CP31 & CP32 – Further Scope Information for Simulator

Updated: 2020-10-04 23:40 PM

This document is to provide a detailed update on the 'Simulator Improvements' section of the project requirement provided at the start of the semester.

This document affects all teams using the Donkey Car Simulator.

Teams

Project ID	Project Name	Team Name	Team Short Code
CP31	Sign Detection using Computer Vision	COMP3888_T13A_Group5	CP31-13A5
CP31	Sign Detection using Computer Vision	COMP3888_T17A_Group5	CP31-17A5
CP32	Sign Detection with TensorFlow	COMP3888_T15A_Group4	CP32-15A4
CP32	Sign Detection with TensorFlow	COMP5615_GROUP2	CP32-17A2
CP32	Sign Detection with TensorFlow	COMP3988 T17B Group 1	CP32-17B1 (CP32B)

Contents

Scope & Requirements

This project is broken into two challenge and problem components that are closely related.

Challenge & Problem 1: Simulator improvements.

Challenge & Problem 2: Sign, Path & Object Detection

High-Level Scope Summary

- **Milestone 1 – Simulator Additions (Week 3)**
    1. Add two new track layouts (outlined in email)
    2. Add objects to map
- **Milestone 2 – Simulator Enhancements (Week 9)**
    1. Improve and documented new fast way to import new track layouts
    2. Add up to two additional (four total) track layouts to simulator and document process
    3. Further improvements and documenting for placing objects (signs, traffic lights, objects)
- **Milestone 3 – Computer Vision minor sign detection (Week 6)**
    1. Improve existing solution (provided code)
    2. Research and Document improvements, show results
    3. Demo on sample data and in simulator (different environments)
    4. Add extra objects for detection not in original solution
- **Milestone 4 – Computer Vision major detection (Week 9)**
    1. All outlined signs detected and corresponding action response
    2. Demo on sample data and in simulator (different environments)
    3. *Advanced*: Line following and Lane Detection, with response from object actions
    4. *Advanced*: Lanes of different colours (white, yellow, etc) based on environment
    5. *Advanced*: No Lanes solution / detection so vehicle still follows a path (e.g. a footpath)
- **Milestone 5 – Completed Solution with Demo and Documentation (Week 12)**
    1. Usage documentation (as per each Milestone)
    2. Demo of working solution in simulator
    3. Demo of working solution on real-world track (TBD)
    4. Deliverables as per 'Hand-over deliverables' section

The changes contained in this document are to account for adjustments to the 'automatic track creation' which was not required to complete tasks. Instead, different tracks have been allocated to each team to test track creation goals of the project.

Simulator Tracks

For the purposes of this unit, we are adding in extra tracks to the simulator. They are outlined and described below. Each team will be required to implement two new track designs into the simulator. These have been allocated in a table.

Team Track Allocations

Team	Track 1	Track 2
CP31-17A5	Nurburgring GP Circuit (F1)	Monaco Circuit (F1)
CP31-13A5	Marina Bay Circuit (night time – F1)	Autodromo Algarve GP Circuit (F1)
CP32-15A4	Circuit of Americas GP Circuit (F1)	Circuit de Spa-Francorchamps (F1)
CP32-17A2	Baby Circuit (Mario Cart)	Sydney Motorsport Park Brabham Circuit
CP32B	Albert Park GP Circuit (F1)	Shanghai GP Circuit (F1)

All GP F1 Circuits will be 1:10 scale compared to their real-world sizes. If the scale of the Donkey Car already in the simulator is different, please use the scale of the Donkey Car assuming it is 1:10 scale real-world.

Judgment Criteria

The completed product will be judged on the below characteristics:

- **Accuracy** – How does the track best represent the real-world equivalent (if applicable). This will be judged on layout (turns in correct places), altitude changes/hills, and scale.
- **Environment** – Teams are expected to use basic static environment objects based on their allocated location. For example: Melbourne's Alberto Park Circuit has a lake in the middle of it – teams should attempt to render in a lake-colour texture. Example: All GP F1 Circuits have crash barriers that are placed around the track with signage.
- **Creativity** – Teams can be as can be as creative as they like for any elements outside the track such as grand-stands and buildings. This includes spectators.
- **Special Effects** – Any team who wishes to implement a traffic light starting sequence the same as F1, will be looked upon favourably (including sound effects). Other lighting effects as well.
- **Pit Lane Detail** – If teams can achieve all the above, teams should add in a Pit Lane based on their allocated track.

