Gravity pull

$$\vec{a}_g = \frac{G \cdot m_1 \cdot m_2}{d^2} \cdot \vec{u}$$

$$\vec{a}_g = -\frac{G \cdot m_1 \cdot m_2}{d^2} \cdot \left(\frac{x\,\vec{i} + y\,\vec{j}}{d} \right)$$

$$\vec{a}_g = \frac{-G \cdot m_1 \cdot m_2}{d^3} \cdot \left(x\,\vec{i} + y\,\vec{j} \right)$$

Speed

$$\frac{d\,\vec{v}}{dt} = \vec{a}_g + \vec{a}_i$$

$$\vec{v} = \left(\vec{a}_g + \vec{a}_i \right) \cdot t + \vec{v}_p$$

$\vec{v}_p$: *speed at previous time lapse*

Position

$$\overrightarrow{OM} = \frac{1}{2} \cdot \left(\vec{a}_g + \vec{a}_i \right) \cdot t^2 + \vec{v}_p \cdot t + \overrightarrow{OM}_p$$

$\overrightarrow{OM}_p$: *position at previous time lapse*

Legend

α : *ship heading*

$\vec{a}_i$: *internal acceleration*, $\|\vec{a}_i\| = a$

$$\vec{a}_i = a\left(\cos\alpha\,\vec{i} + \sin\alpha\,\vec{j} \right)$$

$\|\overrightarrow{OM}\| = d$, *distance star / ship*

$$\vec{u} = \frac{-\overrightarrow{OM}}{\|\overrightarrow{OM}\|} = -\frac{x\,\vec{i} + y\,\vec{j}}{d}$$