Homework2_Ren

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***Abstract*— Homework2.**

I. METHODOLOGY

The pseudocode describes a simulation using the Discrete Elastic Rod (DER) method to model an elastic rod's dynamics. The algorithm starts by defining physical parameters, discretizing the rod into nodes, and calculating initial quantities like undeformed reference lengths and natural curvature. It initializes degrees of freedom (DOFs) and sets boundary conditions. The simulation enters a time-stepping loop where, at each step, it uses the current displacement as an initial guess and applies the Newton-Raphson method to solve for new DOFs. This iterative process computes elastic forces and Jacobians associated with stretching, bending, and twisting, refining the solution until it meets an error tolerance criterion. Velocities and positions are updated accordingly, and the z-coordinate of the last node is recorded. After all time steps are completed, the recorded z-coordinates are plotted against time, visualizing the rod's dynamic behavior and fulfilling the problem's requirements.

II. ASSIGNMENT RESULTS

It simulates from t=0s to t=5s. The images show the initial discrete elastic rob structure and the shape of the rod after 4.91 seconds of simulation.

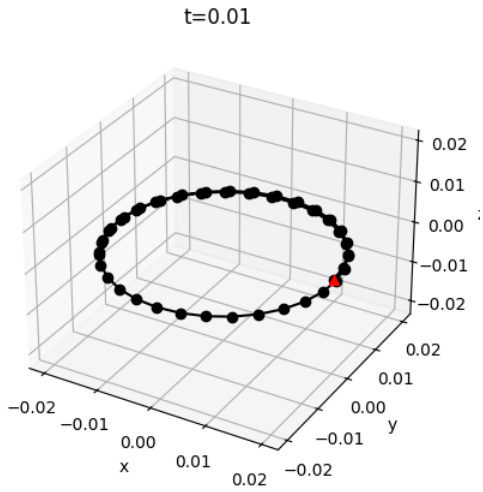

Figure. 1 Discrete Elastic Rob Structure at t=0.01 s

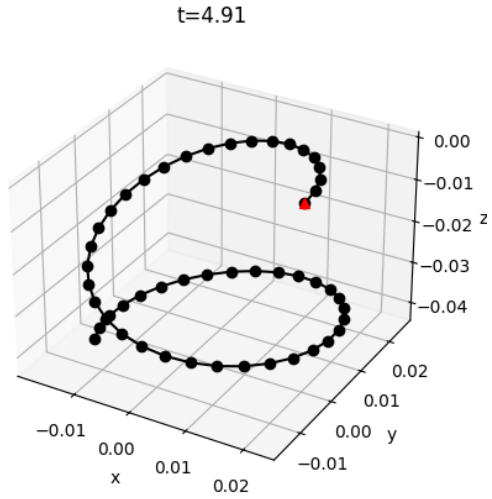

Figure. 2 Discrete Elastic Rob Structure at t=4.91 s

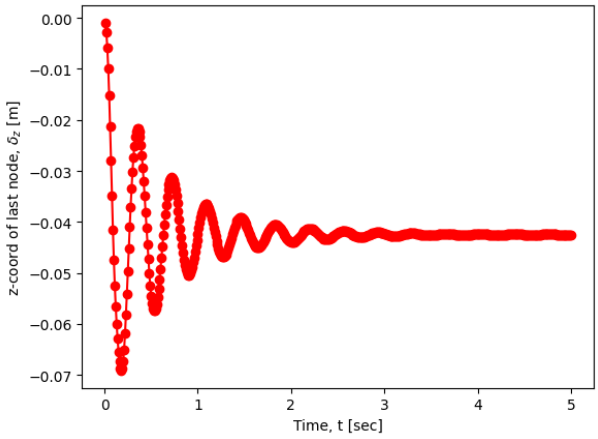

Figure 3. z - Coordinate of Last Node vs. Time

REFERENCES

[1] M. K. Jawed and S. Lim, “Discrete simulation of slender structures,”BruinLearn, 2024.