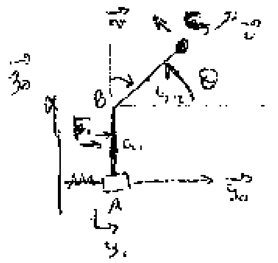

les deux paramètres du mouvement sont.

$$T = T_1 + T_2 + T_3$$

$$T_1 = \frac{1}{2} m_1 \dot{y}_1^2$$

$$T_2 : \overrightarrow{OG_2} = \overrightarrow{OA} + \overrightarrow{AB} + \overrightarrow{BG_2}$$

$$= y_1 \vec{y_0} + l_1 \vec{z_0} + \frac{l_2}{2}\vec{v}$$

$$\frac{d\overrightarrow{OG_2}}{dt} = \dot{y}_1 \vec{y_0} + \frac{l_2}{2}\dot\theta \vec{w}$$

$$= \left[\dot{y}_1 + \frac{l_2}{2}(-\sin\theta)\dot\theta\right]\vec{y_0} + \left[\frac{l_2}{2}\dot\theta\cos\theta\right]\vec{z_0}$$

$$T_2 = \frac12\left[\left[\dot y_1 - \frac{l_2}{2}\dot\theta\sin\theta\right]^2 + \left[\frac{l_2}{2}\dot\theta\cos\theta\right]^2\right] m_2$$

$$+ \frac12 \begin{bmatrix}\dot\theta & 0 & 0\end{bmatrix}_{(\,)} \begin{bmatrix} A & & \\ & & \\ & & \end{bmatrix}_{(xx)} \begin{bmatrix}\dot\theta\\0\\0\end{bmatrix}_{(\vec x,\vec y_0,\vec z_0)}$$

avec $A = \tilde\rho \int_{-\frac{l_2}{2}}^{\frac{l_2}{2}} y_p^2 \, dv_p$ avec $\tilde\rho = \frac{m_2}{l}$

$$= \tilde\rho \frac{l_2^3}{3.4}$$

$$= m_2 \frac{l_2^2}{3.4}$$

$$= \frac{m_2 l_2^2}{12}$$

$$T_2 = \frac12\left[\dot y_1^2 + \frac{l_2^2}{4}\dot\theta^2 - \dot y_1\dot\theta\, l_2 \sin\theta\right] m_2$$

$$+ \frac12 \frac{m_2 l_2^2}{12}\dot\theta^2$$

$$= \frac12 \dot y_1^2 m_2 + \frac12 \frac{m_2 l_2^2}{3}\dot\theta^2 - \frac12 \dot y_1 \dot\theta\, m_2 l_2 \sin\theta$$

$$T_3 = \frac12 M\left[\dot y_1^2 + l_2^2\dot\theta^2 - 2\dot y_1\dot\theta\, l_2\sin\theta\right]$$

$$2T = \dot{y}_1^2 \left[m_1 + m_2 + M \right] + \dot{y}_1 \dot{\theta} \left[- m_2 l_2 \sin\theta - 2 M l_2 \sin\theta \right] + \dot{\theta}^2 \left[\frac{m_2 l_2^2}{12} + M l_2^2 \right]$$

$$\frac{\partial T}{\partial \dot{y}_1} = \left[m_1 + m_2 + M \right] \dot{y}_1 + \left[- l_2 \sin\theta (m_2 + 2M) \right] \dot{\theta}$$

$$\frac{d}{dt} \frac{\partial T}{\partial \dot{y}_1} = \left[m_1 + m_2 + M \right] \ddot{y}_1 + \left[\quad \right] \ddot{\theta}$$

$$- \frac{\partial T}{\partial y_1} = 0$$

$$\frac{\partial T}{\partial \dot{\theta}} = \left[\frac{m_2 l_2^2}{12} + M l_2^2 \right] \dot{\theta} + \left[- l_2 \sin\theta (m_2 + 2M) \right] \dot{y}$$

$$\frac{d}{dt} \frac{\partial T}{\partial \dot{\theta}} = \left[\quad \right] \ddot{\theta} + \left[\quad \right] \ddot{y}$$

- l2 cos(theta) (m2+M) $\dot{y}$ $\dot{\text{theta}}$

$$- \frac{\partial T}{\partial \theta} = l_2 (m_2 + 2M) \dot{y} \dot{\theta} \cos\theta$$

Puissance des efforts extérieurs.

pesanteur sur chaque solide + force extérieure sur S_1

$$P = \vec{F} \cdot \overrightarrow{V_{G_1 \in S_1 / R_0}} + m_1 g (-\vec{z_0}) \cdot \overrightarrow{V_{G_1 \in S_1 / R_0}} + m_2 g (-\vec{z_0}) \cdot \overrightarrow{V_{G_2 \in S_2 / R_0}} + M g (-\vec{z_0}) \cdot \overrightarrow{V_{C \in S_2 / R_0}}$$

$$= F_0 \cos\omega t \; \dot{y}_1 + 0 + (-m_2 g) \cdot \left(\frac{l}{2} \dot{\theta} \cos\theta \right) + (-M g) \cdot (l \dot{\theta} \cos\theta)$$

Or $P = Q_{y_1} \dot{y}_1 + Q_\theta \dot{\theta}$

d'où
$$\begin{cases} Q_{y_1} = F \cos\omega t \\ Q_\theta = \left(- \frac{m_2}{2} - M \right) g l \cos\theta \end{cases}$$

Equations du mouvement :

$$\frac{d}{dt}\frac{\partial T}{\partial \dot{q}_i} - \frac{\partial T}{\partial q_i} = Q_i$$

-1/2 (m2+M) l2 theta^2 cos(theta)

en y_1 :

$$\left[m_1 + m_2 + M\right] \ddot{y}_1 + \left[-\frac{l_2}{2} \sin\theta (m_2 + 2M)\right] \ddot{\theta} = F \cos\omega t$$

en θ :

$$\left[\frac{m_2 l_2^2}{3} + M l_2^2\right] \ddot{\theta} + \left[-l_2 \sin\theta (m_2 + 2M)\right] \ddot{y}_1$$

$$= -\left(\frac{m_2}{2} + M\right) g l \cos\theta$$

corection mise au point par Sylvain Mézil et Jean-Michel Génevaux