

# Requirement Tests

Test ID	Related Requirement	Inputs (Scenario)	Expected Outputs (Pass Criteria)	Rationale and Notes	Author
TEST_UR_CHANGE_DIFFICULTY_UI	UR_CHANGE_DIFFICULTY	The difficulty select menu is loaded, and one of 3 options 'Easy', 'Normal' and 'Hard' under menu 'Difficulty' is selected.	The value of GameData.gameDifficulty is updated to the correct value.		Adam
TEST_UR_CHANGE_DIFFICULTY_MAP	UR_CHANGE_DIFFICULTY	Maps are loaded with 'easy', 'normal' and 'hard' difficulties.	The harder maps must have more obstacles and fewer power ups per lane than the easier maps.		Adam
TEST_FR_SAVE_AND_LOAD_LOADIN_G_MAP	FR_SAVE_&_LOAD	A save file is loaded from a save where the game is in a known state.	The map objects (powerups and obstacles) are all in the expected states.	This isn't a complete test - the loading code for most objects is in Game, so only map objects can actually be tested.  The rest of the loading code and all of saving is tested manually.	Adam
TEST_FR_POWER_UP_ITEMS_HEALTH	FR_POWER_UP_ITEMS	A health boost powerup collides with a boat.	The health-boost powerup disappears. The boat's robustness value increases by 20.		Adam

TEST_FR_POWER_UP_ITEMS_STAMINA	FR_POWER_UP_ITEMS	A stamina boost powerup collides with a boat.	The stamina-boost powerup disappears. The boat's stamina value is increased.		Adam
TEST_FR_POWER_UP_ITEMS_ACCELERATION	FR_POWER_UP_ITEMS	An acceleration boost powerup collides with a boat.	The acceleration-boost powerup disappears. The boat's acceleration increases by 50, and its speed increases by 30.  After 5 seconds, the boat returns to normal.		Adam
TEST_FR_POWER_UP_ITEMS_SPEED	FR_POWER_UP_ITEMS	A speed boost powerup collides with a boat.	The speed-boost powerup disappears. The boat's speed value increases by 10.		Adam
TEST_FR_POWER_UP_ITEMS_TIME	FR_POWER_UP_ITEMS	A time reduction powerup collides with a boat.	The time-reduction powerup disappears. The boat's time reduction value increases by 2.		Adam
<i>Requirements of Team 10</i>					
TEST_UR_UNIQUE_BOATS	UR_UNIQUE_BOATS  FR_STATS	Boats have attributes which are robustness, maneuverability, acceleration , maxima velocity and spirits.	Every robustness of a boat is unique. Every maneuverability of a boat is unique. Every maxima acceleration of a boat is unique. Every maxima velocity of a boat is unique. Every spirit of a boat is		Adam

			unique.		
TEST_UR_DAMAGE	UR_DAMAGE FR_DAMAGE	A boat collides with an obstacle.	The boat's robustness is reduced, and the obstacle is removed from the world.		Adam
TEST_UR_CONTROLS	UR_CONTROLS	A player boat is on a map.	The boat turns left if the left move key is pressed. The boat turns right if the right move key is pressed.		Adam
TEST_UR_MAP_OBJECT_COUNT	UR_MAP	A map is created.	The map contains the same number of obstacles and powerups in every player's lane.		Adam
TEST_UR_MAP_LENGTH	UR_MAP	A player boat is on an empty map.	It takes the player more than 30 seconds but less than 2 minutes to sail to the end of the race.		Adam
TEST_FR_PENALTY_IN_LANE	FR_PENALTY UR_LANE	A boat is in its initial lane.	No penalty of extra time is given.		Adam
TEST_FR_PENALTY_NOT_IN_LANE	FR_PENALTY UR_LANE	A boat moves out of its own line.	The time taken of the boat is extended for the same amount of time it leaves the lane.		Adam
TEST_UR_MENU_WITH_SAVE	UR_MENU	There is a saved file loaded, and the main menu is open.	The Play, Continue, Options and Instructions buttons can all be clicked on, and make the correct changes to state.	The exit button is tested manually.	Adam

