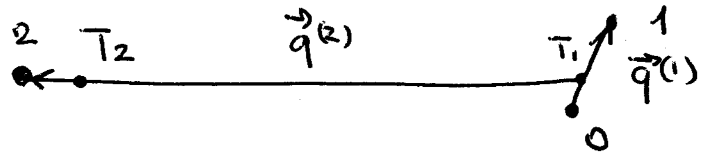

Jacobiho souřadnice

$$\vec{q}^{(1)} = \vec{\rho}^{(1)} - \vec{\rho}^{(0)} \equiv \vec{r}$$

$$\vec{q}^{(2)} = \vec{\rho}^{(2)} - \frac{1}{\underbrace{m_0 + m_1}_{\mathfrak{m}_1}} \left[m_0 \vec{\rho}^{(0)} + m_1 \vec{\rho}^{(1)} \right] \equiv \vec{R}$$

$$\vec{q}^{(0)} = \frac{1}{\underbrace{m_1 + m_2 + m_0}_{\mathfrak{m}_2}} \left[m_0 \vec{\rho}^{(0)} + m_1 \vec{\rho}^{(1)} + m_2 \vec{\rho}^{(2)} \right] \equiv \vec{T}$$

víme inverse vztahu

$$\vec{\rho}^{(0)} = \vec{q}^{(0)} - \frac{m_1}{\mathfrak{m}_1} \vec{q}^{(1)} - \frac{m_2}{\mathfrak{m}_2} \vec{q}^{(2)} =$$

$$= \vec{T} - \frac{m_1}{\mathfrak{m}_1} \vec{r} - \frac{m_2}{\mathfrak{m}_2} \vec{R}$$

$$\vec{\rho}^{(1)} = \vec{q}^{(0)} + \frac{m_0}{\mathfrak{m}_1} \vec{q}^{(1)} - \frac{m_2}{\mathfrak{m}_2} \vec{q}^{(2)} =$$

$$= \vec{T} + \frac{m_0}{\mathfrak{m}_1} \vec{r} - \frac{m_2}{\mathfrak{m}_2} \vec{R}$$

$$\vec{\rho}^{(2)} = \vec{T} + \frac{\mathfrak{m}_1}{\mathfrak{m}_2} \vec{R}$$

Nyní víme

$$\boxed{L = \frac{1}{2} \sum m_i \dot{\vec{\rho}}^{(i)} \cdot \dot{\vec{\rho}}^{(i)} - U}$$

$$U = -G \left(\frac{m_0 m_1}{\Delta_{01}} + \frac{m_0 m_2}{\Delta_{02}} + \frac{m_1 m_2}{\Delta_{12}} \right)$$

Krok č. 1

$$\frac{1}{2}\sum m_i \dot{\rho}^{(i)\,2} = \frac{1}{2} m_0' \dot{\vec{T}}\cdot\dot{\vec{T}} + \frac{1}{2} m_1' \dot{\vec{r}}\cdot\dot{\vec{r}} + \frac{1}{2} m_2' \dot{\vec{R}}\cdot\dot{\vec{R}}$$

kde

$$\boxed{\begin{aligned} m_0' &= \mathfrak{M}_2 = m_1 + m_2 + m_0 \\ m_1' &= \frac{m_0 m_1}{m_0+m_1} \\ m_2' &= \frac{\mathfrak{M}_1 m_2}{\mathfrak{M}_2} = \frac{(m_0+m_1)\,m_2}{m_0+m_1+m_2} \end{aligned}}$$