All tracks are to be lined with a barricade with a scaled height of 1.5 metres and 3-metre-long sections. Teams should also render a fence that is 3 metres higher than the barricade (4.5 metre total height). Some samples will be provided to teams on Discord #downloads.

All track edges should be thick white lines. Use discretion based on conditions. Road should all be the a slightly lighter grey colour as the track 1 from the first specification document. Turns can have the striped red and white as per normal F1.

Below are the tracks. Please consult the above table for which track(s) your team is implementing – you are implementing the two tracks assigned to your team.

Track 1 - Nurburgring GP Circuit (F1)

| Track Name	Nürburgring GP Circuit (F1) 2019
City / Country	Germany
Simulator ID	
Simulator Name/ Code	f1-gp-germany
Length	4.574 km
Number of Turns	16
Wikipedia Article	https://en.wikipedia.org/wiki/German_Grand_Prix
Other Sources	https://www.nuerburgring.de/en/fans-info/race-tracks/grand-prix-track.html#prettyPhoto
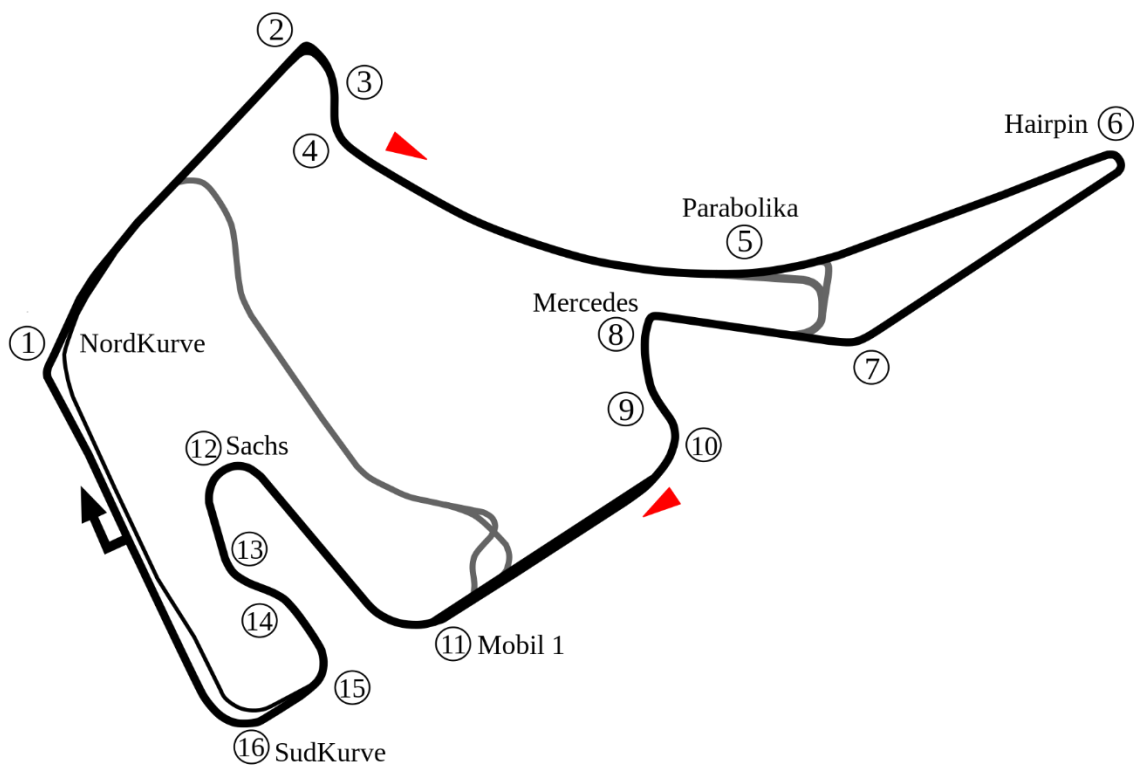
Other Information:

- Use any information relating to the 2019 circuit.
- This track is not flat and will require terrain data being added at the correct points.
- Circuit contains a pit lane
- There is no requirement to add in the 'utility' lanes.
- Circuit contains large sand and grass safety areas.
- Track width varies. Please research thoroughly.

