Battleship Application:
User Manual
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I.A. Game Background

Battleship is a two-player strategy game where opponents try to sink each other's fleet of ships. Each player has two grids, typically 10x10, one of which is used for secretly placing down their ships outside of the view of the other player, and one of which is used for recording shots taken on the opponent. The fleet typically consists of five ships of varying lengths: an aircraft carrier (5 spaces), a battleship (4 spaces), a submarine (3 spaces), a cruiser (3 spaces), and a destroyer (2 spaces).

After ships are placed down, players take turns calling out coordinates to shoot at in an attempt to hit their opponent's ships. If a hit is recorded, the player marks it on their own grid, and the opponent marks it on theirs. When all the spaces a ship occupies are hit, the ship is sunk. The game continues until one player sinks all of the opponent's ships.

I.B. Application Overview

The Battleship program is a networked application which allows two users to play Battleship over a network. The application implements peer-to-peer connectivity and communicates shots between players using the Java socket API.

Upon starting the application, the user can set up the desired state of the game (grid size, ships, and time per turn), enter network settings such as port number and ip address of an opponent, and choose to either connect to an opponent or wait for an opponent to connect to them. Once a network connection is established and the game starts, players place down their ships before time runs out, and then players take turns calling out where to shoot. Additionally, the application allows the user to customize visual aspects of the game, such as the color of ships, shots hit, and shots missed.

Once a player's entire fleet is destroyed, a window appears allowing each player to vote on restarting the game or not. The score of each player is recorded and displayed on screen.

This program can be compiled and run by executing the **scripts/run_windows.cmd** script on windows or **scripts/run_linux.sh** on linux, which compiles and runs the program. There are additional scripts for generating javadoc documentation and for running unit tests. Note that the **user must provide the path to their javafx folder** in order to run the program.

II. Application Details

The Battleship application consists of 2 main scenes: the **startup window**, where game and network settings can be configured and the user can connect to an opponent or wait for an opponent to connect, and the **game window**, which lets the user shoot at the opponent and view the state of their ships and their grid of shots on the enemy.

II.A. Startup Window

The Startup Window consists of several parts: a menu bar with settings and help options, a ToolBar consisting of buttons for connecting to an opponent, waiting for an opponent, and toggling the network settings panel, and a network settings panel containing settings for both the game and for networking. The features of this window are described below:

I.   Menu Bar
   A. Settings option: the only item under the Settings option is labeled "Settings", which when clicked toggles the visibility of the network settings panel.
   B. Help option: the only item under the Help option is labeled "Manual", which when clicked opens a dialog box directing the user to consult this manual for help.
II. ToolBar

A. "Connect to Opponent" button: When this button is clicked, the application attempts to connect to the Opponent using the IP address in the "Opponent IP Address" field at the port specified in the "Port Number" field. If connection fails upon pressing this button, e.g. if an incorrect or invalid IP address is typed in, an error window will pop up after at most a few seconds.

B. "Wait for Opponent" button: When this button is clicked, the application opens up the port specified in the "Port Number" field and waits for a connection. This blocks the program until someone connects to the user at the correct port number, so if nobody connects the program will appear frozen and must be reopened.

C. "Network Settings" button: toggles the visibility of the network settings panel.

III. Network Settings Panel

A. "Port Number" field: allows the user to specify a network port for the connection. By default this is 8189. If incorrect values are inputted into this field and a connection is attempted, an error dialog will be shown notifying the user.

B. "Opponent IP Address" field: allows the user to specify an IP address to connect to for the game. By default this is 0.0.0.0, allowing the user to connect to their own network and play locally using 2 windows. If incorrect values are inputted into this field and a connection is attempted, an error dialog will be shown notifying the user that the connection failed.

C. "Grid Rows" field: allows the user to specify the number of rows for the Battleship game. By default this is 10. If an invalid number or a number less than 1 is inputted into this field and a connection is attempted, an error dialog will be shown notifying the user.

D. "Grid Columns" field: allows the user to specify the number of columns for the Battleship game. By default this is 10. If an invalid number or a number less than 1 is inputted into this field and a connection is attempted, an error dialog will be shown notifying the user.

E. Ship Lengths: Allows the user to specify the number and length of ships in the game, by entering the desired length into the text field and pressing the "Add" button. A list of ship lengths for the game is displayed to the right of the button. Duplicate ship lengths are, of course, allowed. If the user attempts to add a ship length less than 1 or an invalid number, an error dialog will be shown notifying the user. Additionally, the game cannot be played without ships, so if the user attempts to establish a connection without any ships an error dialog will also appear.

