

Integrative Project in Computer Science and Mathematics

Faculty of Science

Vanier College

Waves Simulation

Pluto

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Due Date: February 24, 2023

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## Project Description:

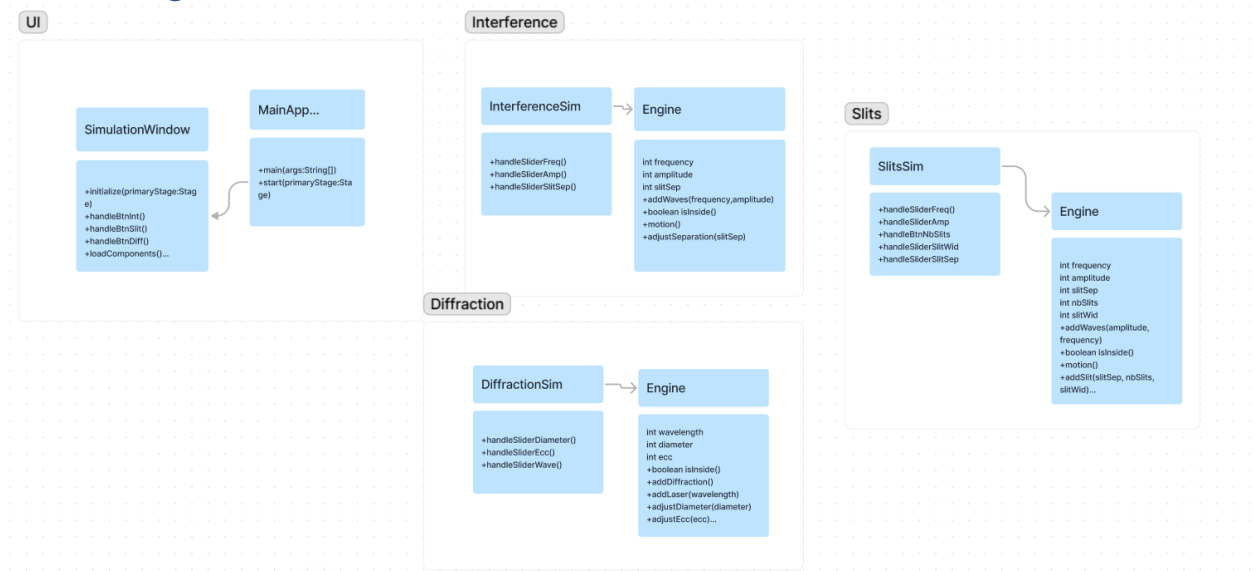
This project is a simulation that demonstrates waves concepts and theories such as interference, slits and diffraction. It allows the user to manipulate and modify different variables (e.g., Amplitude, Frequency, Wavelength) to understand different aspects of waves. In interference, the simulation demonstrates how variables such as the amplitude, frequency and the slit separation affect the waves; therefore, the user input will be implemented to the animation. In slits, it demonstrates how the number of slits can differentiate the visual result of the waves; therefore, the implementation and calculation of the values to the animation will be different for each slit. In diffraction, it demonstrates how light can be seen as a wave or a pattern. This differentiates from the other concepts as the slit can be in different shapes such as circle, square, rectangle, etc. The result of the user's input will differ on the shape's properties. Thus, this project will allow the user to be able to input their values and view accordingly how it affects the wave in order to better understand interference, slits and diffraction.