Track 2 - Monaco GP Circuit (F1)

| Track Name	Circuit de Monaco (F1) 2019
City / Country	Monte Carlo
Simulator ID	
Simulator Name/ Code	f1-gp-monaco
Length	3.337 km
Number of Turns	19
Wikipedia Article	https://en.wikipedia.org/wiki/Circuit_de_Monaco
Other Sources	https://www.formula1.com/en/information.monaco-circuit-de-monaco-monte-carlo.2ZWRtIcSI6ZzVGX1uGRpkJ.html
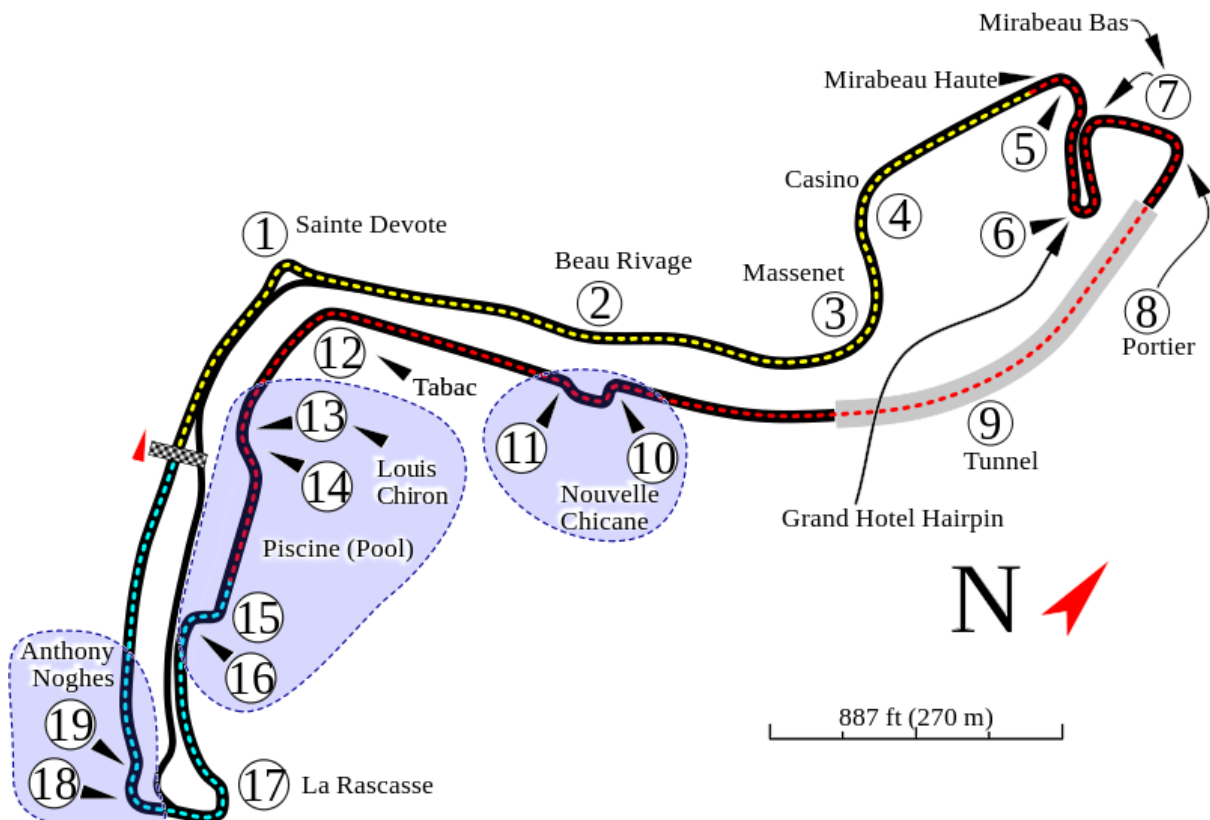
Other Information:

- Use any information relating to the 2019 circuit.
- This track is not flat and will require terrain data being added at the correct points.
- Circuit contains a complex pit lane. Render in if time permits (at the end).
- There is no requirement to add in the 'utility' lanes.
- Circuit contains fences all around the track. Turn 10 is open.
- Track width varies but is mainly narrow. Please research thoroughly.
- Ignore road markings, only render the edge and centre lines.