F. Time Per Round field: allows the user to specify the time per round for the Battleship game. By default this is 30 seconds, and the minimum value the user can specify is 10 seconds, to give players enough time to play. If an invalid number is inputted into this field and a connection is attempted, an error dialog will be shown notifying the user.

An important detail about the startup window is that if 2 players attempt to connect to each other and play with differing game configurations (i.e. different number of rows, columns, time per

round, and ships), an error dialog will pop up informing both users that their game configurations do not coincide and the applications will close. This is to ensure both players are using the same settings.
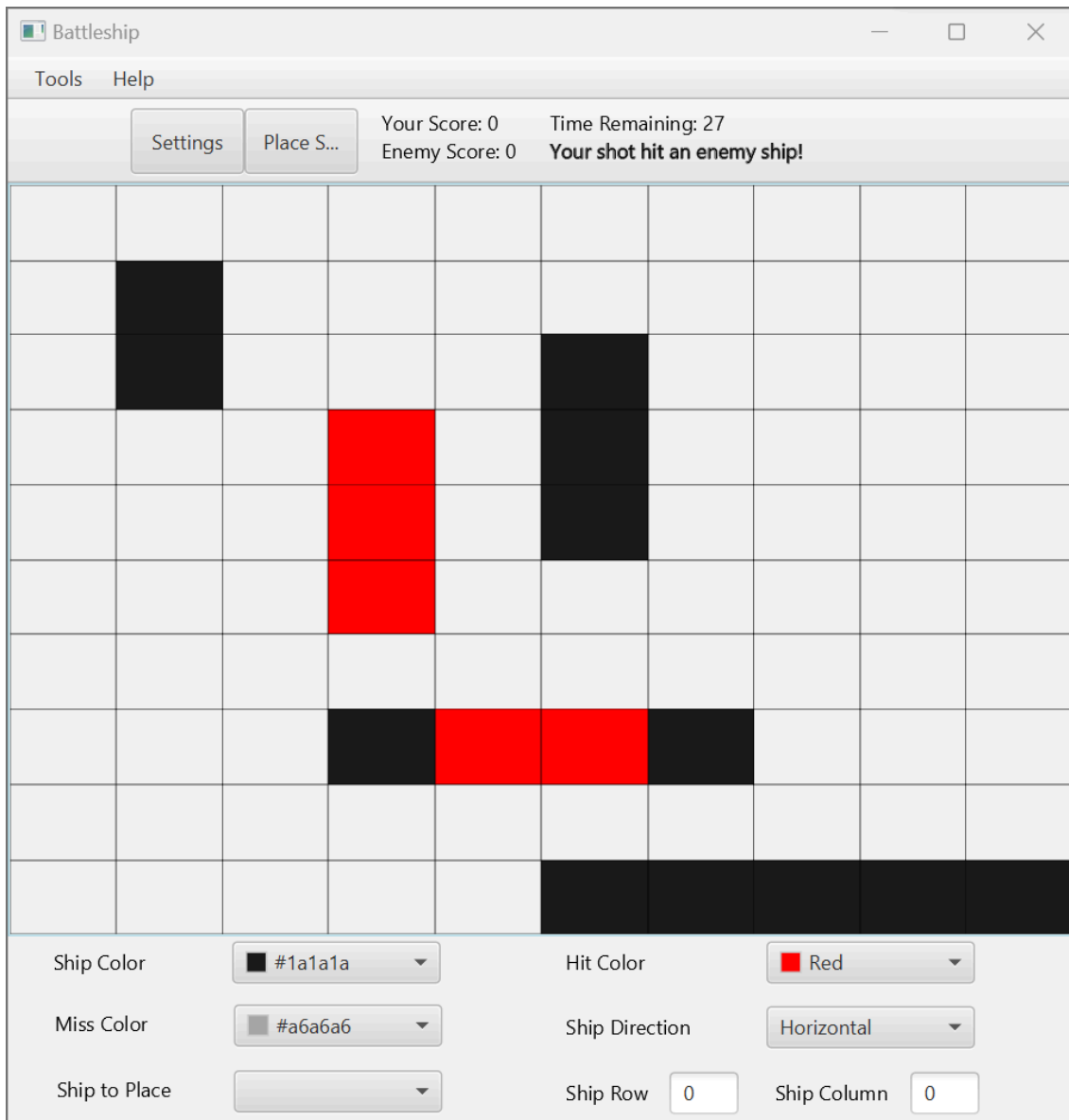
II.B. Game Window

The game window also consists of several parts, similar to the startup window:
- A menu bar with tools and help options
- A ToolBar with buttons for locking in a move in the game, toggling the settings pane, and placing a ship down, as well as displaying information about the results of the previous turn and whether the user locked in their move or not
- A grid which is used to display the user's ship grid and shot grid as well as receive user input for placing ships down and for shooting the enemy, with configurable colors
- A settings pane with color pickers to change the colors of the game, as well as options for placing ships down.

