

# Visualization Tool: Oscillation Design Document

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DAGD 420: Applied Digital Simulation

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# Description

## Slides

The goal of the project is to provide students with a visual aid to learn about *Oscillation* as a principle of math. This program will consist of two parts: a slideshow describing relevant information and an interactive minigame for the user.

The main menu has three options: slides, game, and quit.

The first slide defines oscillation. There will be visual examples, a definition, title of the slide, and brief summary. All slides will have next/prev buttons to go to and from adjacent slides. It will describe oscillation as periodic motion with “to and fro” movement from a fixed point. The visual examples will be a sine wave and a character walking back and forth. The summary will break down the definition and relate it to the sine wave.

The next slide demonstrates periodic motion that is not oscillatory. There will be a visual example, a brief summary, and the title of the slide. This slide will focus on periodic motion and describe how all oscillatory motion is periodic, but not vice versa. The visual example could include a planet in orbit, a rotating fan, an analog clock, etc. The brief summary will point out why the examples are not oscillatory.

Slide three is about simple harmonic motion. There will be a visual example, definition, brief summary, title of slide, and a formula. The definition will state the formula in a readable sentence, while describing what it means to be harmonic. The visual example will be a pendulum. The summary will expand upon the formula and tie it to the visual.

Slide four will have the same layout as slide three, but apply friction to the visual and change the formula to compensate. This will cause the pendulum to slowly come to a stop if staying on the slide for long enough. This slide is important because this is practical to real-world applications and not inside a vacuum.

The last slide describes oscillatory movement that is not harmonic. There will be a visual example, brief summary, and title of slide. This will be a short slide that shows not all oscillations are harmonic. The visual will be a bouncing ball. The summary will talk about how the ball is to and fro motion, but inharmonic due to its trajectory and change in velocity.

## Minigame

The minigame will be a two button rope swinging game. The player hangs from a tether attached to a pivot on the left side of the screen. There are several other pivots randomly placed about, as well as one on the far right side of the screen labeled as the “goal.” The

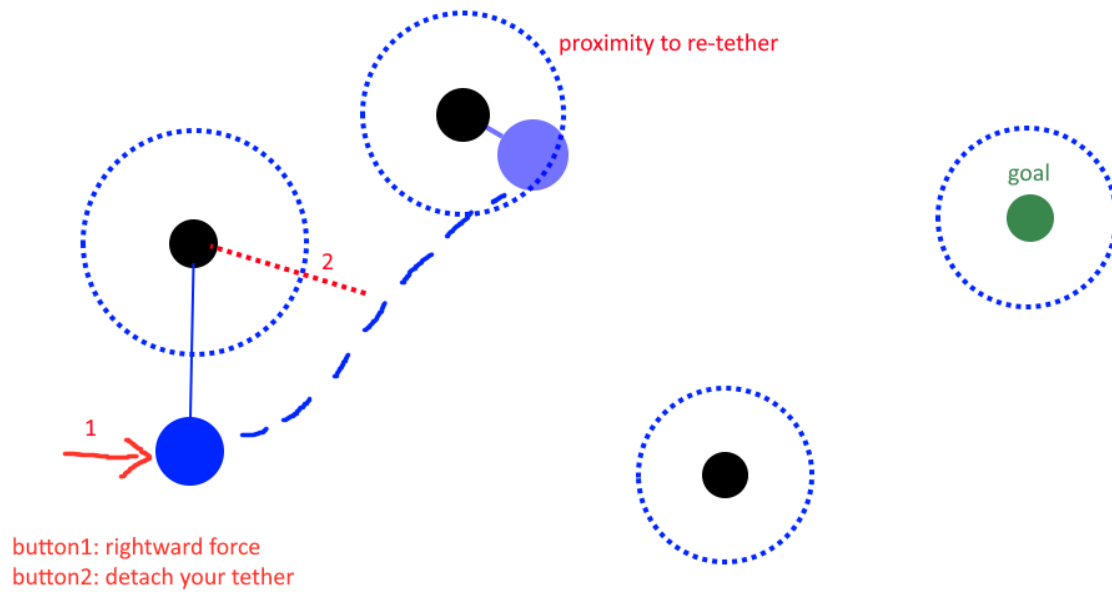
objective of the game is to swing from tether to tether to reach the goal. One button applies a small force to the player, while the other detaches the player's tether from a pivot. Upon entering a certain proximity within another pivot, the player's tether will automatically attach to it. If the player reaches the goal or falls, the level will reset and randomize again.

