BIG DATA RACER: IMPLEMENTATION ARCHITECTURE

# INTRODUCTION

This document describes the HTML5 canvases, files, JavaScript resources (arrays, objects and functions) used the implement the Big Data Racer web browser based car game application.

# APPLICATION FILES

Table 2.1 lists the source code, style and resource files used by the application.

|  |  |  |  |
| --- | --- | --- | --- |
| **File name** | **Path** | **Type** | **Description** |
| index.html | . | Source code (HTML5) | The file which the user fetches to the browser in order to access the application. The file defines the HTML canvases used by the application, loads the associated CSS file (*bdr.css*) and the jQuery library file (*jquery-2.1.1.min.js*). It then calls the main application filed (*bdr.js*). |
| bdr.js | . | Souce code (JavaScript) | Contains all logic, variables, objects and functions associated with the application. |
| bdr.css | ./css | Style (CSS) | Contains CSS style definitions associated with the application |
| Explosion\_Ultra\_Bass-Mark\_DiAngelo-1810420658.mp3 | ./audio | Audio (mp3) | Car explosion sound |
| 474360\_Shoppingcart-Racers.mp3 | ./audio | Audio (mp3) | Game music |
| 192-racetrack-v5\_trans.png | ./img | Graphics (png) | Race track building blocks |
| car.png | ./img | Graphics (png) | Car |
| cloud.png | ./img | Graphics (png) | Cloud |
| cool\_water\_texture.jpg | ./img | Graphics (jpg) | Water overlay |
| explosion\_50FR.png | ./img | Graphics (png) | Car explosion sprite sheet |
| grass.png | ./img | Graphics (png) | Grass background |
| mute.png | ./img | Graphics (png) | Muted speaker icon |
| raindrop1.png | ./img | Graphics (png) | Raindrop |
| raindrop2.png | ./img | Graphics (png) | Raindrop |
| raindrop3.png | ./img | Graphics (png) | Raindrop |
| sound.png | ./img | Graphics (png) | Non-muted speaker icon |
| title\_chinese.png | ./img | Graphics (png) | Game title |

Table 2.1: Game files

# APPLICATION STRUCTURE

## CANVAS LAYERS

Table 3.2.1 describes the HTML5 canvas layers used in the application.

|  |  |  |
| --- | --- | --- |
| **Canvas name** | **Z-value (canvas with higher value placed on top on canvas with lower value)** | **Description** |
| c\_track | 1 | Used for drawing the background grass and the race track. The car collision detection (check whether car is driving outside the track) is gone using this canvas. |
| c\_water | 2 | Used for drawing the race track finish line, the car tyre tracks and the water overlay. |
| c\_car | 3 | Used for drawing the car. |
| c\_cloud | 4 | Used for drawing clouds. |
| c\_rain | 5 | Used for drawing raindrops and snowflakes. |
| c\_night | 6 | User for drawing the darkness overlay and for creating the car light effect. |
| c\_score | 7 | User for drawing the title, the speaker icons and all text associated with application. |

Table 3.2.1: Game canvas layers

## OBJECTS

Table 3.2.1 describes the JavaScript objects defined and used by the application.

|  |  |
| --- | --- |
| **Object name** | **Description** |
| objGame | Properties associated with the game logic. |
| objBD | Properties associated with the big data information used for the game. |
| objCar | Properties associated with the race car. |
| objSpeaker | Properties associated with the music speaker icons. |
| objCloud | Properties associated with the clouds used in the application. |
| objRaindrop | Properties associated with the raindrops used in the application. |
| objSnowflake | Properties associated with the snowflakes used in the application. |

Table 3.2.1: Game objects

## ARRAYS

Table 3.3.1 describes the global JavaScript arrays used in the application.

|  |  |
| --- | --- |
| **Array name** | **Description** |
| cloudArray[] | Array of objCloud object variables |
| raindropArray[] | Array of objRaindrop object variables |
| snowflakeArray[] | Array of objSnowflake object variables |