TEST_UR_MENU_WITHOUT_SAVE	UR_MENU	There is no a saved file loaded, and the main menu is open.	The Play, Options and Instructions buttons can all be clicked on, and make the correct changes to state.	The exit button is tested manually.	Adam
TEST_UR_CHANGE_SETTINGS	UR_CHANGE_SETTINGS	The options menu is open.	The audio volume and controls can be changed by pressing the buttons.		Adam
TEST_UR_DIFFICULTY	UR_DIFFICULTY	AI boats are created for three maps, one for each leg.	The stats of the AI's boats are higher in later legs.	This isn't an incomplete test - AI stat inflation is the only means by which the race is made harder in later legs.	Adam
TEST_FR_STAMINA	FR_STAMINA	A boat moves in the river.	Its stamina value decreases as it moves, but not below 25.		Adam
TEST_FR_STATS	FR_STATS FR_VARIABLE_CONTROLS	Boats with high and low values for speed, acceleration, stamina and maneuverability are created and moved.	The boat with high acceleration accelerates faster, the boats with high maneuverability and stamina turns faster, and the boat with high speed reaches a higher maximum speed.		Adam

# Tests Not Linked to Requirements

Not all our tests are directly linked to a requirement, but we have them anyway as they test important areas of the code. These are mostly testing transitions between screens that aren't explicitly stated in the requirements.

Test ID	Inputs (Scenario)	Expected Outputs (Pass Criteria)	Rationale and Notes	Author
TEST_GOTO_CHOOSING_UI	The difficulty select menu is loaded, and the play button is clicked.	The game moves to the boat selection state, and the boat selection UI is loaded.		Adam
TEST_GOTO_MAIN_MENU_UI	The game over menu is loaded, and the screen is clicked.	The game leaves the game over state, and moves to the reset state.	The logic for actually resetting the game's state and moving to the menu UI is handled by Game, so can't be tested automatically.	Adam
TEST_INSTRUCTIONS_GOTO_MAIN_MENU	The instructions menu is opened.	Clicking the back button returns to the main menu.		Adam

# Manual Tests

A variety of tests can't be done automatically, and so are performed manually. The reason each test can't be automated is provided in the Rationale section.

A particularly common case is that a test can't be automated because it involves the Game class. The Game class can't be instantiated in the testing environment, as it's closely linked to the game engine which errors when run in the testing environment and has behaviour too complex to be mocked.

Code has been moved out of the Game class where possible to enable it to be tested, but moving all logic out of the class would involve extensive refactoring that was not practical within the time constraints.

Test ID	Related Requirement	Inputs (Scenario)	Expected Outputs (Pass Criteria)	Rationale and Notes
TEST_NFR_FAST_CONTROLS	NFR_FAST_CONTROLS	A boat is on a map.	The response of a boat is less than 0.5 second to an input.	Manual test because accurately measuring input delay from the system is impossible.
TEST_NFR_FAST_TRANSITION	NFR_FAST_TRANSITION	The options menu and instructions menu are opened and closed, and then a full game is played to completion.	Each state is changed in 0.5 second.	Manual test because accurately measuring input delay from the system is impossible.
TEST_FR_SAVE_&LOAD_SAVING	FR_SAVE_&_LOAD	A leg is started, then immediately saved.	A save file is created.	Manual test because saving is handled by the Game class.
TEST_FR_SAVE_AND_LOAD_LOADING_MAP	FR_SAVE_&_LOAD	A leg is started, saved and then loaded.	The player's and opponents' boats, the leg number, the timer and the player's position are all	Manual test because almost all of loading is handled by the Game class.

			the same after the load.	Powerups and Obstacles are tested automatically.
TEST_UR_MENU_EXIT	UR_MENU	The main menu is opened with no save file loaded, and the exit button is pressed. Repeat with a save file loaded.	The Exit button closes the game.	Manual test because exit calls Gdx.app.exit(), which can't be mocked as Gdx.app has complex behaviour needed elsewhere.
TEST_UR_DISPLAY_INSTRUCTIONS	UR_DISPLAY_INSTRUCTIONS	The instructions menu is opened.	Instructions are shown on screen.	Manual test because it's impossible to automatically test if something's being displayed correctly.
TEST_FR_ASPECT	FR_ASPECT	The choose boat menu is opened.	All four boats have different sprites.	Manual test because it's impossible to automatically test if something is being displayed correctly.
TEST_FR_OBSTACLES	FR_OBSTACLES	A leg is started.	There is no clear pattern to the distribution or type of obstacles.	Manual test because it's impossible to automatically test for all kinds of patterns.
TEST_UR_HUD	UR_HUD FR_HEALTHBAR	A leg is started.	The robustness-bar changes with the player's robustness.  The stamina bar changes with the player's stamina.	Manual test because rendering functions can't be run in the testing environment.

