Test Plan

Black Box Testing

We have used Black Box Testing to test the requirements of the program. This has mostly been focused on the user requirements, however in instances where these tests did not cover requirements from the other categories, then new tests have been created. For example, NFR_USABILITY_TEST was created to test the usability requirements from the non-functional-requirements section that weren't covered by the user requirements.

This testing was performed both during and after the creation on the program. Tests on initial requirements could be performed before the additional requirements from assessment 2 were implemented.

Black box testing was used for the requirements because it was not necessary to see the code in order to check that the requirements have been met. For example, simply attempting to play the game will reveal whether the boat moves as intended, if the obstacles spawn evenly, and if the game progresses from stage to stage correctly.

Therefore, the testing served several processes. By playing the game it could be seen whether there are any obvious initial bugs that could then be fixed. It would also help highlight if there were any features promised in the requirements that were not implemented.

Due to the nature and simplicity of the game, there was not a huge variety of different inputs to test. The main menus used the mouse click and scroll functionality and the main game used WASD to control movement (although S wasn't used as backwards movement wasn't a feature). The only other inputs were ESC to return to the main menu, and SPACE to move between stages.

A traceability matrix was created for the Black Box testing. This was useful as it highlighted that some requirements in the NFR section were not tested by the existing tests. Furthermore, it shows that some requirements are tested by other tests, which limits the number of tests that must be created. This was the case with the functional requirements, all of which were covered by the tests that were derived from the user requirements. In turn this helps to reduce redundant tests.

White Box Testing
Outside of Github's own white box testing that we will use for continuous integration, we will not be using white box testing. This is because of the nature of designing a game that interacts with the player; there is a constant player interaction and feedback loop that makes it impossible to account for all circumstances. e.g. updating the boat's stats through a powerup doesn't account for all the minor possibilities before hitting the powerup.

Test Case	Input	Expected output	Actual Output	Success?
UR_BOAT_UNIQUENESS_TEST	N/A	Each boat will look and act different	Boats are unique and have noticeably different stats	✔
UR_DIFFICULTY_LEVEL_TEST	N/A	The difficulty increases in each leg	Each leg feels harder than the last	✔
UR_PADDLERS_STAMINA_DECREASE_TEST	W	Stamina decreases throughout the leg	The stamina noticeably decreases, and refills when letting go of the forward button	✔
UR_PLAYER_PENALTY_TEST	N/A	Leaving the required lane results in a time penalty	Upon finishing the leg, penalties are added for leaving the lane	✔
UR_OBSTACLES_TEST	N/A	Obstacles spawn along the river	Obstacles spawn evenly throughout the leg	✔
UR_OBSTACLE_COLLISION_TEST	W A D	The robustness of the boat decreases upon hitting an obstacle, until the boat breaks	Boat takes damage from obstacles until it breaks	✔
UR_MOVEMENT_TEST	W A D	User can move forward, left and right	Successfully implemented movement	✔
UR_POWERUPS_TEST	W A D	The user can pick up power ups	Power-ups vanish when collided with. Health/Stamina visibly increase.	✔
UR_RACE_TOTAL_TEST	SPACE (transition between races)	The user plays three races before the final	Three races are played if the user's boat doesn't break	✔
UR_DIFFICULTY_BEFORE_GAME_TEST	MOUSE CLICK	The user can select a difficulty before starting	There is a difficulty select screen after choosing a boat	✔
UR_GAME_LENGTH_TEST	N/A	The game lasts between 3 and 5 minutes	Successful, the game lasts around 4 mins	✔