Table 3.3.1: Game arrays

## FUNCTIONS

Table 3.4.1 describes the JavaScript functions used in the game

|  |  |  |
| --- | --- | --- |
| **Function name** | **Type** | **Description** |
| init() | Initialization | Called when the index.html file has been loaded and executed. Initializes the canvas context references, initializes all key listeners, fetches all graphics- and audio resources, and creates object variables (instances) of the JavaScript objects used in the application. |
| gameloop() | Game loop | Called periodically as long as the application is running. Calculates the position of all moving objects, calls the canvas drawing functions, performs collision detection, and counts the number of laps driven by the car during a race. |
| update() | Game logic | Calls update functions for individual moving objects. |
| getPixel() | Game logic | Gets canvas pixel information from a given X,Y position. Used when performing collision detection for the car. |
| addRaindrop() | Game logic | Adds a raindrop to the array of raindrops, until the maximum number of raindrops have been reached. |
| addSnowflake() | Game logic | Adds a snowflake to the array of snowflakes, until the maximum number of snowflakes have been reached. |
| createCloud() | Game logic | Uses a random generator to determine whether a new cloud shall be generated. The cloud density big data value is used as input, and the bigger the value the bigger the probability that a new cloud will be created. |
| checkCollision() | Game logic | Checks whether the car is currently located on or outside the race track. |
| checkBorders() | Game logic | Checks whether the car has hit any of the canvas borders, in which case the car is turned around 180 degrees. |
| lap() | Game logic | Calculates the laps driven by the car. In order for a lap to complete, the car needs to cross both the finish line, and a similar location on the other side of the track. |
| explode() | Game logic | Initializes the explosion sprite sheet animation when the car’s engine temperature reaches 100 and the car explodes. |
| engineTemp() | Game logic | Updates the car’s engine temperature, based on the big data temperature value, on the whether the car is currently accelerating, and on the current speed of the car. |
| checkSoundExplosion() | Game logic | Checks whether the car explosion sound shall be played, based on the current car explosion sprite state. |
| updateRaindropPos() | Game logic | Updates the location of all raindrops in the raindrop array. |
| updateSnowflakePos() | Game logic | Updates the location of all snowflakes in the snowflake array. |
| updateCar() | Game logic | Updates car location, car driving direction and car speed. |
| resetKeys() | UIX | Resets the key press indicators. |
| keypressed() | UIX | Callback function when a keyboard key has been pressed. Indicates which key has been pressed (if the key is used for controlling the game). |
| keyreleased() | UIX | Callback when a previously pressed keyboard key is released. |
| handleMousedown() | UIX | Callback function when a mouse click occurs. If the mouse cursor is placed on top of the speaker icon, the game music is turned off/on. |
| getLocation() | AJAX | Creates an AJAX request in order to fetch location based on IP address. |
| getWeather() | AJAX | Callback function when the location information has been received. Creates an AJAX request in order to fetch weather information based on fetched location (longitude, latitude). |
| parseWeather() | AJAX | Callback function when the weather information has been received. Parses the returned information (provided in JSON format) and sets the associated properties in the objBD object variable used by the application. |
| paint() | Graphics | Calls individual drawing functions. |
| drawTrack() | Graphics | Draws race track |
| drawFinishLine() | Graphics | Draws finish line |
| drawMarks() | Graphics | Draws car tyre marks in the snow |
| drawCloud() | Graphics | Draws each cloud in the array of clouds. |
| drawDark() | Graphics | Draws darkness overlay and creates car light effect. |
| drawScore() | Graphics/Text | Draws game title and all text shown in the application. |
| drawRaindrop() | Graphics | Draws each raindrop in the raindrop array. |
| drawSnowflake() | Graphics | Draws each snowflake in the snowflake array. |
| drawSpeaker() | Graphics | Draw speaker icon. |

Table 3.4.1: Game functions