The following screenshots are examples of the game window when it is the user's turn to shoot, and when it is the user's turn to receive a shot, respectively:
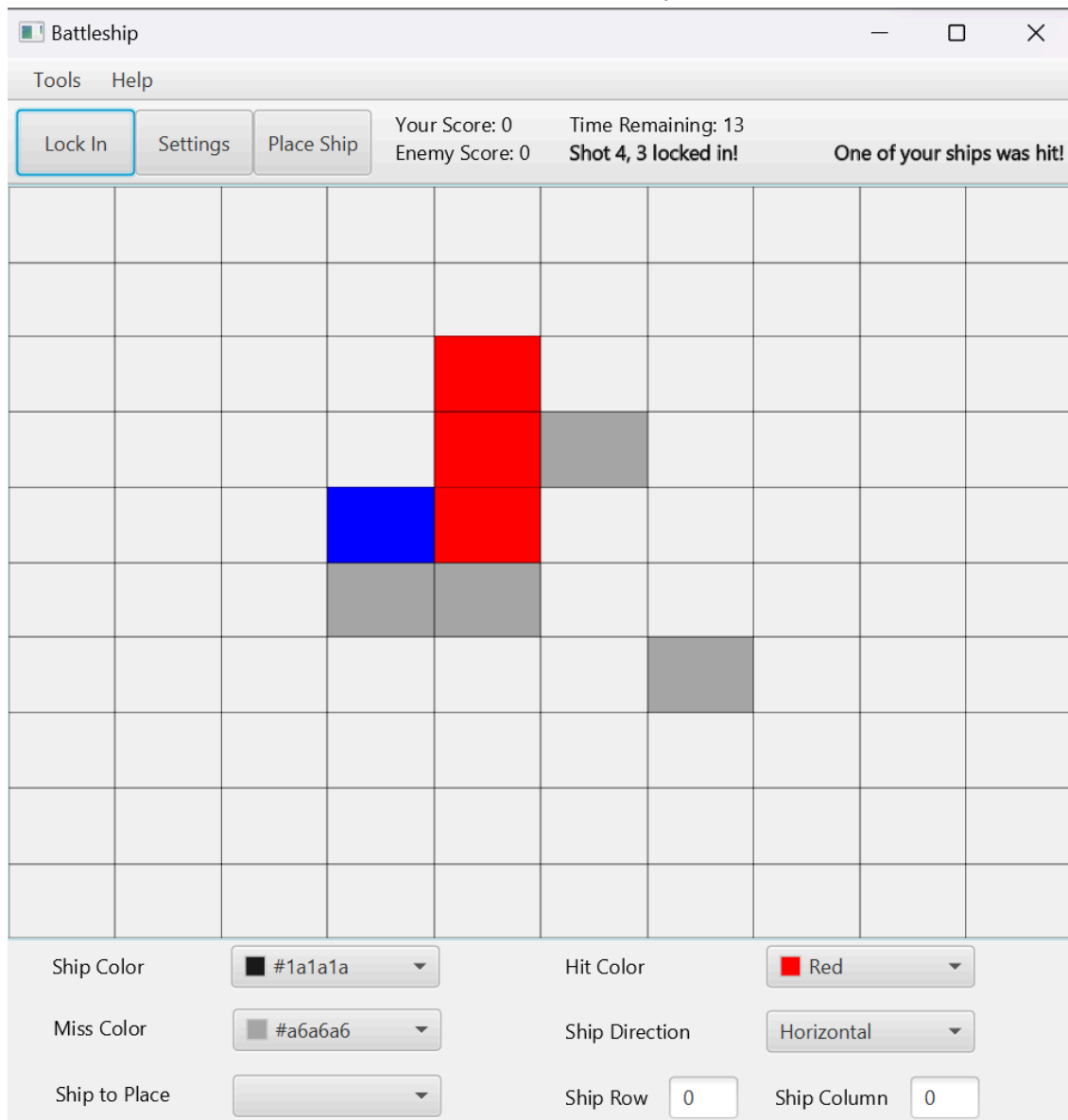
The different features of the game window are described in detail below:

I. Menu Bar
   A. Tools option: the only item under the Tools option is labeled "Settings", which toggles the visibility of the settings pane.
   B. Help option: the only item under the Help option is labeled "Manual", which when clicked opens a dialog box directing the user to consult this manual for help.