UR_GAME_END_TEST	ESC (return to main menu)	The game ends when: User boat is broken, User doesn't reach the final; User completes the final	Successful. The game ends as intended for each instance with an appropriate end screen	✔
NFR_USABILITY_TEST	MOUSE CLICK MOUSE SCROLL	There are features in place to help usability. These include a help screen and an explanation of the game.	Help screen is implemented however it cannot be scrolled without a physical mouse. Scrolling with arrow keys or touch pad does not work.	☐
UR_SAVE_TEST	1 2 3	At any point during the race, the game can be saved	Pressing escape allows you to save the game using the number keys	✔
UR_LOAD_TEST	1 2 3	There is an option to load up a saved game from the main menu and continue playing	The load game button takes you to a screen where the user can choose from the three slots to load from. Game has same health, stamina and positions as before.	✔
UR_ROUNDS_TEST	Escape	Playing the game more than once resets rounds to 1.	After round 3, game goes to round 6, then round 7 with only 4 boats	☐

Traceability Matrix

Requirement Identifiers	Reqs tested	UR1	UR2	UR3	UR4	UR5	UR6	UR7	UR8	UR9	UR10	UR11	UR12	UR13	UR14	UR15
Test cases	57	1	1	1	1	2	1	6	1	1	1	1	1	2		
UR_BOAT_UNIQUENESS_TEST	5	x						x								
UR_DIFFICULTY_LEVEL_TEST	4		x					x								
UR_PADDLERS_STAMINA_DECREASE_TEST	2			x												
UR_PLAYER_PENALTY_TEST	3				x											
UR_OBSTACLES_TEST	4					x										
UR_OBSTACLE_COLLISION_TEST	7					x	x							x		
UR_MOVEMENT_TEST	5							x	x							
UR_POWERUPS_TEST	4							x			x					
UR_RACE_TOTAL_TEST	3											x				
UR_DIFFICULTY_BEFORE_GAME_TEST	4							x					x			
UR_GAME_LENGTH_TEST	4							x						x		
UR_GAME_END_TEST	4													x		
NFR_USABILITY_TEST	3															
UR_SAVE_TEST	2														x	
UR_LOAD_TEST	3															x

Requirement Identifiers	Reqs tested	FR1	FR2	FR3	FR4	FR5	FR6	FR7	FR8	FR9	FR10	FR11	FR12	FR13	FR14	FR15	FR16	FR17	FR18	FR19
Test cases	57	1	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1			
UR_BOAT_UNIQUENESS_TEST	5	X																		
UR_DIFFICULTY_LEVEL_TEST	4			x																
UR_PADDLERS_STAMINA_DECREASE_TEST	2																x			
UR_PLAYER_PENALTY_TEST	3				x	x														
UR_OBSTACLES_TEST	4			X			x													
UR_OBSTACLE_COLLISION_TEST	7							x	x				X							
UR_MOVEMENT_TEST	5									x	x									
UR_POWERUPS_TEST	4											x								
UR_RACE_TOTAL_TEST	3														x	x				
UR_DIFFICULTY_BEFORE_GAME_TEST	4		x																	
UR_GAME_LENGTH_TEST	4													x						
UR_GAME_END_TEST	4												x							
NFR_USABILITY_TEST	3																			
UR_SAVE_TEST	2																	X		
UR_LOAD_TEST	3																		x	x

| Requirement Identifiers	Reqs Tested	NFR1	NFR2	NFR3	NFR4	NFR5
Test cases	57	1	1	10	1	1
UR_BOAT_UNIQUENESS_TEST	5			x		x
UR_DIFFICULTY_LEVEL_TEST	4			X		
UR_PADDLERS_STAMINA_DECREASE_TEST	2					
UR_PLAYER_PENALTY_TEST	3					
UR_OBSTACLES_TEST	4			x		
UR_OBSTACLE_COLLISION_TEST	7			x		
UR_MOVEMENT_TEST	5			x		
UR_POWERUPS_TEST	4			x		
UR_RACE_TOTAL_TEST	3					
UR_DIFFICULTY_BEFORE_GAME_TEST	4			x		
UR_GAME_LENGTH_TEST	4			X		
UR_GAME_END_TEST	4			x	x	
NFR_USABILITY_TEST	3	x	x	x		
UR_SAVE_TEST	2					
UR_LOAD_TEST	3					