			<p>The timer changes with the timer. The leg number changes with the leg number. The position changes with the player's standing in the race.</p>	
TEST_PAUSE_DURING_LEG		<p>A leg is started, Esc is pressed, the tester waits for two seconds, and then Esc is pressed again.</p>	<p>The timer and world have not changed while the game was paused.  The timer and world resume movement after the game is unpause.</p>	Manual test because pausing is handled by the Game class.
TEST_PAUSE_RESULTS_SCREEN		<p>A leg is finished, and then Esc is pressed.</p>	Nothing happens.	Manual test because pausing is handled by the Game class.

# Evidence for Tests

Automated testing report:

## Test Summary



Packages

Classes

### Packages

Package	Tests	Failures	Ignored	Duration	Success rate
<a href="#">com.hardgforgif.dragonboatracing.tests.GameTests</a>	18	0	0	10.603s	100%
<a href="#">com.hardgforgif.dragonboatracing.tests.UITests</a>	7	0	0	1.183s	100%

### Classes

Class	Tests	Failures	Ignored	Duration	Success rate
<a href="#">com.hardgforgif.dragonboatracing.tests.GameTests.BoatTest</a>	7	0	0	2.767s	100%
<a href="#">com.hardgforgif.dragonboatracing.tests.GameTests.CollisionTest</a>	7	0	0	1.790s	100%
<a href="#">com.hardgforgif.dragonboatracing.tests.GameTests.MapTest</a>	4	0	0	6.046s	100%
<a href="#">com.hardgforgif.dragonboatracing.tests.UITests.ChooseDifficultyUITest</a>	2	0	0	0.153s	100%
<a href="#">com.hardgforgif.dragonboatracing.tests.UITests.GameOverTest</a>	1	0	0	0.036s	100%
<a href="#">com.hardgforgif.dragonboatracing.tests.UITests.InfoUITest</a>	1	0	0	0.115s	100%
<a href="#">com.hardgforgif.dragonboatracing.tests.UITests.MenuUITest</a>	2	0	0	0.831s	100%
<a href="#">com.hardgforgif.dragonboatracing.tests.UITests.OptionsUITest</a>	1	0	0	0.048s	100%

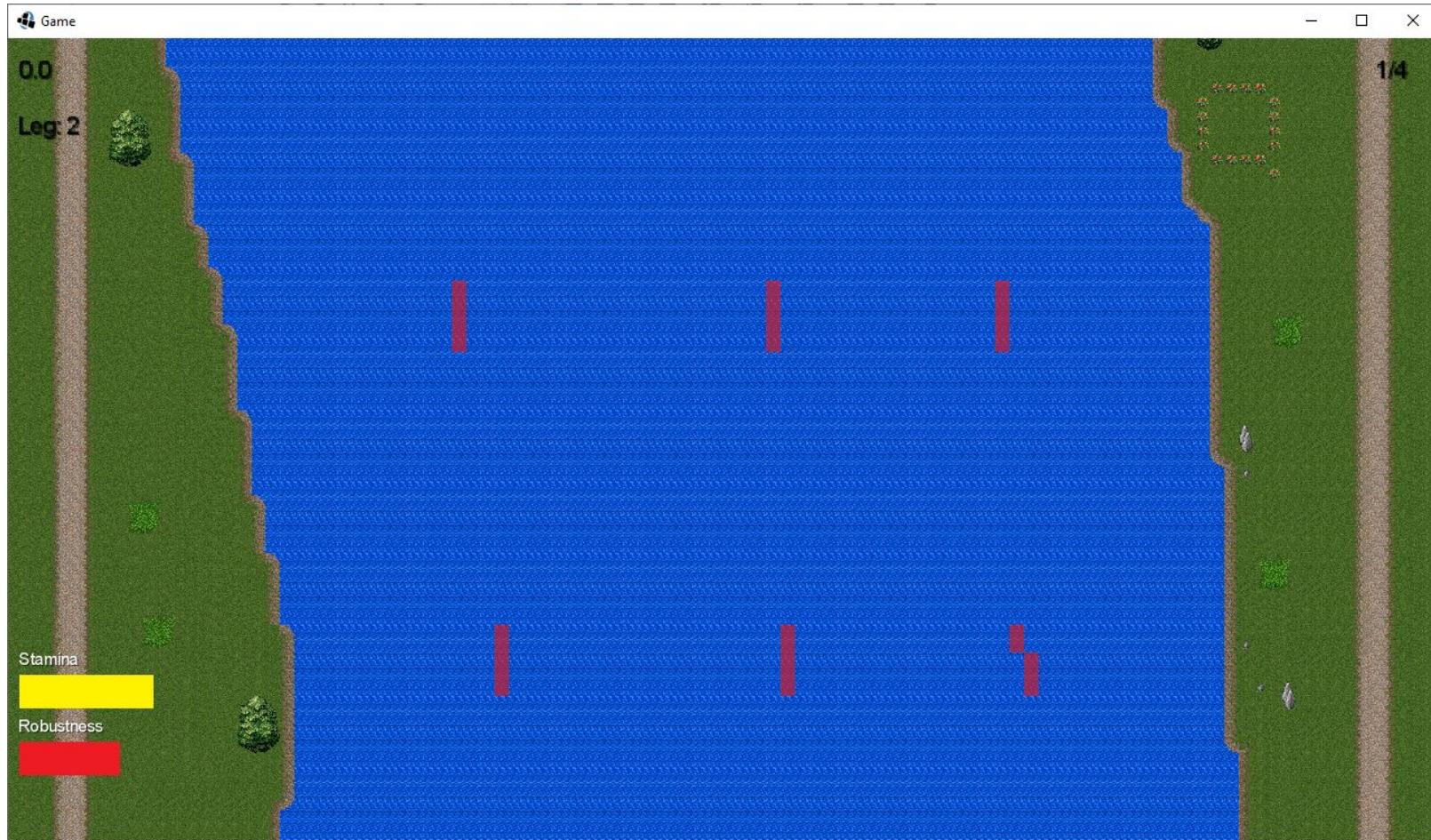
Manual tests:

