MAE C263F Homework 2

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***Abstract*— This assignment was to implement code to simulate the deformation of an elastic rod under bending. The z-coordinate of the last node is plotted below against time.**

I. Introduction

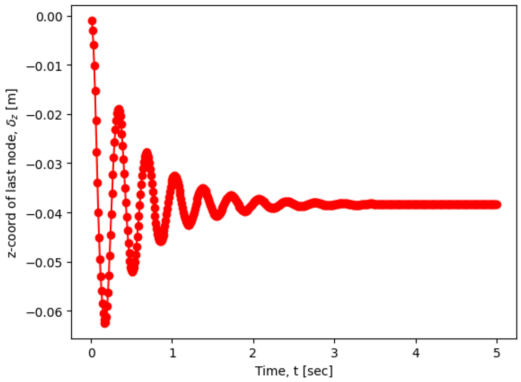
Simulating the deformation of elastic structures is a foundational problem in computational mechanics, relevant across fields such as physics, engineering, and computer graphics. One classic problem within this area is modeling the behavior of an elastic rod, which deforms under external forces such as bending. In this assignment, the objective was to develop a computational model to simulate a discrete elastic rod—a rod broken down into a series of nodes and segments that interact according to the principles of elasticity.

The focus of the simulation was on tracking the deformation of the rod over time, with a particular emphasis on the displacement of its end node in the z-direction. By discretizing the rod into individual segments and calculating the forces and displacements at each node, the model captures the complex behavior of the rod as it responds to bending forces.

II. Results

Figure 1 below shows the z-coordinate of the last node plotted against time in the resulting simulation.

Figure 1 – Z-Coordinate of Last Node vs. Time



As shown in Figure 1, the last node oscillates but is dampened until it reaches a steady state at around 3.5 seconds. The z-coordinate of the last node at this time is about -0.039 m. Since this is the last node in the rod, we can assume the entire rod has also reached steady state at 3.5 seconds as well.