

# **Location Racing**

**Functional Specification**

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### **1. Introduction**

Location Racing is a racing game which enables a player to race competitively around the real life streets of the players determined location. The application will detect the player's location and automatically generate and replicate racing circuits based on the streets that surround the player's location. The player may race against either computer controlled or human controlled opponents.

## 2. Functionality

### 2.1. Determine Location

The application will be required to detect the location of a player. The location of the player can be determined by either using Global Positioning System (GPS) coordinates that may be provided by the device itself or by the Internet Protocol (IP) address of the internet connection that the device is connected to.

**Degree of difficulty: Easy**

### 2.2. Generate Track

When GPS coordinates or an IP address location has been determined the value of the location is searched for in a map database. OpenStreetMap is the database which will be queried for the map data.

Once the geographical location of the player has been identified correctly all of the GPS coordinates for the roads surrounding the player within a 4 kilometre by 2 kilometre area will be available to download from OpenStreetMap in an Extensible Markup Language (XML) format.

This XML file will be parsed by an XML reader. Each programming language has a XML reader so obtaining the coordinate information regarding the roads will be a relatively easy task. The difficulty for this part of the project is actually converting the contents of the XML file into a format that can be rendered in a game engine and displayed on a screen.

**Degree of difficulty: Difficult**

### 2.3. Display Map

After the contents of the XML file will be converted into a format which will be loaded into the game, the map will be drawn to the screen. The drawing will be handled by the game engine itself.

**Degree of difficulty: Easy**

### 2.4. Generate Race Circuit

Once the track has been created and displayed on screen the player may then race around the real life computer generated replica of their town or location. The route or circuit that the player will race around may be automatically generated for the player by the application or the player may choose to create their own track to race on.

If the computer selects the circuit then an algorithm will generate a route of nodes for the player to drive to. Once the race circuit has been established then the application will have to start a race. The race will begin and continue until either the time elapses on the player or the finish line has been reached within the given time limit.

**Degree of difficulty: Medium**

### 2.5. The Race

The race part of the game is going to be the most difficult part of the project. This part of the game will have to simulate a car driving around the pre-determined track. This is the main feature of the game so this part will be the main game loop.

The game loop will contain all of the driving functionality and physics that the player will interact with. The game loop will have to draw the car on screen at a speed of 30 frames per second. This will give the application a fluid feeling while the car is driven around the track. The game loop will have to keep redrawing the car on screen as the car changes position around the track. While the car is driving around the track it will also have to react to the track in a particular way depending on the physics within the game loop.

If the game is going to be a multiplayer game then the game loop will have to deal with drawing the opponent cars and deal with their artificial intelligence (AI). There will also be some physics contained within the game loop which may have to handle the cars colliding with other cars or objects.

If the game is being played as a multiplayer game online by all human opponents then the game loop will have to interpret the controls for all of the players which will be sent to the game loop over the internet and send them back to the player over the internet.

While the car is being driven around the track and the cars are being re drawn on the track, the camera will also have to move around the track. The view plane of the camera will also have to be calculated and rewritten to the screen at a rate of 30 frames per second.

The game loop will also have to interpret the controls that will be inputted to the game by some form of a controller or touch screen interface.

**Degree of difficulty: Very Difficult**

### 2.6. Multiplayer

Once the location has been determined and a track has been created for the player then the application will connect to a server to check if any other human players are logged in within the local area of the player. Each player will have to create an account to play online against other players online. Each player will be identified by their player ID.

If any players want to race against other members online then they will be brought to an area which is called a lobby. The lobby will be like a waiting room for the players before the game begins. A clock will countdown so that each player knows when the game is going to begin.

Multiplayer will also allow players to become friends so that they can join up whenever they are all online.

**Degree of difficulty: Medium - Difficult**

### 2.7. User Accounts

A player will be offered the option to create an account for the racing game so that all of their scores and statistics can be stored on a server within the cloud. This step will be optional but if a player chooses to play anonymously then their scores and statistics will be unable to be saved.

**Degree of difficulty: Easy - Medium**

## 3. Target Users

### 3.1. Racing Game Enthusiasts

This application is targeted towards but not limited to racing game enthusiasts. The game will be easy to play while also being difficult enough to challenge the player. This will attract casual gamers, hard-core gamers and hard-core gamers.

### 3.2. Casual Gamers

A casual gamer is someone who likes to play the occasional game. They like to be able to pick up a game at random and play it for a small amount of time without having to worry about spending 40 minutes learning what the buttons do in order to play the game.

### 3.3. Hard-core Gamers

Hard-core gamers on the other hand like to get involved in a game. These players spend a lot more time playing games than casual gamers so it is crucial to ensure that these players keep coming back for more. The appeal to these players is to beat the game, unlock features and earn a reputation within the game. For these players a scoring system is crucial so that these players keep coming back to play the game.

### 3.4. Social Gamers

There are also social gamers. Some of these players will own a game but may have never played the single player story mode of the game. These players enjoy playing against human opponents so they will only play the online multiplayer mode of the game or the offline multiplayer mode. These players are not necessarily strictly social gamers. They may also be casual social gamers or hard-core social gamers.