**TEST\_NFR\_FAST\_CONTROLS** - Passed

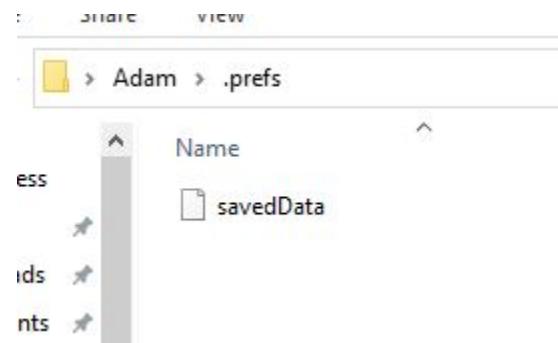


### **TEST\_NFR\_FAST\_TRANSITION - Failed**

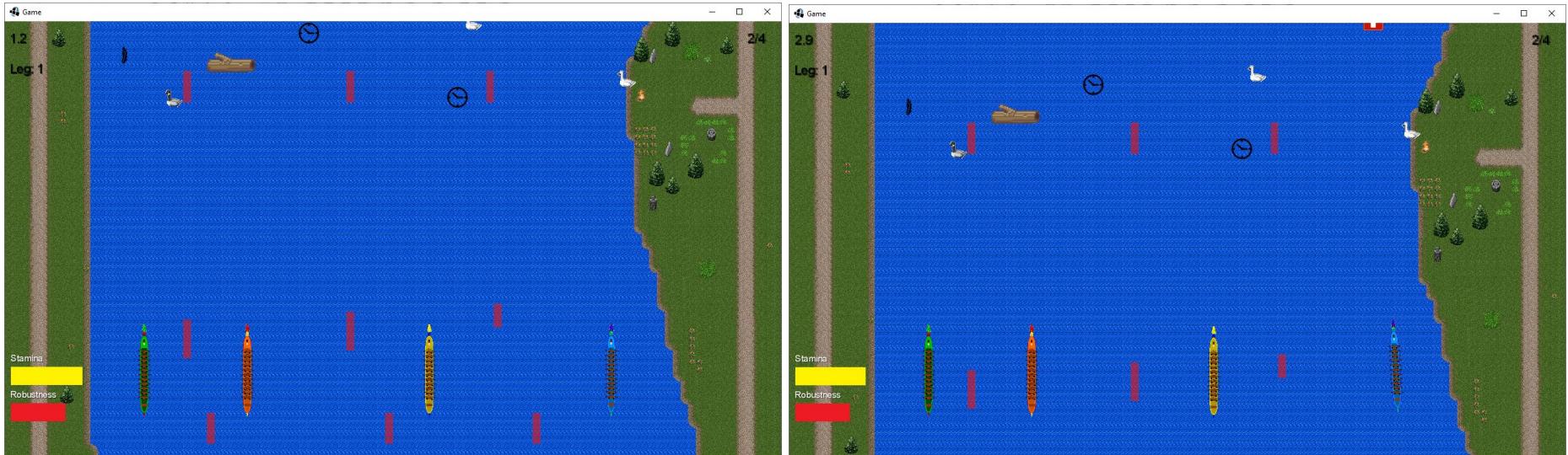
The time taken to load a new map is ~1.5 seconds, which is higher than 0.5 seconds.