Track 3 - Marina Bay Street Circuit (F1)

| Track Name	Marina Bay Street Circuit (F1) 2018
City / Country	Singapore
Simulator ID	
Simulator Name/ Code	f1-gp-singapore
Length	5.063 km
Number of Turns	23
Wikipedia Article	https://en.wikipedia.org/wiki/Marina_Bay_Street_Circuit
Other Sources	
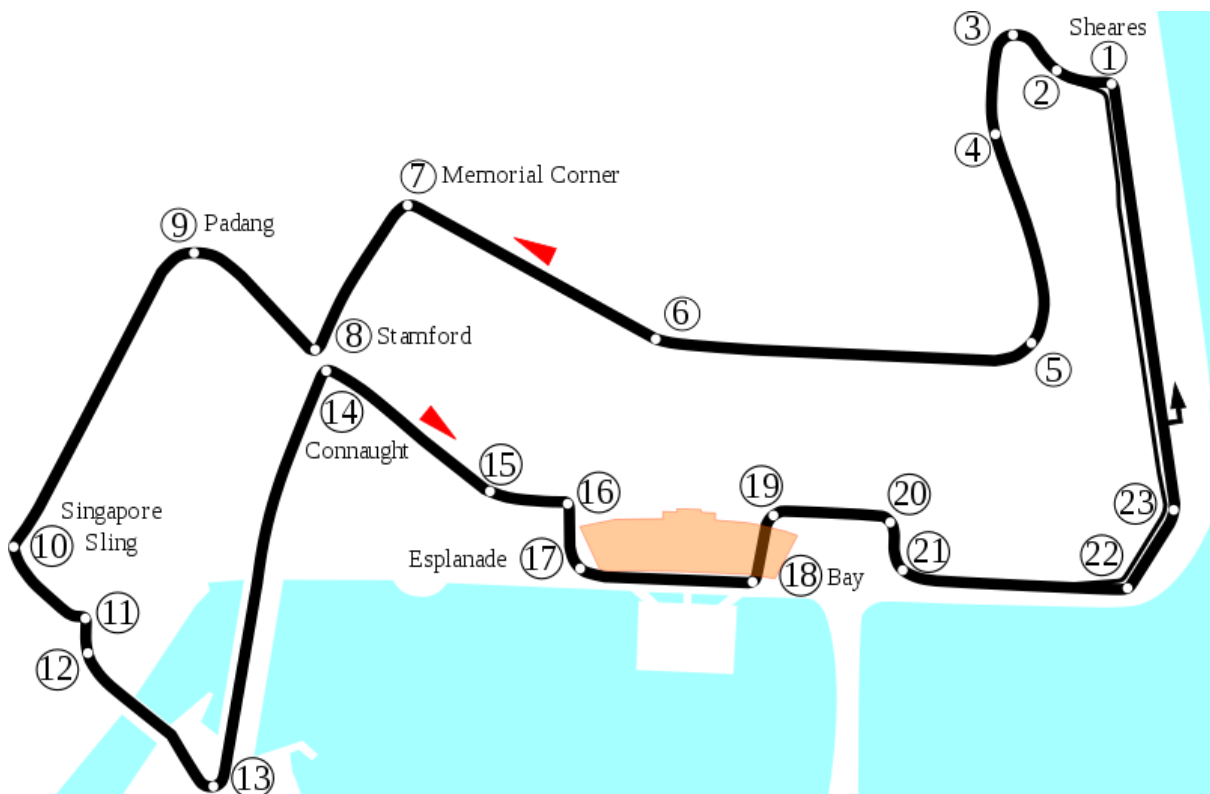
Other Information:

- Night-time Circuit – must render in streetlights as the source of light
- Use any information relating to the 2018 circuit.
- This track is flat and will not require terrain data being added at the correct points.
- Circuit contains a pit lane.
- Circuit contains fences all around the track.
- Track width varies. Please research thoroughly.