## Project Plan:

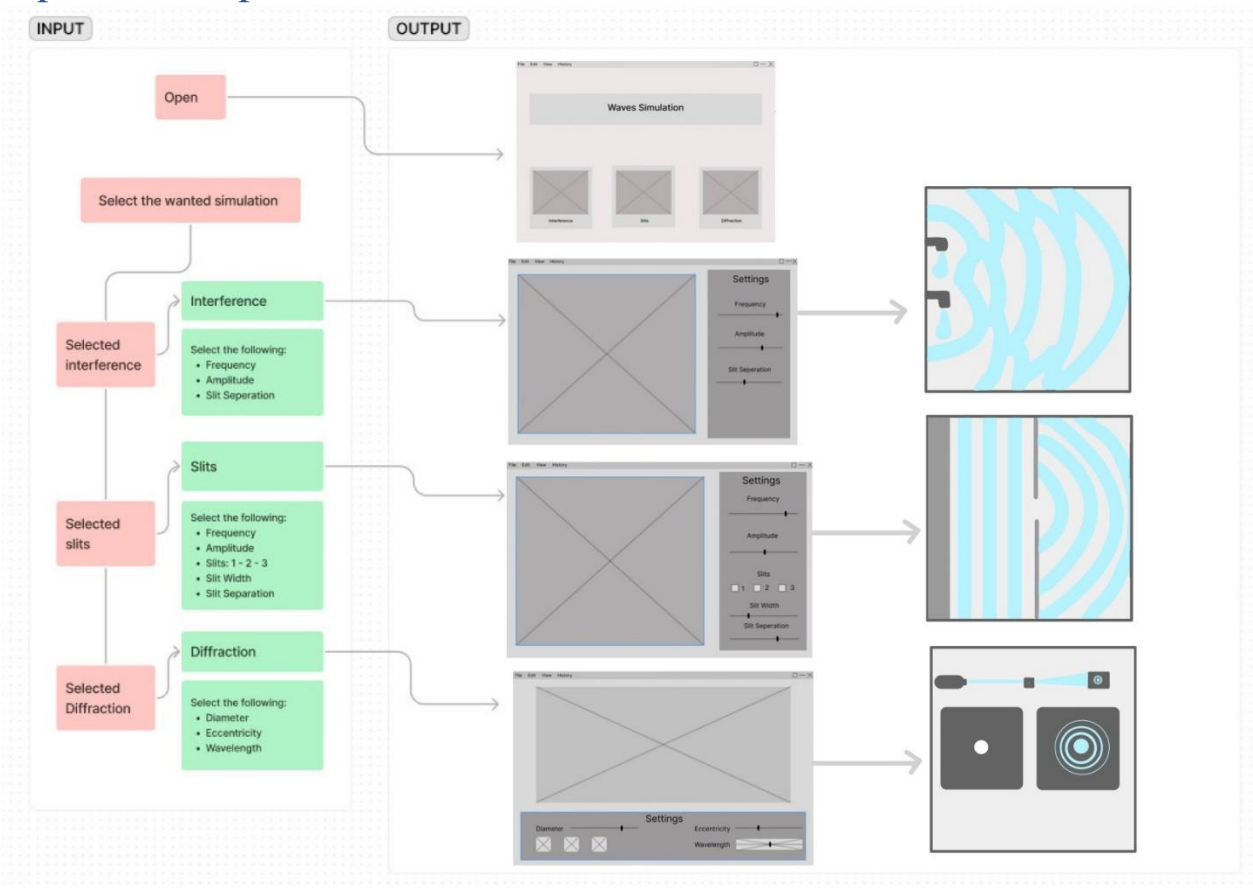
Task/User Story	Start Date – End Date	Assignments
Create the project in Netbeans	25 February – 27 February	Karen
Add the appropriate packages and classes	28 February – 2 March	Karen
Add the variables and methods to each class	3 March to 7 March	Darina
Create the Cover page Subtasks: <ul style="list-style-type: none"><li>- Add each different simulation to the cover page</li></ul>	28 February – 7 March	Steven
Create the Diffraction Simulation Subtasks: <ul style="list-style-type: none"><li>1. Create the settings bar using Scene Builder</li></ul>	8 March to 8 May  1. 8 March to 17 March	Karen

<ul style="list-style-type: none"> <li>2. Incorporate the JavaFx layout (made with SceneBuilder) into the code</li> <li>3. Create the animation of Diffraction</li> <li>4. Incorporate the user input to the animation</li> <li>5. Test the simulation</li> </ul>	<ul style="list-style-type: none"> <li>2. 18 March to 24 March</li> <li>3. 25 March to 16 April</li> <li>4. 17 April to 28 April</li> <li>5. 29 April to 8 May</li> </ul>	
<p><b>Create the Interference Simulation</b></p> <p><b>Subtasks:</b></p> <ul style="list-style-type: none"> <li>1. Create the settings bar using Scene Builder</li> <li>2. Incorporate the JavaFx layout (made with SceneBuilder) into the code</li> <li>3. Create the animation of Interference</li> <li>4. Incorporate the user input to the animation</li> <li>5. Test the simulation</li> </ul>	<p>8 March to 8 May</p> <ul style="list-style-type: none"> <li>1. 8 March to 17 March</li> <li>2. 18 March to 24 March</li> <li>3. 25 March to 16 April</li> <li>4. 17 April to 28 April</li> <li>5. 29 April to 8 May</li> </ul>	Darina
<p><b>Create the Slits Simulation</b></p> <p><b>Subtasks:</b></p> <ul style="list-style-type: none"> <li>1. Create the settings bar using Scene Builder</li> <li>2. Incorporate the JavaFx layout (made with SceneBuilder) into the code</li> <li>3. Create the animation</li> <li>4. Incorporate the user input to the animation</li> <li>5. Test the simulation</li> </ul>	<p>8 March to 8 May</p> <ul style="list-style-type: none"> <li>1. 8 March to 17 March</li> <li>2. 18 March to 24 March</li> <li>3. 25 March to 16 April</li> <li>4. 17 April to 28 April</li> <li>5. 29 April to 8 May</li> </ul>	Steven
<p><b>Add Java Documentation throughout the coding process</b></p>	<p>25 February to 8 May</p>	<p>Karen, Darina, Steven</p>

