SOLAR SYSTEM

NEWTON FORCES BETWEEN TWO STARS

The origin of the system is placed in the center of the sun, we make the hypothesis that all the stars are contained in the plan xOy.

$$m_1\overrightarrow{a_1} = \sum \overrightarrow{F_{ext,2\to 1}}$$

$$m_1 * \begin{pmatrix} a_{1x} \\ a_{1y} \\ a_{1z} \end{pmatrix} = \sum \begin{pmatrix} F_x \\ F_y \\ F_z \end{pmatrix}$$

$$\overrightarrow{F_{ext}} = -G * m_1 * m_2 * \frac{\left(\overrightarrow{OM_1} - \overrightarrow{OM_2}\right)}{\left\|\overrightarrow{M_2M_1}\right\|^3}$$

$$\begin{pmatrix} \boldsymbol{a_{1x}} \\ \boldsymbol{a_{1y}} \\ \boldsymbol{a_{1z}} \end{pmatrix} = -\boldsymbol{G} * \boldsymbol{m_2} * \frac{\mathbf{1}}{[(\boldsymbol{x_1}-\boldsymbol{x_2})^2 + (\boldsymbol{y_1}-\boldsymbol{y_2})^2 + (\boldsymbol{z_1}-\boldsymbol{z_2})^2]^{\frac{3}{2}}} \begin{pmatrix} \boldsymbol{x_1}-\boldsymbol{x_2} \\ \boldsymbol{y_1}-\boldsymbol{y_2} \\ \boldsymbol{z_1}-\boldsymbol{z_2} \end{pmatrix}$$

POSITION CALCULATION

$$\vec{a}(t) = \frac{\vec{v}(t+dt) - \vec{v}(t)}{dt} = \frac{1}{(dt)^2} * \left[\overrightarrow{OM}(t+2*dt) - 2*\overrightarrow{OM}(t+dt) + \overrightarrow{OM}(t)\right]$$

$$\vec{a}(t-dt) = \frac{\vec{v}(t) - \vec{v}(t-dt)}{dt} = \frac{1}{(dt)^2} * \left[\overrightarrow{OM}(t+dt) - 2*\overrightarrow{OM}(t) + \overrightarrow{OM}(t-dt)\right]$$

$$\boldsymbol{\overrightarrow{OM}(t+dt) = (dt)^2 * \vec{a}(t-dt) + 2 * \overrightarrow{OM}(t) - \overrightarrow{OM}(t-dt)}$$