II. ToolBar
   A. "Lock In" button: this button is crucial for the progression of the game: once a move is chosen by the user and executed via a click on the grid, or a ship configuration is chosen by the user via clicking on the grid or using the "Place Ship" button, the user must lock in their move before time runs out or they will lose automatically. If the user attempts to lock in their move without having fully

executed a move, i.e. without placing down all their ships or without selecting a square on the grid to shoot at, an error dialog will appear informing the user of what they need to do in order to lock in. This button is hidden when it is the opponent's turn to shoot since the user has nothing to do at this time, as shown in the example above.

B. Settings button: this button toggles the visibility of the settings pane.

C. "Place Ship" button: This button attempts to place a ship on the board using the configurations in the settings pane. Specifically, it attempts to place a ship of the length selected via the "Ship to Place" choice box starting at the row and column specified in the "Ship Row" and "Ship Column" fields, in the direction selected via the "Ship Direction" choice box. If placing a ship there is impossible due to conflict with another ship or going off the grid, the ship is not placed and no change occurs on the board.

D. Score text: The user and their opponent's scores are listed on the ToolBar as well. These scores are updated when the game ends. Rack up a high score by winning successive games.

E. Timer text: The time remaining in the round is also displayed on the ToolBar. If the game is in the initial setup phase and the user does not place down all their ships and lock in their ship configurations, they lose. If the game is in the main phase and it is the user's turn to shoot, if they do not select a square in the grid to shoot at and lock in their choice, they also lose. If it is not the user's turn to shoot the timer doesn't make them lose.

F. There are also two areas of text which displays some information about the current and previous turn: the text on the left notifies the user that they have to make a move and lock it in if it is their turn, and notifies the user about if their shot hit an enemy ship or not when it's not their turn, while the text on the left notifies the user if any of their ships were shot by the enemy in the previous turn.

III. Grid: The main feature of this application is the ability to execute moves by clicking on the grid, and viewing the state of the user's ships and information about enemy ships via the shot grid. Since these are two noticeably different states of the application, they have been split up below.

A. Ship Grid: During the setup/initial phase of the game, the user can click on a square in the grid to attempt to place a ship starting at that square, of the length selected via the "Ship to Place" choice box, and in the direction specified by the "Ship Direction" choice box. Similarly to the place ship button, if placing a ship there is impossible due to conflict with another ship or going off the grid, the ship is not placed and no change occurs on the board. If the user clicks on a square on the grid which has a ship on it, that ship is removed and returned to the user's list of ships.

During the main phase of the game, when it is not the user's turn to shoot the ship grid is displayed, showing the user their ship configuration, with ships being of the color selected via the "Ship Color" color picker, and hit parts of each ship being of the color selected via the "Hit Color" color picker. An entirely red ship

means that ship was sunk by the enemy, while a ship with still some parts left un-hit is still in the game.
   B. Shot Grid: The shot grid only appears during the main phase of the game, after the users have placed down their ships. The shot grid is used to display the user's information about the enemy ships, ascertained by firing at the enemy at certain locations. If it is this player's turn to shoot, the shot grid is displayed and the user can click on a square in the grid to aim a shot there. The square in the grid turns bright blue to show the user which one they selected. After the user clicks a square to aim at, they **must** click the Lock In button to lock their choice of a shot in; if they do not do this before time runs out, then they automatically lose the game.
IV.   Settings Pane
   A. Ship Color Picker: allows the user to pick a color for their non-hit ships.
   B. Hit Color Picker: allows the user to pick a color for hits on both their ships and their hit grids.
   C. Miss Color Picker: allows the user to pick a color for missed shots on their hit grids.
   D. Ship Direction Choice Box: during the initial setup phase, allows the user to pick between placing their ship horizontally or vertically. The choice is vertical by default.
   E. Ship to Place Choice Box: during the initial setup phase, allows the user to pick a ship length to put on the grid via clicking or the place ship button. By default this choice is the lowest length ship the user currently has. The listing of the user's ships is maintained in sorted order.
   F. Ship row & Ship column fields: during the initial setup phase, allows the user to specify a row and column in the grid at which to attempt to place a ship using the place ship button.