## Class Diagram:



## Input and Output Data Grid:



The user will face a home page when they open the application, which allows them to select which animation they would like to play: Interference, slits or diffraction.

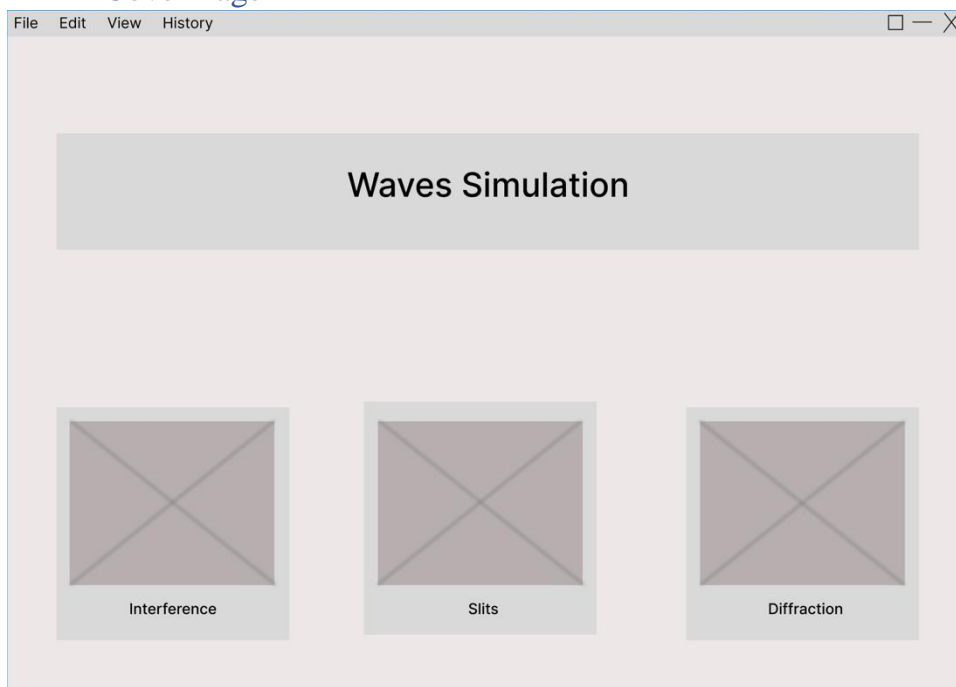
If they chose interference, the interference animation will open and they will be able to choose the frequency, amplitude and slit separation. When choosing these options, the animation will start as shown in the graph above. Changing the amplitude will change the size of the waves shown, bigger with higher amplitude, changing the frequency will change the speed of the waves, faster when higher frequency, and changing the slit separation will adjust the separation of the 2 waves. Example, if the separation is bigger, the two “faucets” would be wider spaced and with a higher amplitude and frequency the waves would be bigger, and the animation would be faster.