Evidence of Testing

UR_BOAT_UNIQUENESS_TEST
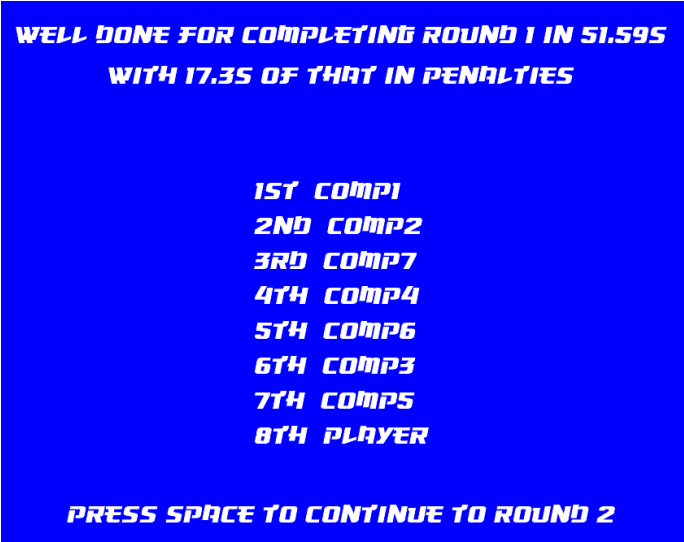The four different types of boat
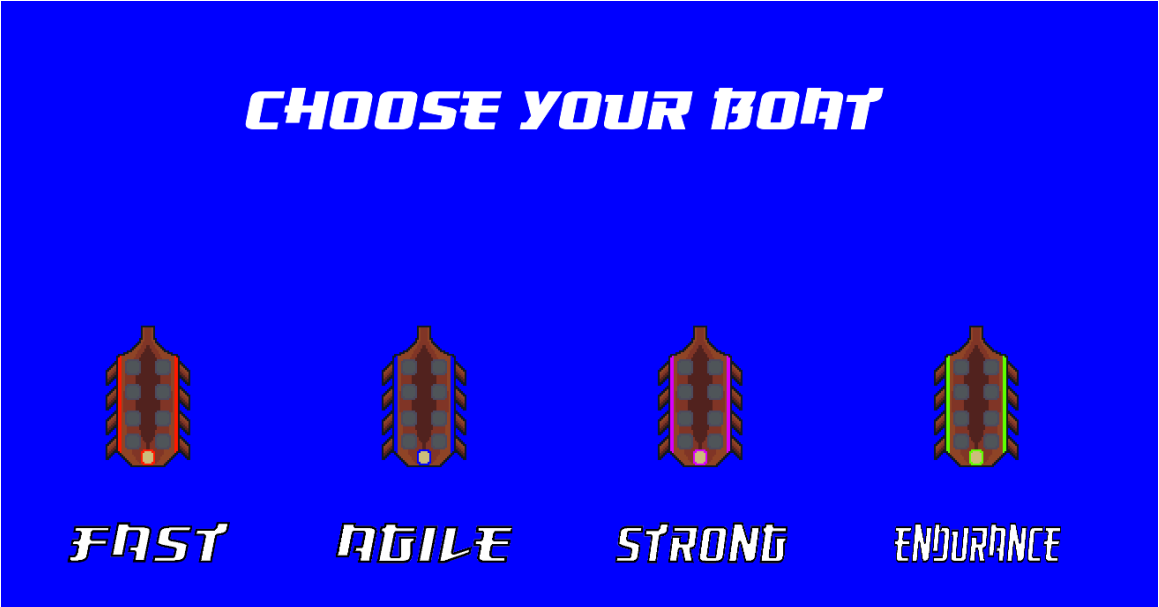
UR_PADDLERS_STAMINA_DECREASE_TEST
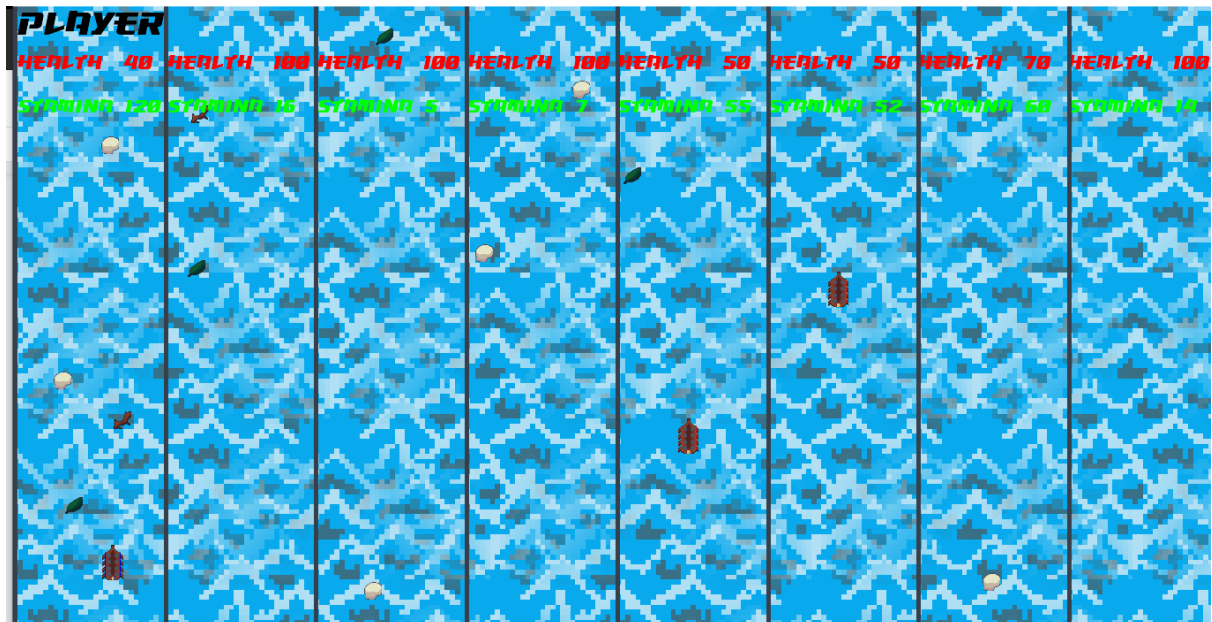Here the stamina has decreased
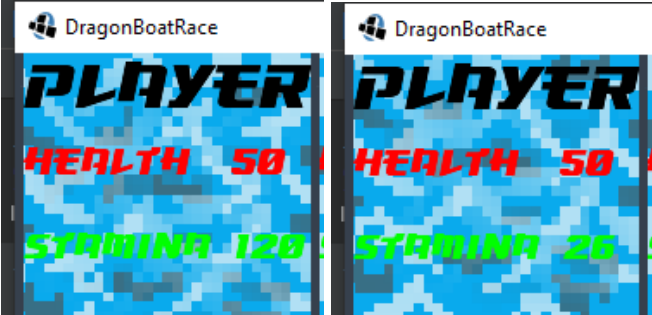
UR_PLAYER_PENALTY_TEST
A time penalty has been added for leaving the lane

