N-Pendulum

Gaffar, Eufrat, Dedi, Bene

Projek GUI

Algorithm

1. input variable
   (a) $\theta_1, \theta_2, .., \theta_n$ at t = 0
   (b) Constant g, l, m
2. construct n-n matrix from this equation small oscillation approximation[1].

$$\sum_{j=1}^{n}(n - \max(k, j) + 1)\ddot{\theta}_j = -(n - k + 1)\frac{g}{a}\theta_k$$

   which can be written

$$A_{kj}\ddot{\theta}_j = b_k$$

3. construct general function for each k[2]

$$\ddot{\theta}_k = \sum_{j=1}^{n} A_{kj}^{-1} b_k \theta_j$$

4. Apply multivariable runge-kutta method for each $\ddot{\theta}_k$.[3]
5. In term $x_1, ..., x_n$ and $y_1, ..., y_n$

$$x_k = l\sum_{j=1}^{k}\sin\theta_k \quad \text{and} \quad y_k = -l\sum_{j=1}^{k}\cos\theta_k$$

Reference

[1] Rubenzahl, Ryan. 2017. Small Oscillations of the n-Pendulum and the Hanging Rope Limit $n \to \infty$. University of Rochester.
[2] www.theijst.com/wp-content/uploads/2017/08/4.-ST1708-013.pdf
[3] https://www.myphysicslab.com/explain/runge-kutta-en.html