The theme of this game pulls from both Cut the Rope and Spider-Man games as influences. It demonstrates the properties of applying oscillatory properties to a game alongside timing, momentum, tangents, and trajectories with gravity.

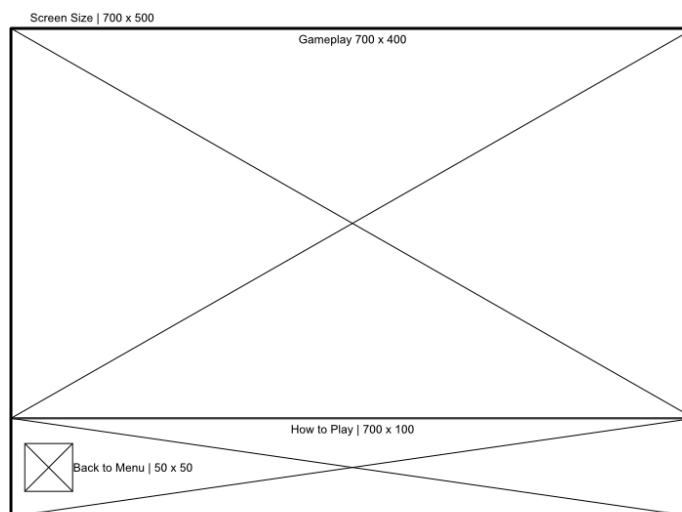
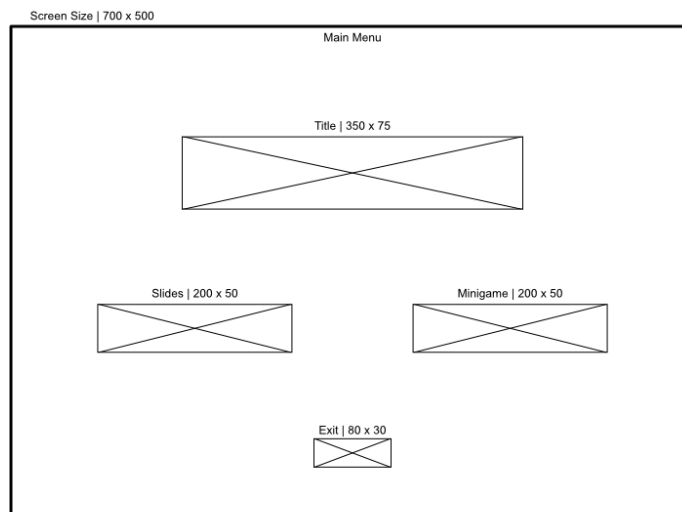
## Feature List

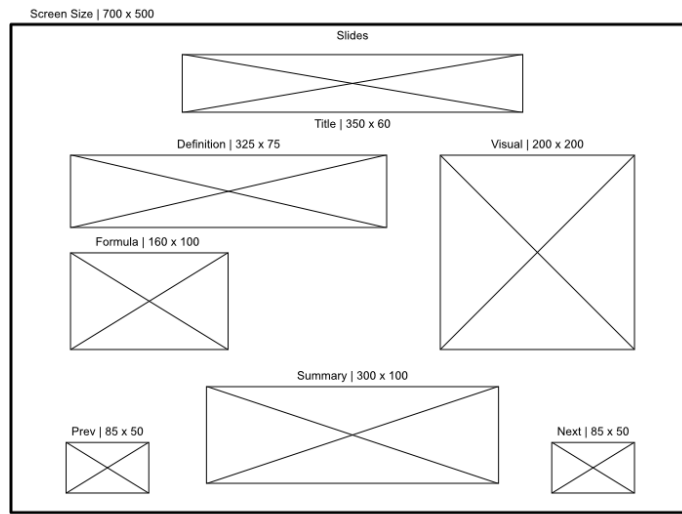
- Main Menu
- Slides
  - Defining Oscillation
  - What is not Oscillation?
  - Simple Harmonic Motion
  - Damped Harmonic Motion
  - Inharmonic Motion **NO LONGER NEEDED**
- Visuals
  - Moving sine wave
  - Pacing sprite
  - Orbiting object
  - Pendulum
  - Damped pendulum
  - Bouncing ball **NO LONGER NEEDED**
- Minigame
  - How to Play Section
  - Randomized levels
  - Proximity radial collision
  - Gravity, friction, and applied forces
  - "Tethering" to pivots
  - Winning/Losing

# Mockup



# UI Wireframes





## Sitemap