UR_OBSTACLES_TEST
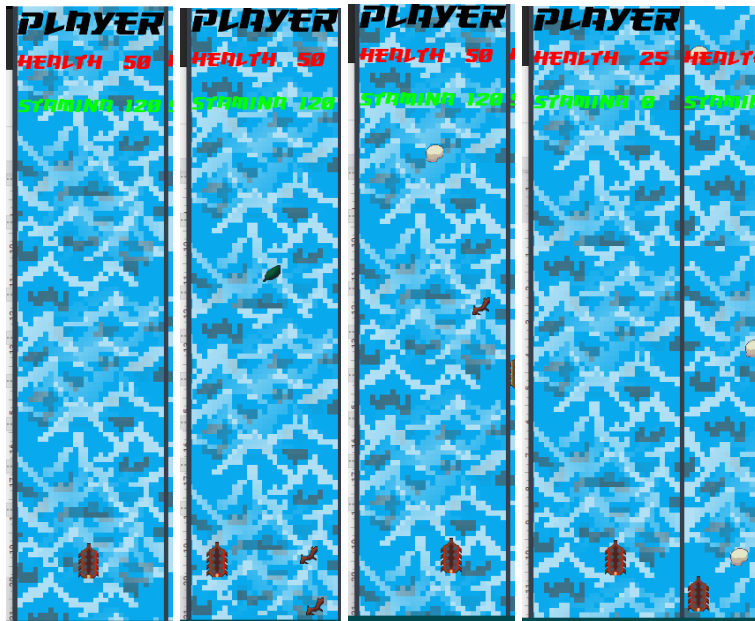Obstacles are visible in all lanes