ozn. $X_0 = \frac{m_0}{m_0+m_1}$
$X_1 = \frac{m_1}{m_0+m_1}$

- $\Delta_{01} = |\vec{\rho}^{(1)} - \vec{\rho}^{(0)}| = |\vec{r}| = \underline{r}$
- $\Delta_{02}^2 = (\vec{\rho}^{(2)} - \vec{\rho}^{(0)})\cdot(\vec{\rho}^{(2)} - \vec{\rho}^{(0)}) = (\vec{R} + \frac{m_1}{\mathfrak{M}_1}\vec{r})\cdot(\vec{R} + \frac{m_1}{\mathfrak{M}_1}\vec{r})$
  $= \underline{R^2 + 2X_1\,\vec{r}\cdot\vec{R} + X_1^2 r^2}$
- $\Delta_{12}^2 = (\vec{\rho}^{(2)} - \vec{\rho}^{(1)})\cdot(\vec{\rho}^{(2)} - \vec{\rho}^{(0)}) = (\vec{R} - \frac{m_0}{\mathfrak{M}_1}\vec{r})\cdot(\vec{R} - \frac{m_0}{M_1}\vec{r}) =$
  $= \underline{R^2 - 2X_0\,\vec{r}\cdot\vec{R} + X_0^2 r^2}$

$$\boxed{\begin{aligned} L = \cancel{\tfrac{1}{2} m_0' \dot{\vec{T}}\cdot\dot{\vec{T}}} + \tfrac{1}{2} m_2' \dot{\vec{R}}\cdot\dot{\vec{R}} + \tfrac{1}{2}(m_0+m_1) X_1 X_0\, \dot{\vec{r}}\cdot\dot{\vec{r}} \\ + G\left(\frac{m_0 m_1}{r} + \frac{m_0 m_2}{\Delta_{02}} + \frac{m_1 m_2}{\Delta_{12}}\right) \end{aligned}}$$

$\dot{\vec{T}} = \text{konst.}$, $\quad \vec{T} = \vec{A}t + \vec{B} \equiv 0$ (CM system)

Legendrova Rade

$$(1-2\alpha x+\alpha^2)^{-1/2} = \sum_0^\infty P_n(x)\,\alpha^n$$

$P_0 = 1$
$P_1 = x$
$P_2 = \frac{1}{2}(3x^2-1)$
$P_3 = \frac{1}{2}(5x^3-3x)$
$\vdots$

tj:

$$\frac{1}{\Delta_{02}} = \frac{1}{R}\left[1 + 2X_1\frac{r}{R}\cos\gamma + X_1^2\frac{r^2}{R^2}\right]^{-1/2} =$$

$$= \frac{1}{R}\sum_0^\infty P_n(\cos\gamma)\left(-X_1\frac{r}{R}\right)^n =$$

$$= \frac{1}{R}\left\{1 - X_1\frac{r}{R}\cos\gamma + \frac{1}{2}X_1^2\frac{r^2}{R^2}(3\cos^2\gamma-1)+\dots\right\}$$

$$\frac{1}{\Delta_{12}} = \frac{1}{R}\left[1 - 2X_0\frac{r}{R}\cos\gamma + X_0^2\frac{r^2}{R^2}\right]^{-1/2} =$$

$$= \frac{1}{R}\sum_0^\infty P_n(\cos\gamma)\left(X_0\frac{r}{R}\right)^2 =$$

$$= \frac{1}{R}\left\{1 + X_0\frac{r}{R}\cos\gamma + \frac{1}{2}X_0^2\frac{r^2}{R^2}(3\cos^2\gamma-1)+\dots\right\}$$

tj.
$$\frac{m_0m_2}{\Delta_{02}} + \frac{m_1m_2}{\Delta_{12}} = m_2(m_0+m_1)\left[\frac{X_0}{\Delta_{02}} + \frac{X_1}{\Delta_{12}}\right] =$$

$$= \frac{m_2(m_0+m_1)}{R}\left[1 + \overset{(dip)}{\cancel{\phi}} + \frac{1}{2}X_0X_1\frac{1}{2}\left(\frac{r}{R}\right)^2(3\cos^2\gamma-1)+\dots\right]$$

$$= \frac{m_2(m_0+m_1)}{R} + (m_0+m_1)X_0X_1\frac{m_2}{2}\left(\frac{r}{R}\right)^2(3\cos^2\gamma-1)+\dots$$