II.C. Game End
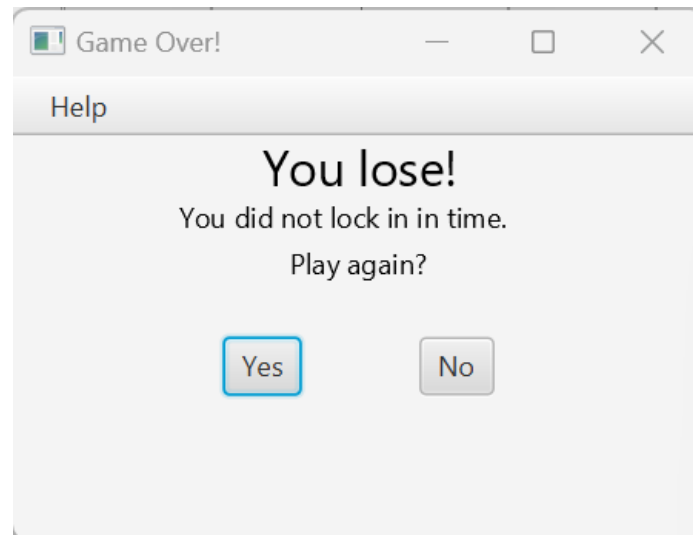
When the game ends, a window appears informing the user if they won or lost the game, as well as information regarding why they lost the game (either from running out of time or having all their ships shot down). The user can vote whether or not to restart the game. If both users vote yes then the game is restarted; if one or more users votes no then the application is closed.

Upon choosing yes or no, the application blocks until it receives a response from the opponent. So it may appear like the application is freezing but it's really not.

This window also has a menu bar with a help section with one option titled "manual", which again displays a window directing the user to this manual.