UR_OBSTACLE_COLLISION_TEST
User boat about to hit an obstacle, health down to 10, end screen after boat was broken

GAME OVER!

YOUR BOAT IS BROKEN. BETTER LUCK NEXT TIME!

PRESS ESC TO RETURN TO MAIN MENU

PLAYER
HEALTH 10
STAMINA 74

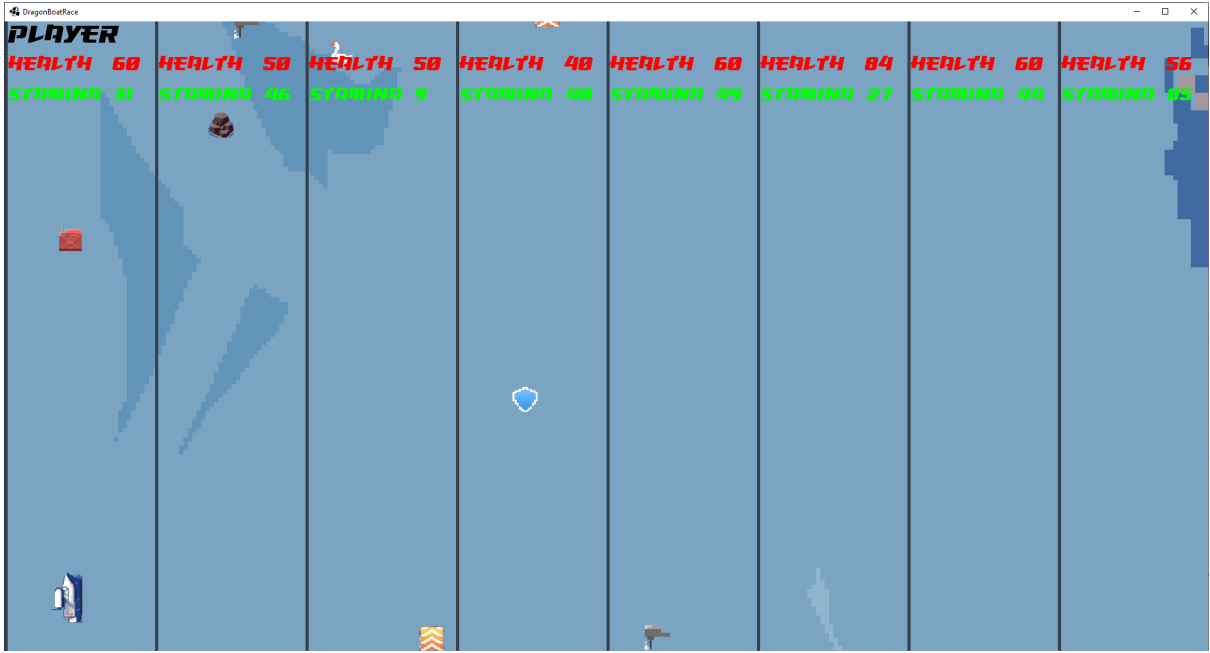UR_MOVEMENT_TEST
(Initial position, move to left, move to right, moving forward of an opponent)