## TEST\_FR\_SAVE\_&\_LOAD\_SAVING - Passed



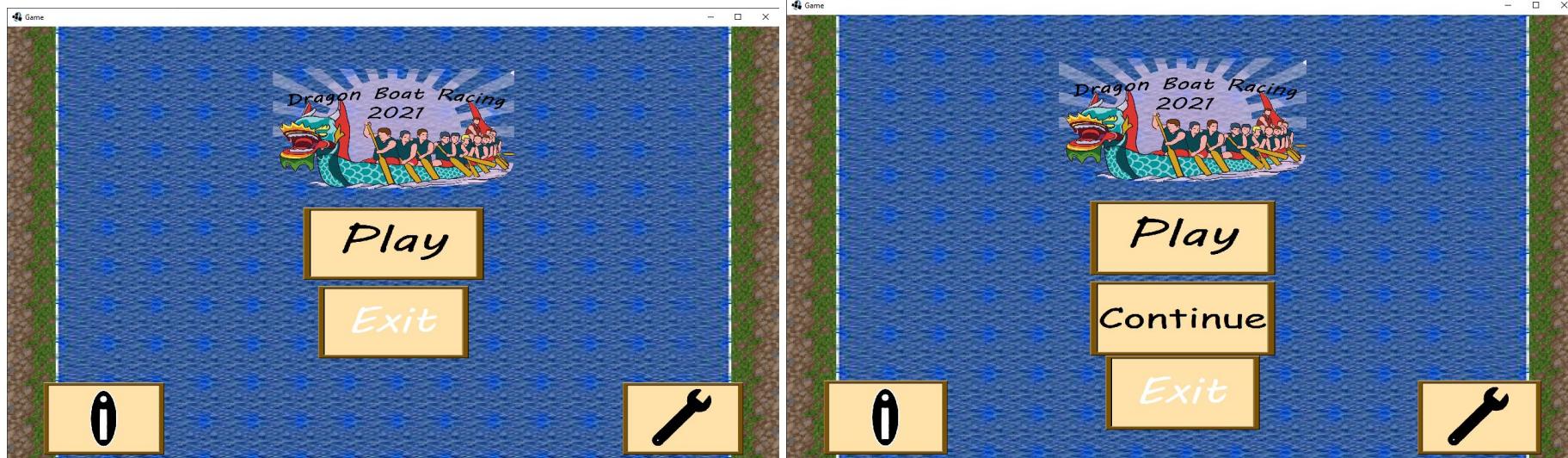
**TEST\_FR\_SAVE\_AND\_LOAD\_LOADING\_MAP - Passed**



Left: Before saving

Right: After loading (with a slight delay in taking the screenshot)

