GRADUATE SCHOOL OF
SCIENCES AND ENGINEERING

MECH 534/ 434: Computer- Based
Modeling and Simulation

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Term Project 2: 3D Simulation of a Flexible Object

13/06/2022

Spring 2022

Introduction

A 3D flexible rope is physically simulated in the project. It is assumed that the rope is made up of particles connected by a spring and a damper to two other particles.

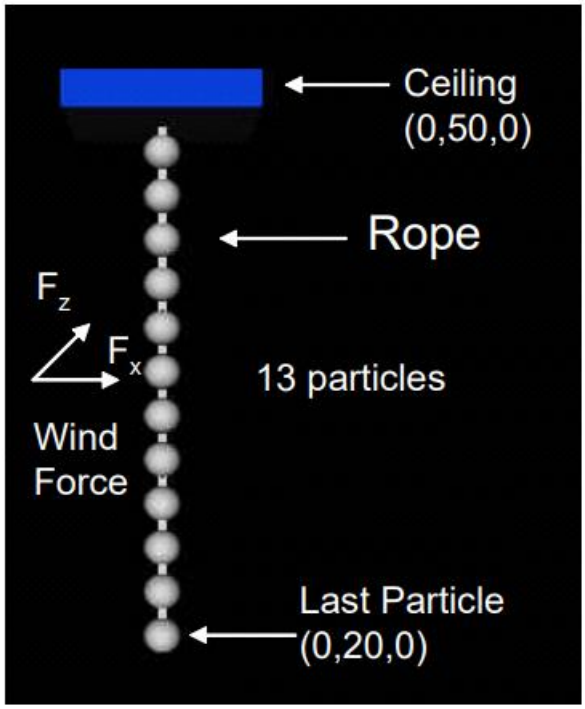

Figure 1: Flexible rope as experimental setup

The simulation setup is suspended from the ceiling, as indicated in the illustration above. The position of each particle on the rope must be known in order to replicate the rope. For each particle, this entails solving a second-order differential equation. Equation of motion for the initial particle on the rope, equation of motion for the last particle on the rope, and equation of motion between other particles are separately derived.

Deep Dive to Script

Required libraries are firstly imported and entered given variables. Euler time and frequency variables are initialized. After that, visible elements of rope, wind magnitude, and direction are defined. In the next step, position, velocity, and acceleration variables of particles are implemented using Numerical Recipes.

After physical based calculations are completed, simulation part is constructed. In the simulation part, position of applied force, strength of the wind can be adjusted. Its control directions are provided when the simulation are started.