III. Error Messages

Error dialogs are displayed by the program in a few cases, almost always due to the user entering non-numeric or out-of-range data into input fields in the program, though they can also appear due to connection problems.
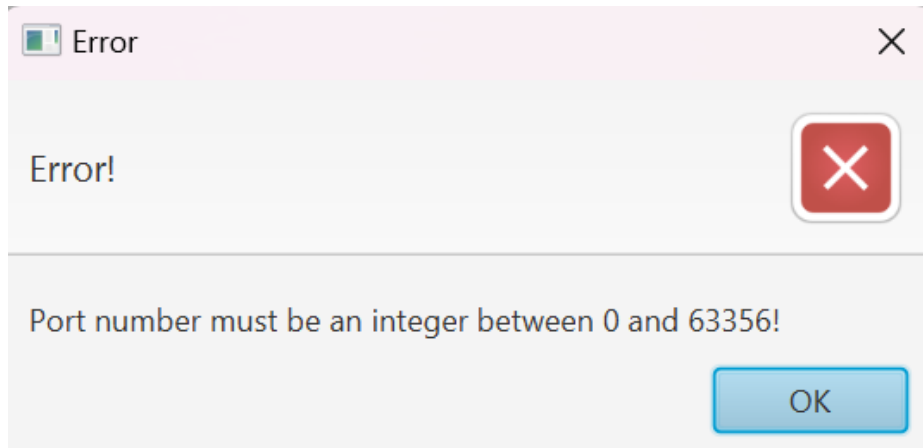
III.A. Startup
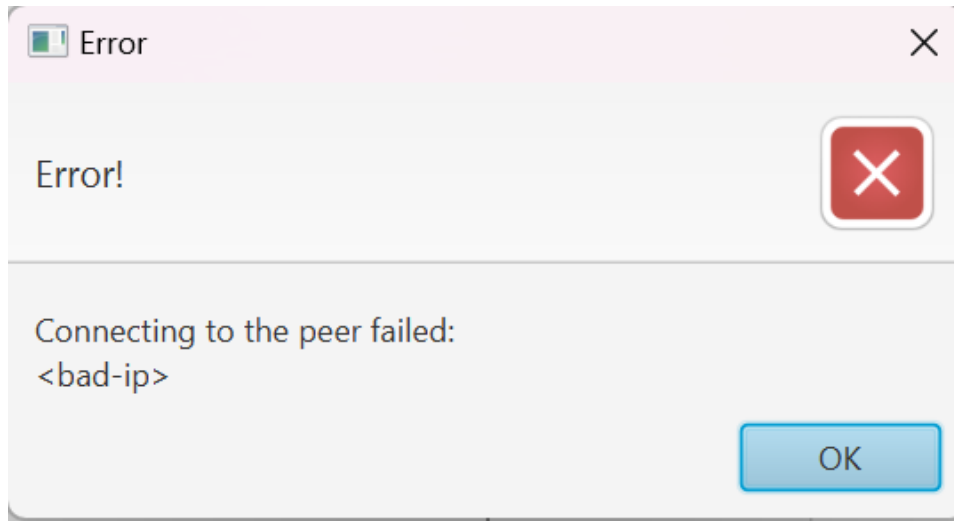
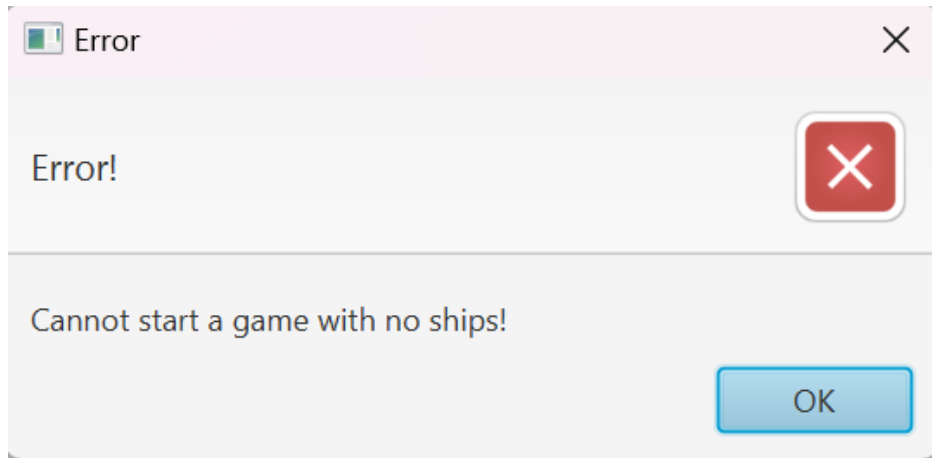Displayed when the user attempts to connect to an invalid ip address <bad-ip>.
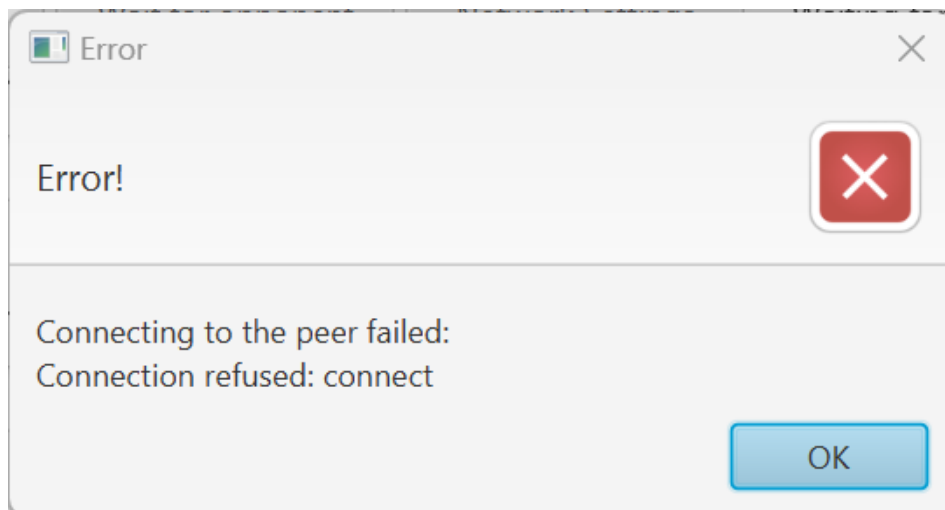
Displayed when the user attempts to connect to an IP address which does not have a player waiting for it.
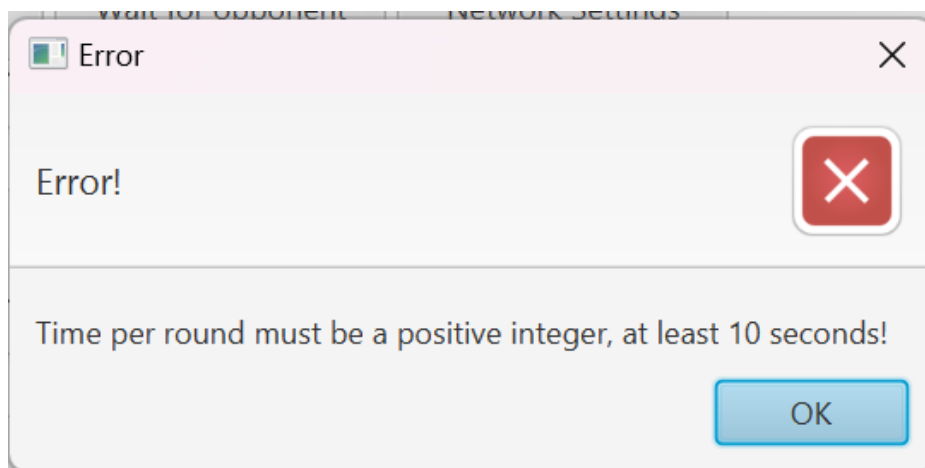
Displayed when the user attempts a connection having entered a port number into the port number field which is not an integer between 0 and 63356, exclusive. This can be any malformed input or a number outside this exclusive range.
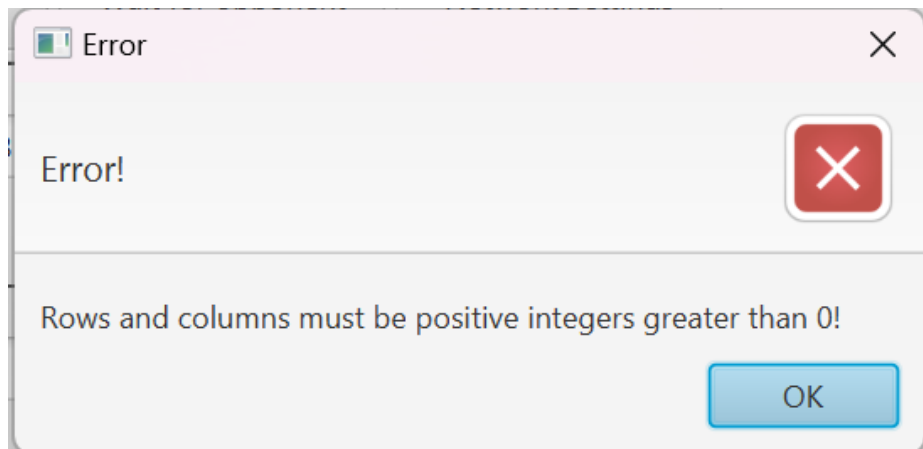