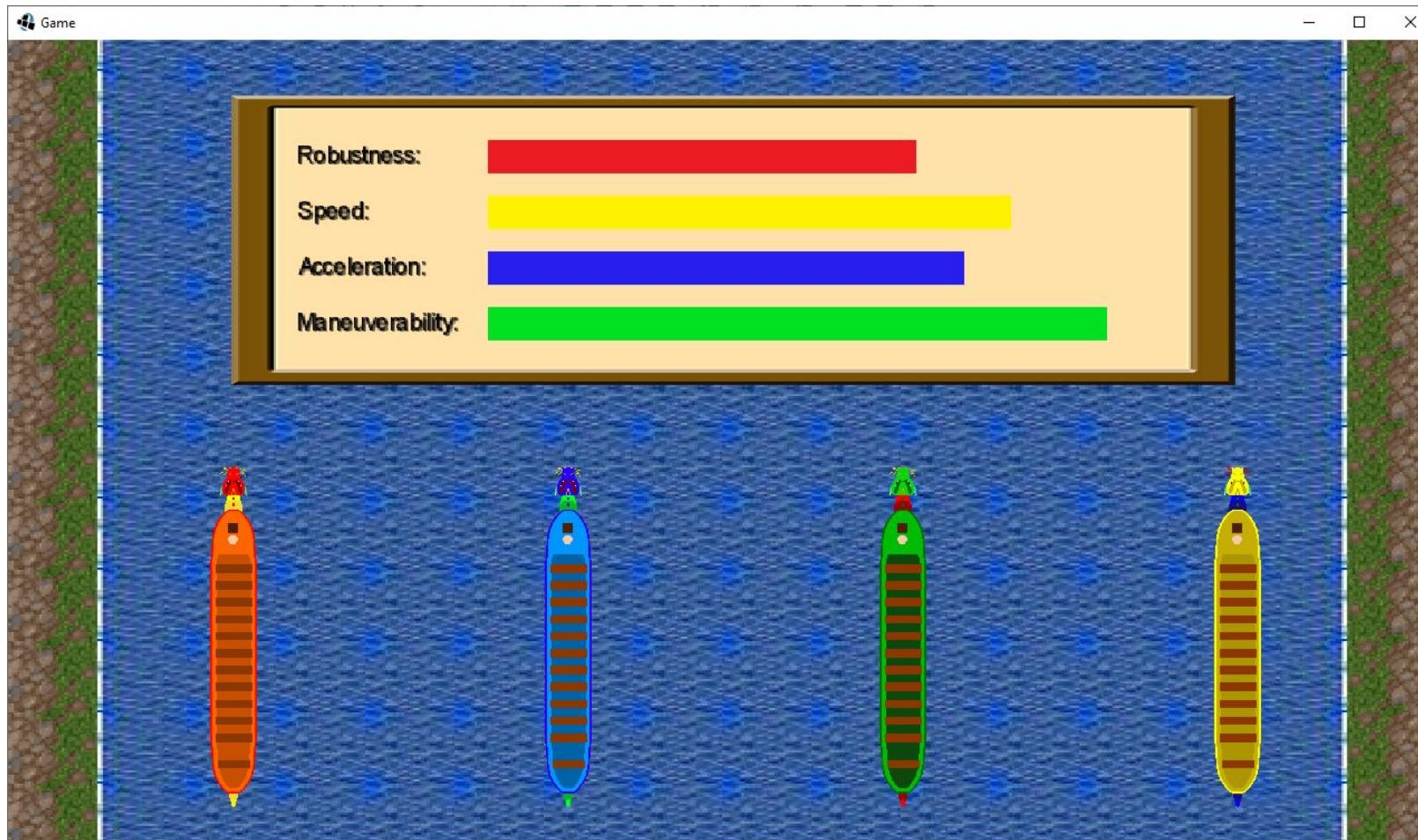
TEST\_UR\_MENU\_EXIT - Passed



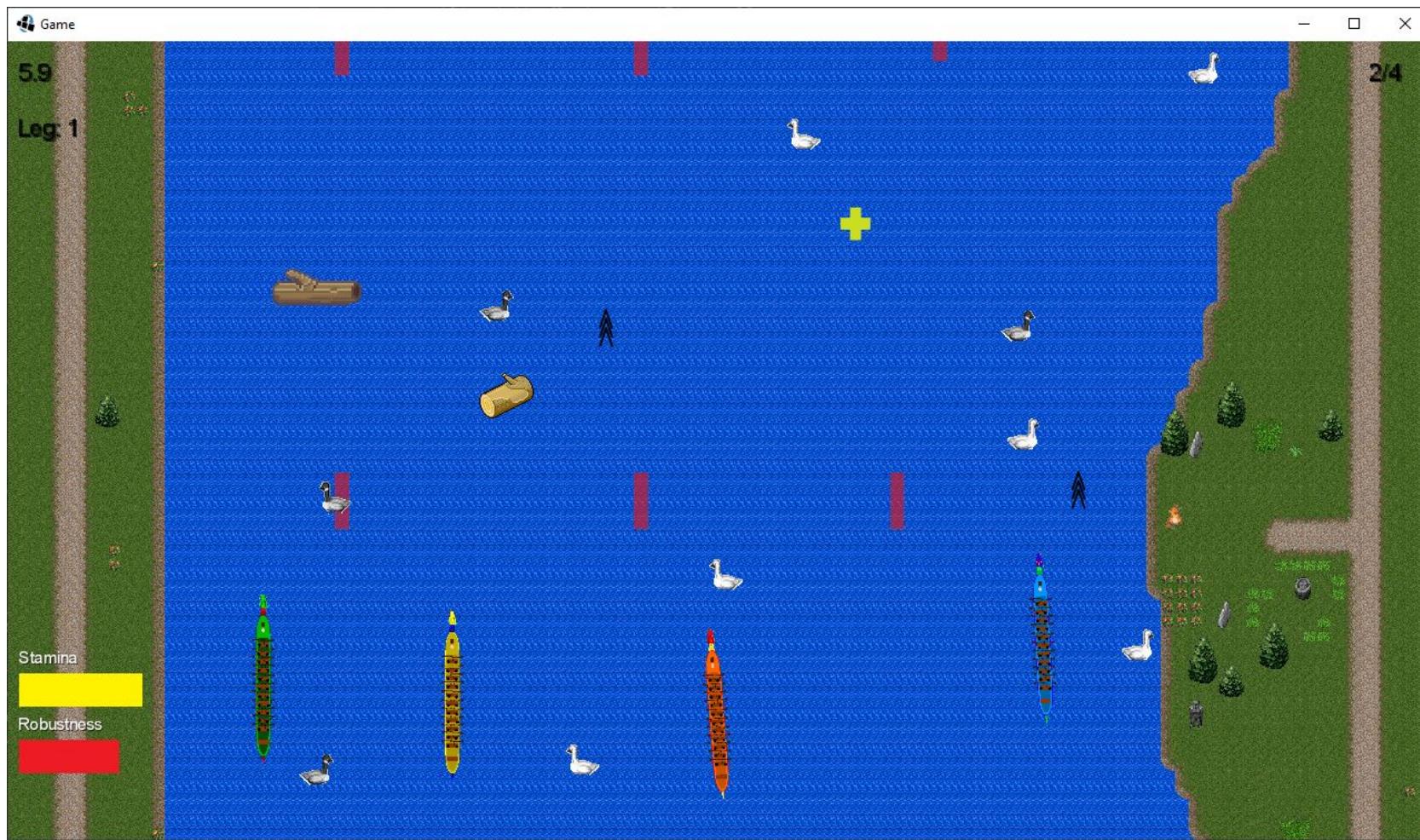
## TEST\_UR\_DISPLAY\_INSTRUCTIONS - Passed



