_v}{d_{min}}\right)^n, & 0 < d_v < d_{min} \\ k_{a_{min}}, & d_v \geq d_{min} \end{cases} \tag{4}$$

This will give a gradual darkening from the outer to the inner parts of the foliage.

Normal Vector Realignment

Reduce the noisiness of the diffuse and specular reflection.

Realign normals according to the implicit surfaces.

(a) standard local illumination

(b) expressive illumination based on implicit surfaces