

Enačbe za sistem vozička s palico na neravni površini

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6. marec 2020

1 Enačbe prvotnega problema, kot jih vrne Mathematica

$$\ddot{x} = \frac{F + m \sin(\Theta) (-g \cos(\Theta) + l \dot{\Theta}^2)}{m + M - m \cos(\Theta)^2}$$

$$\ddot{\Theta} = -\frac{(\cos(\Theta) F + \sin(\Theta)) (-g(m + M) + lm \cos(\Theta) \dot{\Theta}^2)}{l(m + M - m \cos(\Theta)^2)}$$

2 Gibanje, parametrizirano s s in Θ

$$\ddot{s} = \frac{-2F + \ddot{y}(s) (g(m + 2M + m \cos(2\ddot{\Theta})) - 2lm \cos(\Theta) \dot{\Theta}^2 + \dot{s}^2 (m \sin(2\Theta) \ddot{x}(s) + (m + 2M + m \cos(2\Theta)) \ddot{y}(s))) + \dot{x}(s) (-(-gm \sin(2\Theta)) - 2lm \sin(\Theta) \dot{\Theta}^2 + \dot{s}^2 ((m + 2M - m \cos(2\Theta)) \dot{x}(s) + m \sin(2\Theta) \dot{y}(s)))}{(-m - 2M + m \cos(2\Theta)) \dot{x}(s)^2 - 2m \sin(2\Theta) \dot{x}(s) \dot{y}(s) - (m + 2M + m \cos(2\Theta)) \dot{y}(s)^2}$$

$$\ddot{\Theta} = \frac{F(\cos(\Theta) \dot{x}(s) - \sin(\Theta) \dot{y}(s)) + (\sin(\Theta) \dot{x}(s) + \cos(\Theta) \dot{y}(s)) (\dot{y}(s) (-lm \sin(\Theta) \dot{\Theta}^2) + (m + M) \dot{s}^2 \ddot{x}(s)) + \dot{x}(s) (lm \cos(\Theta) \dot{\Theta}^2 + (m + M) (-g - \dot{s}^2 \ddot{y}(s)))}{l \left((-m - M + m \cos(\Theta)^2) \dot{x}(s)^2 - m \sin(2\Theta) \dot{x}(s) \dot{y}(s) - \frac{(m + 2M + m \cos(2\Theta)) \dot{y}(s)^2}{2} \right)}$$

3 Gibanje, parametrizirano z x in Θ

$$\ddot{x} = \frac{2F + 2lm \dot{\Theta}^2 (\sin(\Theta) + \cos(\Theta) \dot{y}(x)) + (m \sin(2\Theta) + (m + 2M + m \cos(2\Theta)) \dot{y}(x)) (g - \dot{x}^2 \ddot{y}(x))}{m + 2M - m \cos(2\Theta) + 2m \sin(2\Theta) \dot{y}(x) + (m + 2M + m \cos(2\Theta)) \dot{y}(x)^2}$$

$$\ddot{\Theta} = \frac{-2 \left(F(\cos(\Theta) - \sin(\Theta) \dot{y}(x)) - (\sin(\Theta) + \cos(\Theta) \dot{y}(x)) (lm \dot{\Theta}^2 (-\cos(\Theta) + \sin(\Theta) \dot{y}(x)) - (m + M) (g - \dot{x}^2 \ddot{y}(x))) \right)}{l \left(m + 2M - m \cos(2\Theta) + \sin(2\Theta) \dot{y}(x) + (m + 2M + m \cos(2\Theta)) \dot{y}(x)^2 \right)}$$