Track 4 - Autodromo Algarve GP Circuit (F1)

| Track Name	Autodromo Algarve GP Circuit (F1) 2020
City / Country	Portugal
Simulator ID	
Simulator Name/ Code	f1-gp-portugal
Length	4.653 km
Number of Turns	15
Wikipedia Article	https://en.wikipedia.org/wiki/Algarve_International_Circuit
Other Sources	https://www.formula1.com/en/racing/2020/Portugal/Circuit.html
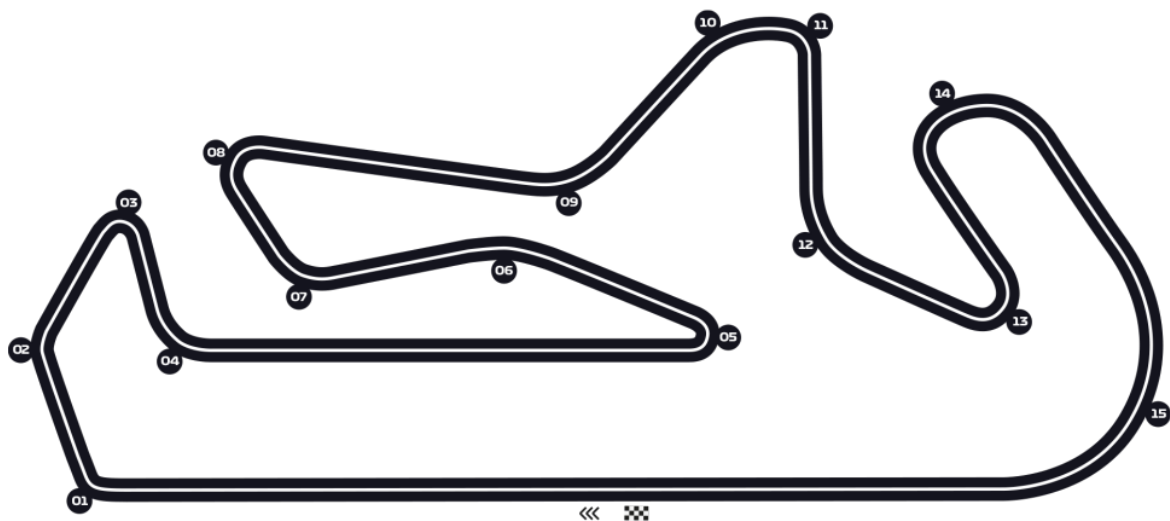
Other Information:

- Use any information relating to the 2020 circuit.
- This track is not flat and will require terrain data being added at the correct points.
- Circuit contains a pit lane
- There is no requirement to add in the 'utility' lanes.
- Circuit contains large sand and grass safety areas.
- Track width varies. Please research thoroughly.

Track 5 - Circuit of Americas GP Circuit (F1)

| Track Name	Circuit of Americas GP (F1) 2019
City / Country	United States of America
Simulator ID	
Simulator Name/ Code	f1-gp-usa
Length	5.513 km
Number of Turns	20
Wikipedia Article	https://en.wikipedia.org/wiki/Circuit_of_the_Americas
Other Sources	
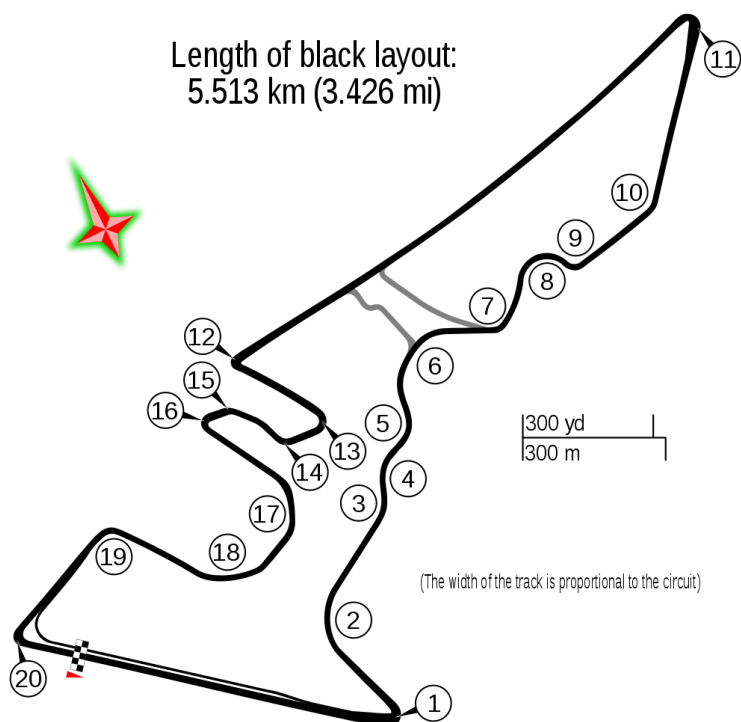
Other Information:

- Use any information relating to the 2019 circuit.
- This track is not flat and will require terrain data being added at the correct points.
- Circuit contains a pit lane
- There is no requirement to add in the 'utility' lanes.
- Circuit contains large sand and grass safety areas.
- Track width varies. Please research thoroughly.