UR_RACE_TOTAL_TEST
Round 1, Round 2, Round 3

WELL DONE FOR COMPLETING ROUND 1 IN 33.22S
WITH 0.2S OF THAT IN PENALTIES

1ST COMP3
2ND COMP6
3RD PLAYER
4TH COMP7
5TH COMP5
6TH COMP2
7TH COMP4
8TH COMP1

PRESS SPACE TO CONTINUE TO ROUND 2

WELL DONE FOR COMPLETING ROUND 2 IN 34.239998S
WITH 0.6S OF THAT IN PENALTIES

1ST COMP2
2ND COMP6
3RD PLAYER
4TH COMP1
5TH COMP4
6TH COMP5
7TH COMP7
8TH COMP3

PRESS SPACE TO CONTINUE TO ROUND 3

WELL DONE FOR COMPLETING ROUND 3 IN 31.86S
WITH 0.0S OF THAT IN PENALTIES

1ST PLAYER
2ND COMP2
3RD COMP4
4TH COMP7
5TH COMP1
6TH COMP3
8TH COMP5
8TH COMP6

PRESS SPACE TO SEE IF YOU MADE IT TO THE FINAL

UR_DIFFICULTY_BEFORE_GAME_TEST

The difficulty select screen

UR_GAME_LENGTH_TEST

Start of game and end of the game, with the times displayed, 4 minutes apart
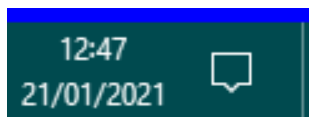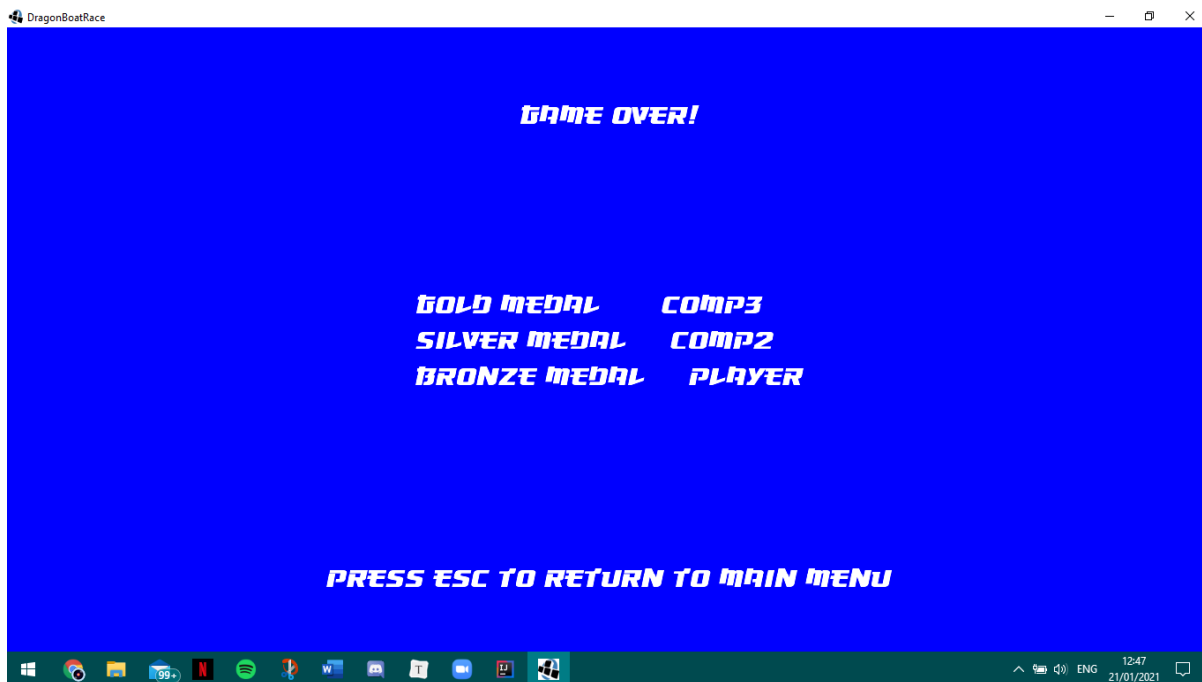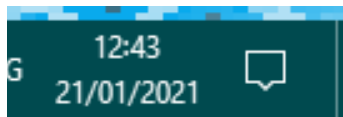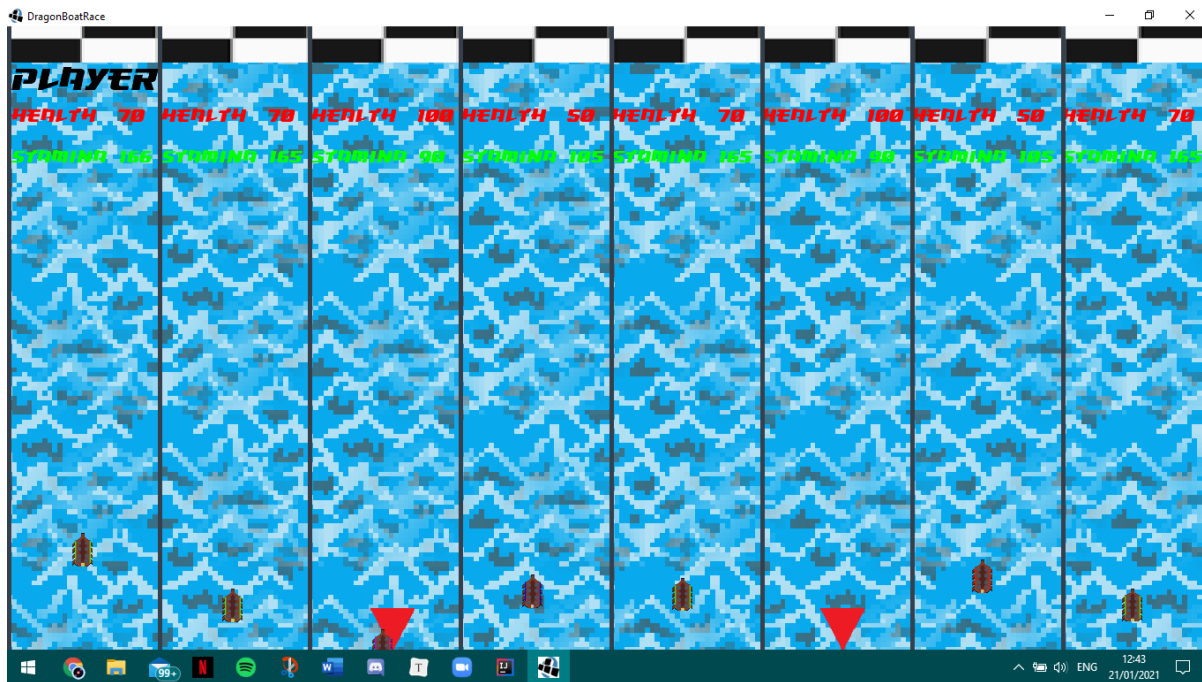
UR_GAME_END_TEST
Game ending to broken boat, not reaching final, completing final