**TEST\_FR\_ASPECT - Passed**



**TEST\_FR\_OBSTACLES - Passed**



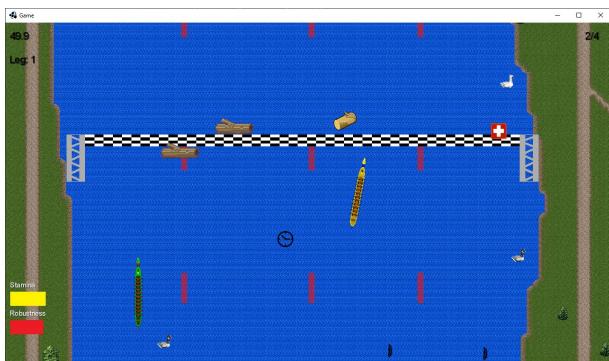
## TEST\_UR\_HUD - Passed



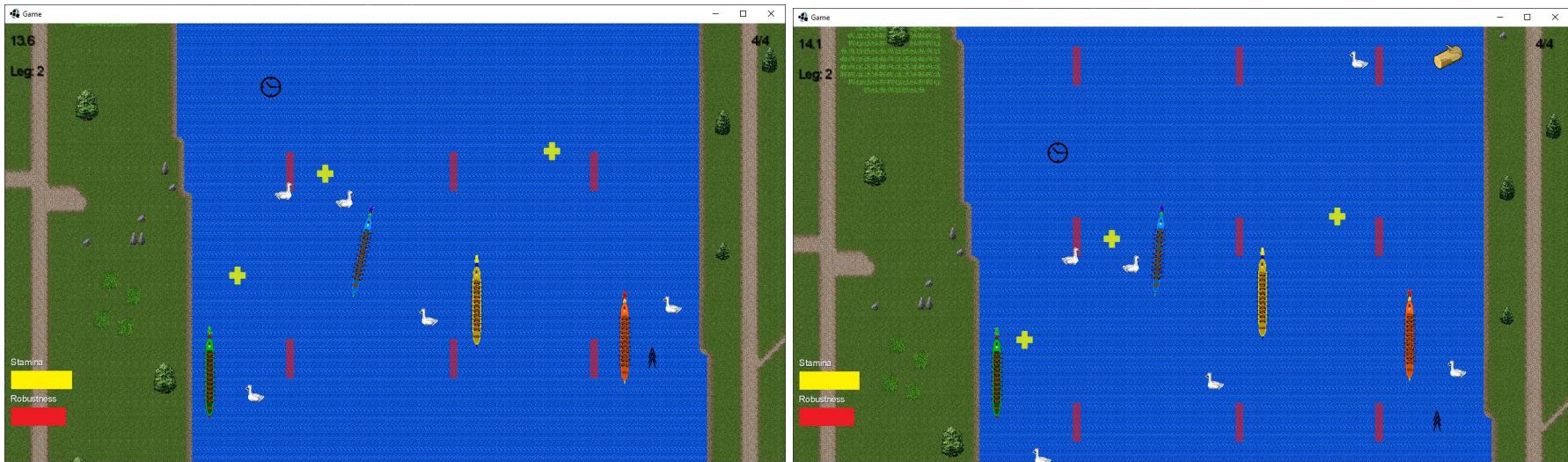
Left: Immediately before hitting an obstacle.