Track 6 - Circuit de Spa-Francorchamps (F1)

Track Name	Circuit de Spa-Francorchamps (F1) 2019
City / Country	Belgium
Simulator ID	
Simulator Name/ Code	f1-gp-belgium
Length	7.004 km
Number of Turns	19
Wikipedia Article	https://en.wikipedia.org/wiki/Circuit_de_Spa-Francorchamps
Other Sources	
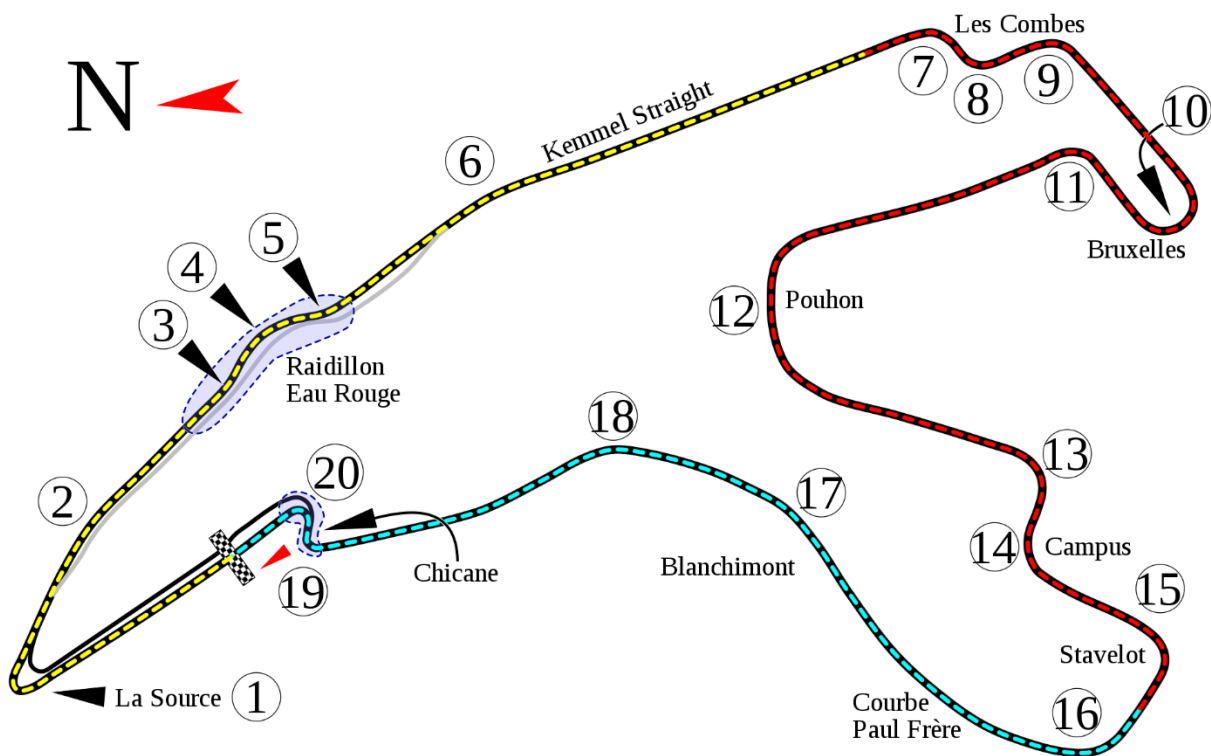
Other Information:

- Use any information relating to the 2019 circuit.
- This track is not flat and will require terrain data being added at the correct points.
- Circuit contains a complex pit lane.
- There is no requirement to add in the 'utility' lanes.
- Circuit contains large sand and grass safety areas.
- Track width varies. Please research thoroughly.