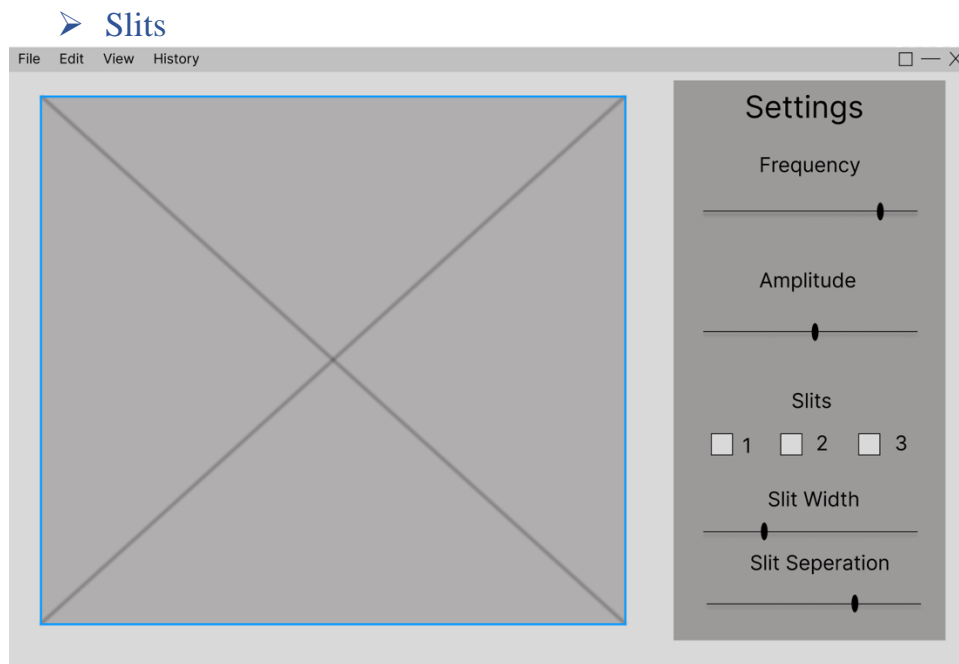
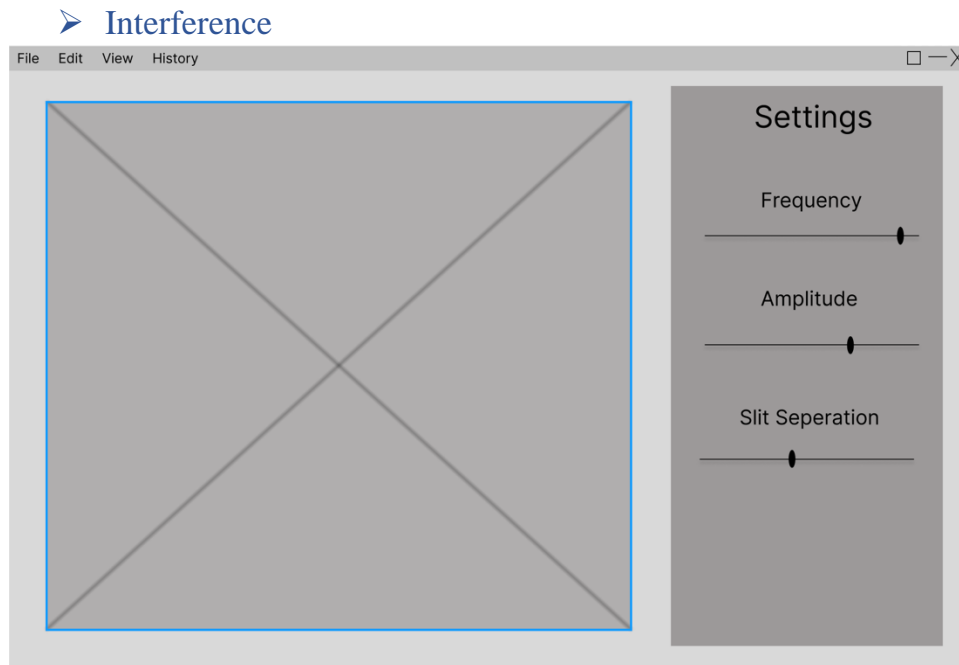
If they chose slits, the slits animation will open and they will be able to choose the frequency, amplitude, number of slits (1, 2 or 3), slit width and slit separation. Changing the frequency will change the speed of the propagated waves, faster with higher frequency, changing the amplitude will adjust the size of the waves, bigger with higher amplitude, changing the number of slits will change the animation to have 1, 2 or 3 slits, therefore changing the number of waves formed, changing the slit width will adjust the wideness of the slits and changing the slit separation will adjust the distance between the slits. Example, when the user changes the number of slits, the animation will have the chosen number of slits and the waves will form accordingly.