GAME OVER!

YOUR BOAT IS BROKEN. BETTER LUCK NEXT TIME!

PRESS ESC TO RETURN TO MAIN MENU

GAME OVER!

YOU WERE NOT FAST ENOUGH. BETTER LUCK NEXT TIME!

PRESS ESC TO RETURN TO MAIN MENU

GAME OVER!

GOLD MEDAL   COMP3
SILVER MEDAL   COMP2
BRONZE MEDAL   PLAYER

PRESS ESC TO RETURN TO MAIN MENU

NFR_USABILITY_TEST

Sections from the help screen (note this can only be reached using a physical mouse)
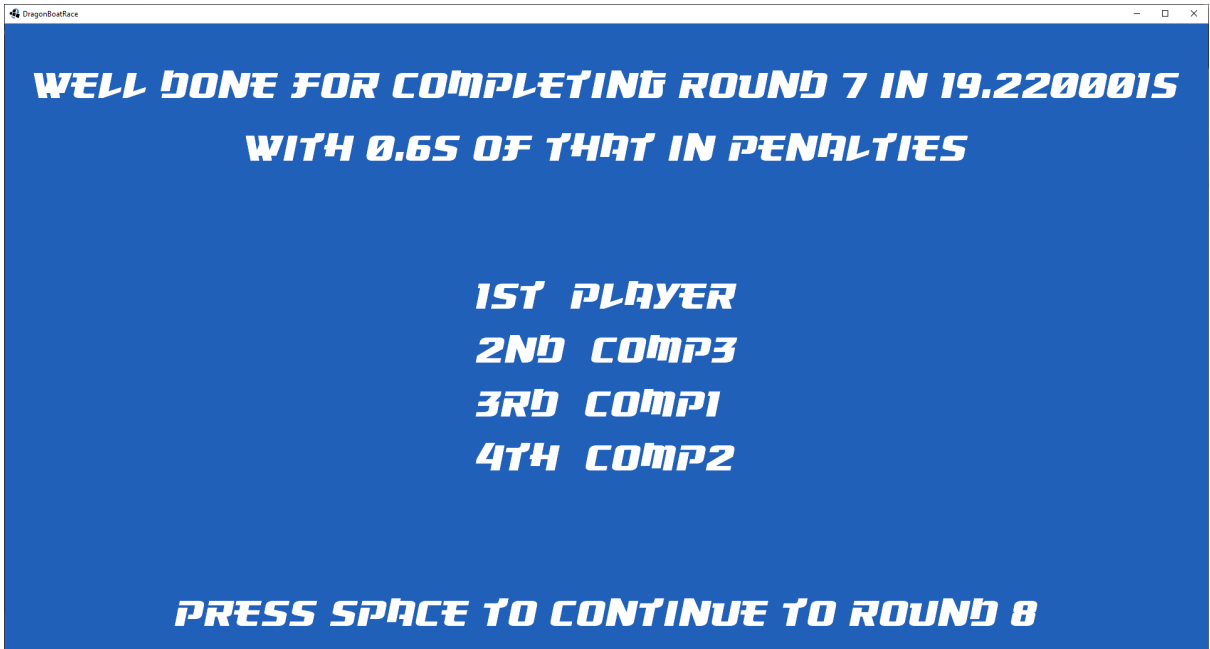
UR_POWERUPS_TEST

UR_ROUNDS_TEST

WELL DONE FOR COMPLETING ROUND 6 IN 20.93S
WITH 0.7S OF THAT IN PENALTIES

1ST PLAYER
2ND COMP2
3RD COMP7
4TH COMP6
5TH COMP5
7TH COMP3
7TH COMP4
8TH COMP1

PRESS SPACE TO CONTINUE TO ROUND 7

WELL DONE FOR COMPLETING ROUND 7 IN 19.220001S

WITH 0.6S OF THAT IN PENALTIES

1ST PLAYER
2ND COMP3
3RD COMP1
4TH COMP2

PRESS SPACE TO CONTINUE TO ROUND 8

UR_SAVE_TEST

PLAYER
HEALTH 40 HEALTH 60 HEALTH 100 HEALTH 60 HEALTH 84 HEALTH 100 HEALTH 56 HEALTH 60
STAMINA 49 STAMINA 112 STAMINA 18 STAMINA 60 STAMINA 135 STAMINA 18 STAMINA 55 STAMINA 55

PAUSED

PRESS ESC TO GO BACK.
PRESS Q TO QUIT THE GAME.
PRESS 1 TO OVERWRITE SLOT 1
PRESS 2 TO SAVE TO SLOT 2
SAVE SUCCESSFUL.
PRESS 3 TO SAVE TO SLOT 3

UR_LOAD_TEST

PLAYER

HEALTH 40 HEALTH 60 HEALTH 100 HEALTH 60 HEALTH 84 HEALTH 100 HEALTH 56 HEALTH 60
STAMINA 69 STAMINA 122 STAMINA 1 STAMINA 53 STAMINA 117 STAMINA 1 STAMINA 34 STAMINA 34

PRESS ESC TO PAUSE THE GAME.