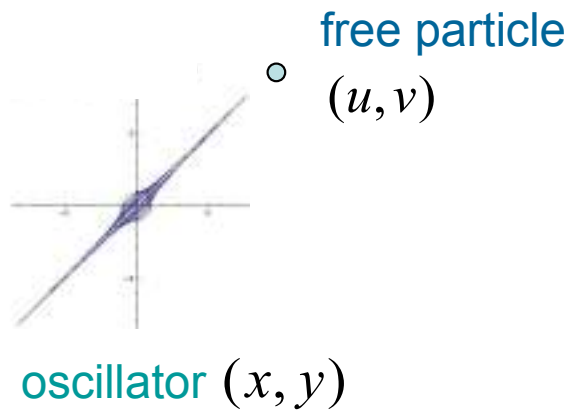


## Collision of the oscillator with a free particle



Particle is practically free before and after the collision

This part of the Lagrangian models the collision interaction

Model Lagrangian:

$$L = \frac{1}{2}(\dot{x}^2 - \dot{y}^2) - \frac{1}{2}(x^2 - y^2) - \frac{\lambda}{2}(x^2 - y^2)^2 + \frac{1}{2}(\dot{u}^2 + \dot{v}^2) - \frac{\alpha/3}{[(u-x)^2 + (v-y)^2 + a]^{3/2}}$$

$$\ddot{x} + x + \lambda x(x^2 - y^2) + \frac{\alpha(u-x)}{[(u-x)^2 + (v-y)^2 + a]^{5/2}} = 0$$

$$\ddot{y} + y + \lambda y(x^2 - y^2) - \frac{\alpha(v-y)}{[(u-x)^2 + (v-y)^2 + a]^{5/2}} = 0$$

$$\ddot{u} - \frac{\alpha(u-x)}{(u-x)^2 + (v-y)^2 + a} = 0$$

$$\ddot{v} - \frac{\alpha(v-y)}{[(u-x)^2 + (v-y)^2 + a]^{5/2}} = 0$$