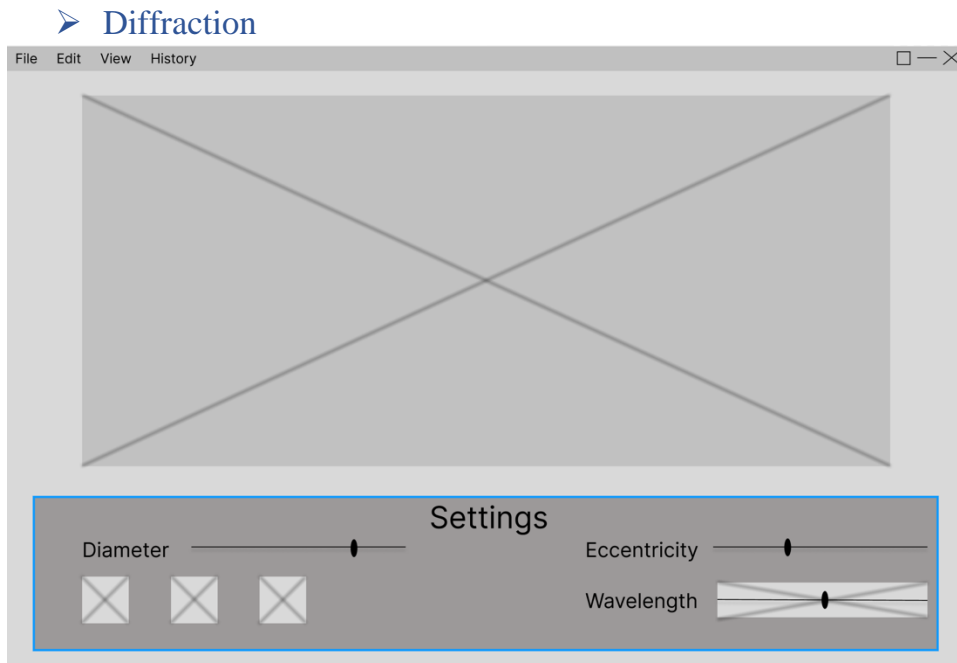
If they chose diffraction, the diffraction animation will open, and they will be able to choose the diameter, eccentricity and wavelength. Changing the diameter will adjust the size of the hole that the laser is shined on, therefore changing the image given on the right screen. Changing the eccentricity will change the shape of the final image on the right screen, making it longer vertically when augmenting the eccentricity. Changing the wavelength will change the color of the laser, depending on the wavelength’s theoretical color. Example, choosing a wavelength of 700nm will give a red laser therefore resulting in a red image.

## Wireframes:

➤ [Cover Page](#)







## Sprint Report:

### 1. Team Stories

Received Stories	Resolved Stories	Carry Over Stories	Blocked Stories
P-1 Do Deliv. 2: Project Description (2)	P-1 Do Deliv. 2: Project Description (2)		
P-2 Do Deliv. 2: Project Plan (2)	P-2 Do Deliv. 2: Project Plan (2)		
P-3 Do Deliv. 2: Class Diagram (2)	P-3 Do Deliv. 2: Class Diagram (2)		
P-4 Do Deliv. 2: I/O Grid (3)	P-4 Do Deliv. 2: I/O Grid (3)		
P-5 Wireframes (3)	P-5 Wireframes (3)		
P-6 Sprint Report (2)	P-6 Sprint Report (2)		
P-7 Review Deliv. 2 (1)	P-7 Review Deliv. 2 (1)		
<b>Total points: 15</b>	<b>Total points: 15</b>	<b>Total points: 0</b>	<b>Total points: 0</b>



## 2. Individual Stories

### Sprint 1 - Karen

Received Stories	Resolved Stories	Carry Over Stories	Blocked Stories
P-2 Do Deliv. 2: Project Plan (2)	P-2 Do Deliv. 2: Project Plan (2)		
P-6 Sprint Report (2)	P-6 Sprint Report (2)		
P-7 Review Deliv. 2 (1)	P-7 Review Deliv. 2 (1)		
<b>Total points: 5</b>	<b>Total points: 5</b>	<b>Total points: 0</b>	<b>Total points: 0</b>

### Sprint 1 - Steven

Received Stories	Resolved Stories	Carry Over Stories	Blocked Stories
P-1 Do Deliv. 2: Project Description (2)	P-1 Do Deliv. 2: Project Description (2)		
P-5 Wireframes (3)	P-5 Wireframes (3)		
<b>Total points: 5</b>	<b>Total points: 5</b>	<b>Total points: 0</b>	<b>Total points: 0</b>

### Sprint 1 - Darina

Received Stories	Resolved Stories	Carry Over Stories	Blocked Stories
P-3 Do Deliv. 2: Class Diagram (2)	P-3 Do Deliv. 2: Class Diagram (2)		
P-4 Do Deliv. 2: I/O Grid (3)	P-4 Do Deliv. 2: I/O Grid (3)		
<b>Total points: 5</b>	<b>Total points: 5</b>	<b>Total points: 0</b>	<b>Total points: 0</b>

### 3. Trello Screenshot