Displayed when the user attempts a connection having entered an invalid number of rows or columns, or ones that are 0 or less.
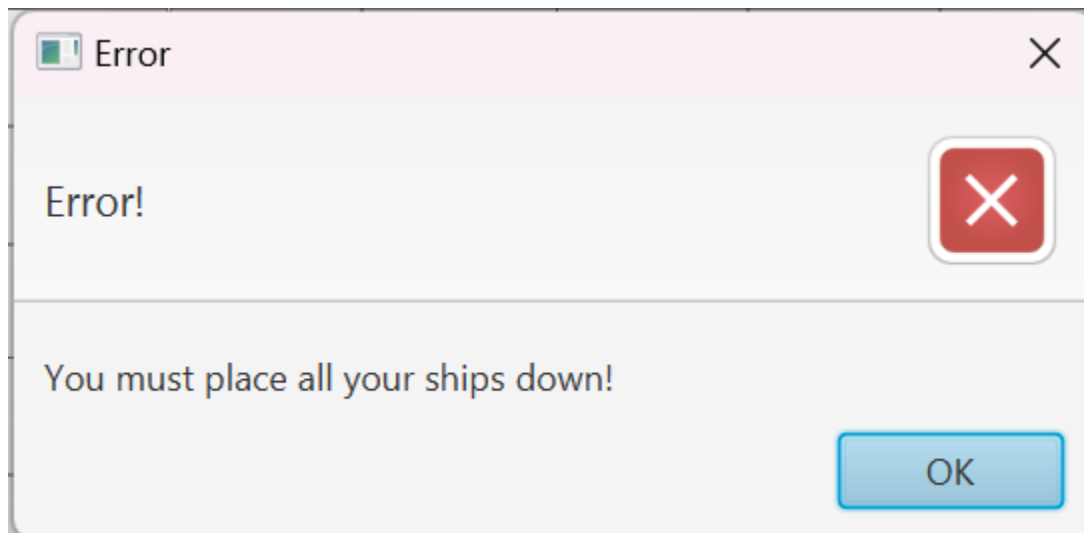
Displayed when the user attempts a connection without having added any ships to the game settings.