## 4. Success Scenario – Tasks in Order of Implementation

In order for this application to be deemed a success the following criteria must be achieved:

### 4.1. Location Feature

Determining the location of the player in this application is crucial because the location of the player is what the game is based on. With that being said, determining the location of the player won't be a difficult task with the current technology.

Location can be determined easily using GPS within a device or by the IP address of the internet connection. Once this location has been determined it is passed on to the feature which will generate a track to race on.

This feature should be easily implemented.

### 4.2. Track Generation Feature

Once the location feature has successfully determined the player's location the track generator feature must use this location to fetch the correct geographical information so that a realistic replica of the streets that surround the player can be successfully loaded into the game and rendered on the screen. This is also a very important feature within the game because the actual race feature of the game cannot be implemented without this feature being successful.

In order for this feature to be successful a race track of a real-life location must be implemented within a game environment. The geographical information will be retrieved from the OpenStreetMap database. This information can be retrieved in the form of an XML file.

The XML file will contain all of the GPS coordinates of all of the roads and streets that surround the player.

The beauty of XML is that every programming language has a XML reader. The information should be relatively easy to pull from the XML file but manipulating the information to another format so that it may be implemented and rendered graphically as a racing track will be more difficult.

Even though the track generation is very important within this game and it will be difficult, it won't be the most difficult part of the project.

Obtaining the XML file containing all of the GPS coordinates for this feature may be straight forward but the difficult part of this feature will be to manipulate the GPS information into a format which is recognisable by a game engine.

### 4.3. Display Map Feature

This feature should be relatively easy when compared to some of the other features that have to be implemented in this application.

As long as the information for the map is stored in the correct file format it should be relatively easy to display the map on screen.



### 4.4.Race Feature

The race feature part of the project is the most complicated part of the project. This part is the whole game loop. The game loop has to draw all of the sprites to the screen, draw the track, keep a record of the time, handle collision detection and handle the physics of the game so that when the cars are driving around the track they are reacting and handling realistically.

This is the hardest part of the project. If, up to and including, this part of the project are successfully implemented then I will believe that the project has been successful. Anything that is implemented after this feature is an added bonus.

### 4.5.Circuit Determination Feature

This feature has 2 options. The player can choose to allow the computer to automatically generate a race circuit or the player can create their own race circuit. If the player allows the computer to select a circuit then the computer will randomly choose a route on the map up to 2 miles long. This distance may be changed by the player.

If the player decides to create their own race circuit then the player can choose a circuit with no maximum length specified. The only conditions for the creation of the circuit are that it cannot leave the map, it must contain a start point and a finishing point and it must have a minimum distance of 500 meters.

This feature will allow the user to actually race a car around their surrounding location. Hopefully this feature will be implemented because this will allow the user to pick their own circuit to race around or to have the computer generate a random circuit for them to race around.

If this feature gets implemented then the project will be a very successful project. The player will be able to experience everything that the project hoped to achieve.

This feature would be of medium difficulty.

### 4.6.User Accounts Feature

If a user account feature was successfully implemented this would add some valuable extra features to the game. If each user had their own account they could keep track of their score and achievements easily in the cloud.

Implementing a user account feature would be easier than most of the other features that will be implemented in the game but it would add a lot of extra value to the game.

### 4.7. Multiplayer Feature

The multiplayer feature will allow human players who are in the same geographical location to race against each other online. This feature will be driven by a server which is hosted in the cloud.

This feature will allow an online community to thrive and maybe grow into something bigger. The implementation of an online multiplayer feature will allow friends to meet up and challenge each other to race on familiar turf.

## 5. Inspiration

Ever since I played racing games such as Ridge Racer and Gran Turismo on the PlayStation I always thought that it would be great if someone developed a racing game which would allow a player to race around the streets of their home town.

The technology for an application didn't exist back in 1995 when the PlayStation was first released so now that it does I would like to develop an application that will make this dream of mine become a reality. (Wikipedia - PlayStation, 2013)

There is no racing game in the world which will determine a players location, builds an open race circuit based on the location of the player and renders the race circuit graphically on screen of a device being used by the player.

## 6. Similar Games

It can be said almost every racing game ever made is similar to this project because nearly every racing game that has ever been made is made up of a car and a track. Some of these tracks exist in real-life and they have been recreated within the game so that the player can experience what it is like to race around a real circuit within a game.

### 6.1. The Getaway

The Getaway is an action adventure game which allows the player to roam freely and drive around a recreated 10 square mile area of London. All of the streets were recreated by a team of developers which took many years for the team to develop. (Wikipedia - The Getaway, 2013)

The Getaway is a 3Dimensional game. This game is close to the type of game that is proposed in this project. The reason it comes close is because the whole environment in the game is based on a real-life area of London. The game environment wasn't created dynamically. It took the developers years to recreate the area.

Location racing proposes to create its own racing environment on the fly.