Right: After hitting an obstacle. Robustness has decreased

Below: Near the end of the race - stamina has decreased.



## TEST\_PAUSE\_DURING\_LEG - Passed

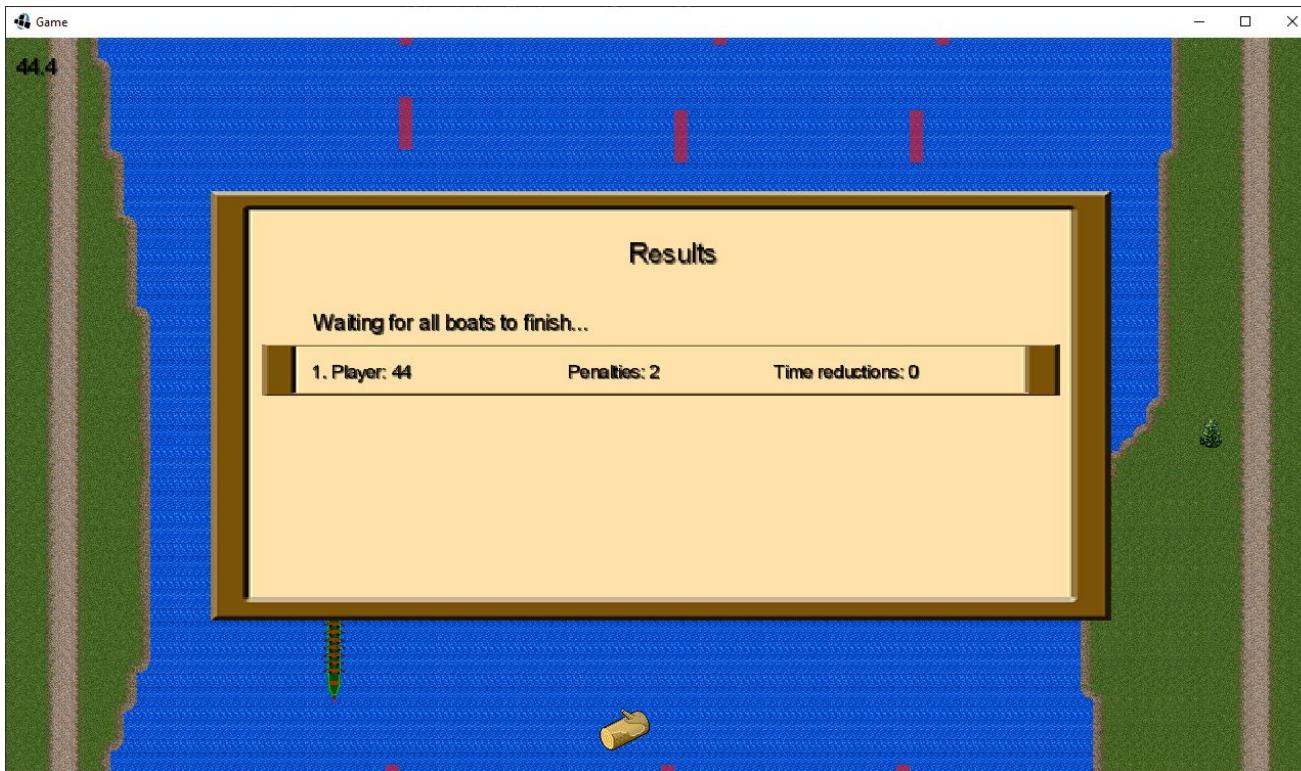


Left: Before pausing

Right: After unpause, having waited for 2 seconds.

Note that a small amount of time has passed between the screenshots, though this is only because I'm slow with the screenshot key. In reality, the game state had not changed.

**TEST\_PAUSE\_RESULTS\_SCREEN - Passed**



not pictured - furious Esc key mashing