Displayed when the user attempts a connection with an invalid number of time per round entered, or with a number of time less than 10 seconds entered.

Error

Error!

You must place all your ships down!

OK
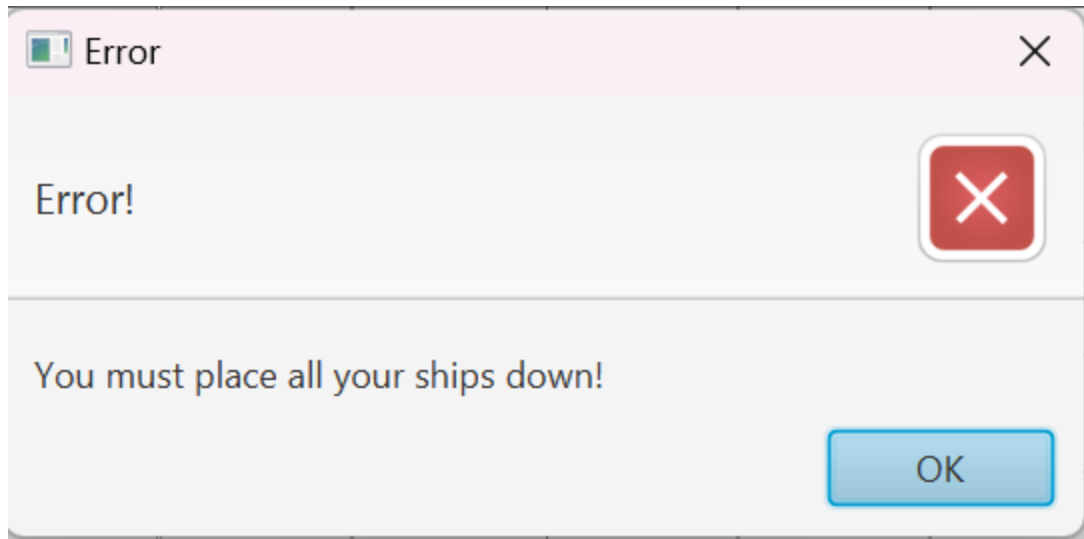
III.B. Game

Displayed in the initial setup phase of the game, when the user attempts clicking the Lock In button to lock in a ship placement without having placed all their ships down.
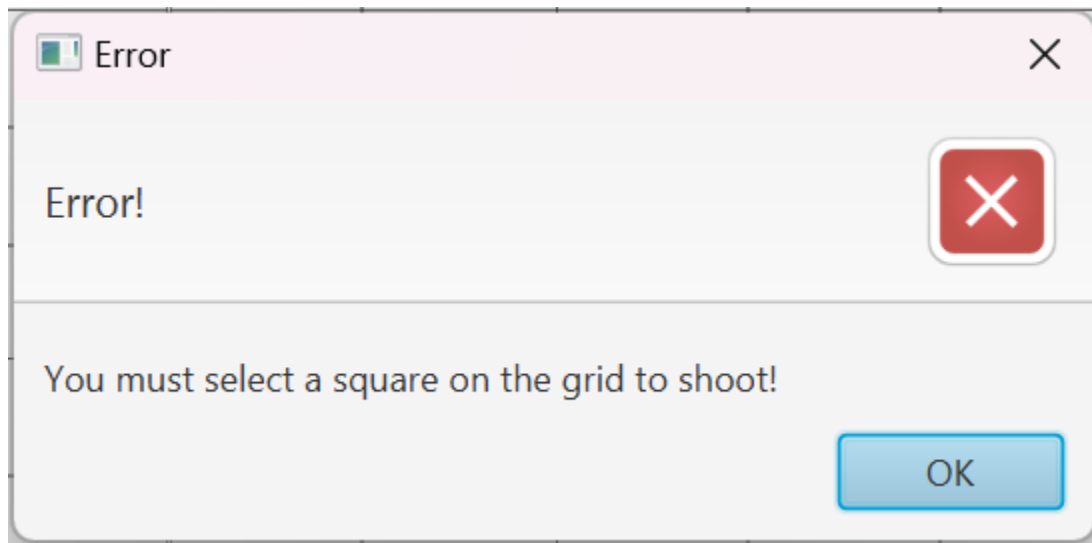
Displayed during the main phase of the game, when it is the user's turn to shoot and they attempt clicking the Lock In button to lock in a shot without having selected a square on the grid to shoot at.