Fig. 1 – The Getaway Screenshot

### 6.2. Super Sprint

2D racing games are a top down view of a race track. The race track may remain in a static position while the cars race around the track. This is the style which was used in the hugely popular Super Sprint game. See Fig. 2

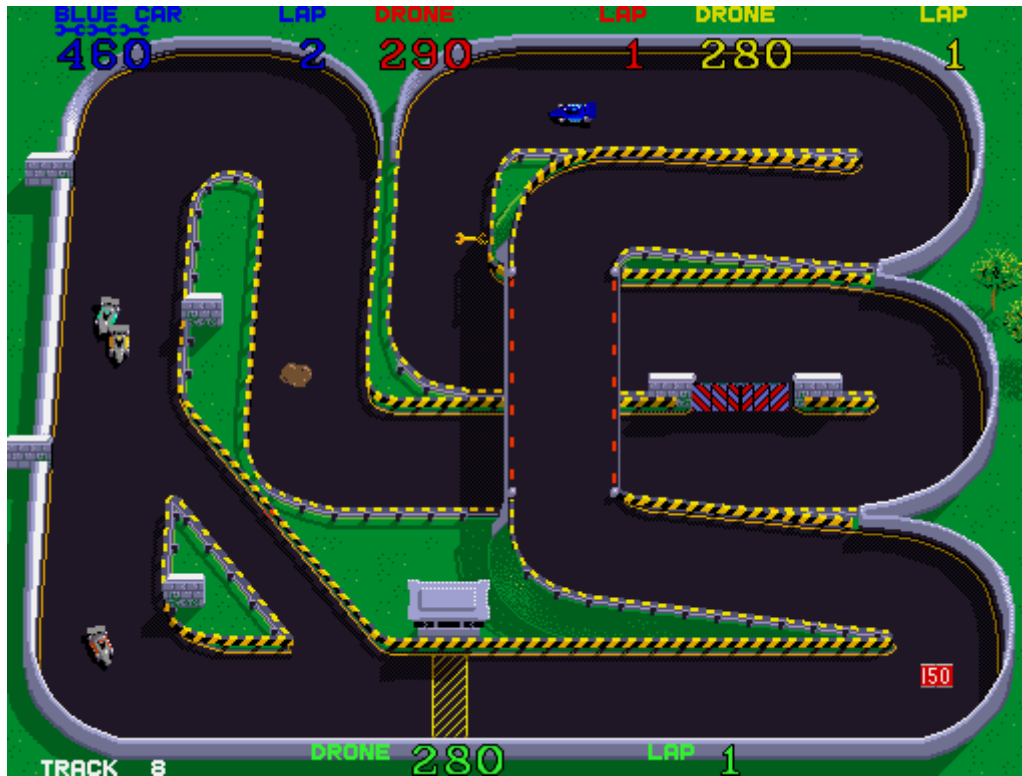


Fig. 2 – Super Sprint Screenshot

### 6.3. Micro Machines

Or the 2D racing may show only a small portion of the track at any one time. This technique allows the player to get closer to the action within the game by allowing the screen to scroll around the track based on the player's speed and position within the track.

This technique gives the player the sense of speed and movement by scrolling the track onto the screen. This technique was used in the, also, hugely Micro Machines games. See Fig. 3



Fig. 3 – Micro Machines Screenshot

### **7. Conclusion**

Given the sheer difficulty of this project it has been decided to create a location based racing game which will determine a players location, generate a race circuit based on the streets and roads that are surrounding the player and then render the circuit on the screen of the device being used by the player

The racing game will be 2D racing game which will be similar in style to previous racing games such as Super Sprint or Micro Machines. (Wikipedia - Super Sprint, 2013) (Wikipedia - Micro Machines, 2013)

### Bibliography

Wikipedia - Micro Machines, 2013. *Micro Machines (video game series)* - *Wikipedia, the free encyclopedia*. [Online]

Available at: [http://en.wikipedia.org/wiki/Micro\\_Machines\\_\(video\\_game\\_series\)](http://en.wikipedia.org/wiki/Micro_Machines_(video_game_series))

[Accessed 12 December 2013].

Wikipedia - PlayStation, 2013. *PlayStation (console)* - *Wikipedia, the free encyclopedia*. [Online]

Available at: [http://en.wikipedia.org/wiki/PlayStation\\_\(console\)](http://en.wikipedia.org/wiki/PlayStation_(console))

[Accessed 12 12 2013].

Wikipedia - Super Sprint, 2013. *Super Sprint* - *Wikipedia, the free encyclopedia*. [Online]

Available at: [http://en.wikipedia.org/wiki/Super\\_Sprint](http://en.wikipedia.org/wiki/Super_Sprint)

[Accessed 12 December 2013].

Wikipedia - The Getaway, 2013. *The Getaway (video game)* - *Wikipedia, the free encyclopedia*.

[Online]

Available at: [http://en.wikipedia.org/wiki/The\\_Getaway\\_\(video\\_game\)](http://en.wikipedia.org/wiki/The_Getaway_(video_game))

[Accessed 12 12 2013].