Track 7 - Baby Park (Mario Cart)

| Track Name	Baby Park (Mario Cart 8 or DS)
City / Country	NA
Simulator ID	
Simulator Name/ Code	mario-babypark
Length	
Number of Turns	
Wikipedia Article	https://www.mariowiki.com/Baby_Park
Other Sources	https://mariokart.fandom.com/wiki/Baby_Park

Other Information:

- Track should include the colours as per the above picture (half red, half blue)
- For the length, use your own judgement and research. Each lap should be approximately 10 seconds.
- Render in some scenery including, grass and walls.
- It does not need to be floating, but if you want, you can make it float.

Track 8 - Sydney Motorsport Park Brabham Circuit

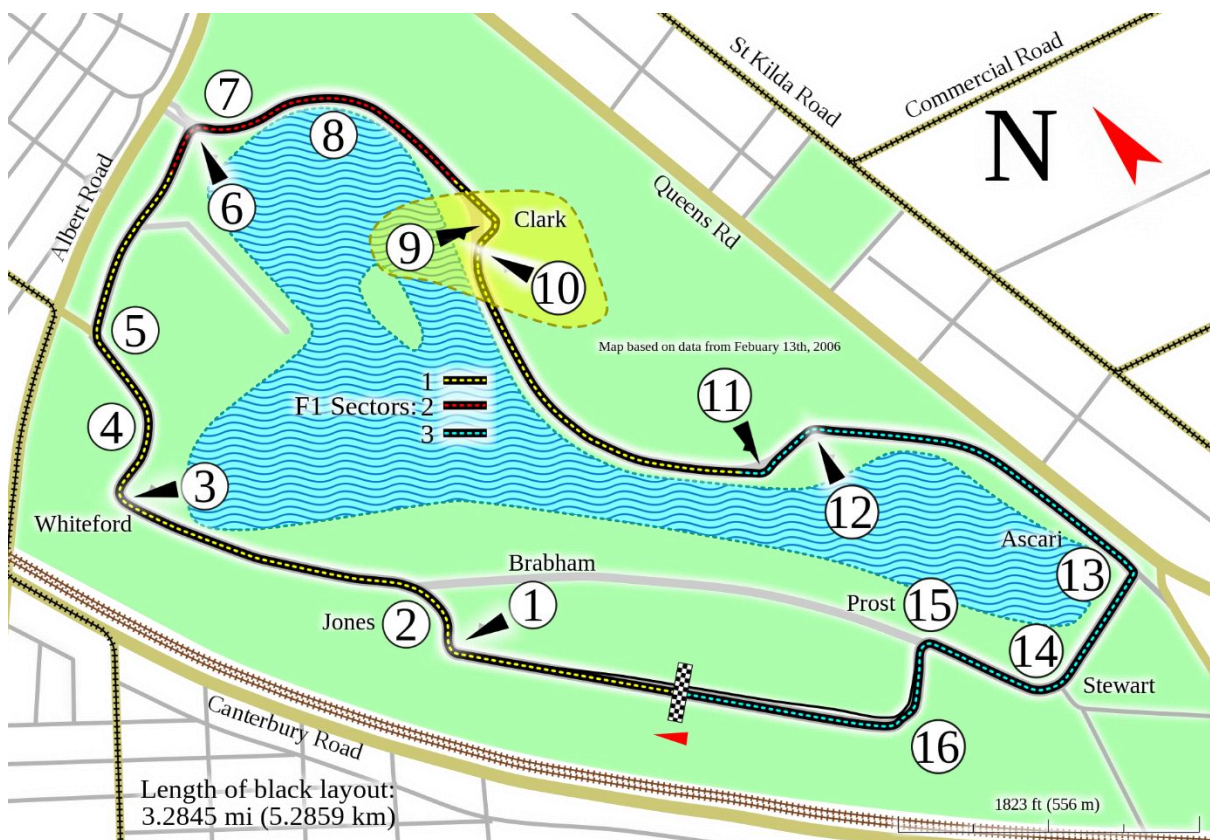| Track Name	Sydney Motorsport Park (Brabham Extended)
City / Country	Sydney
Simulator ID	
Simulator Name/ Code	f1-gp-sydney
Length	4.5 km
Number of Turns	18
Wikipedia Article	https://en.wikipedia.org/wiki/Sydney_Motorsport_Park
Other Sources	https://www.racingcircuits.info/australasia/australia/sydney-motorsport-park.html#.X3m0xmgzaJM
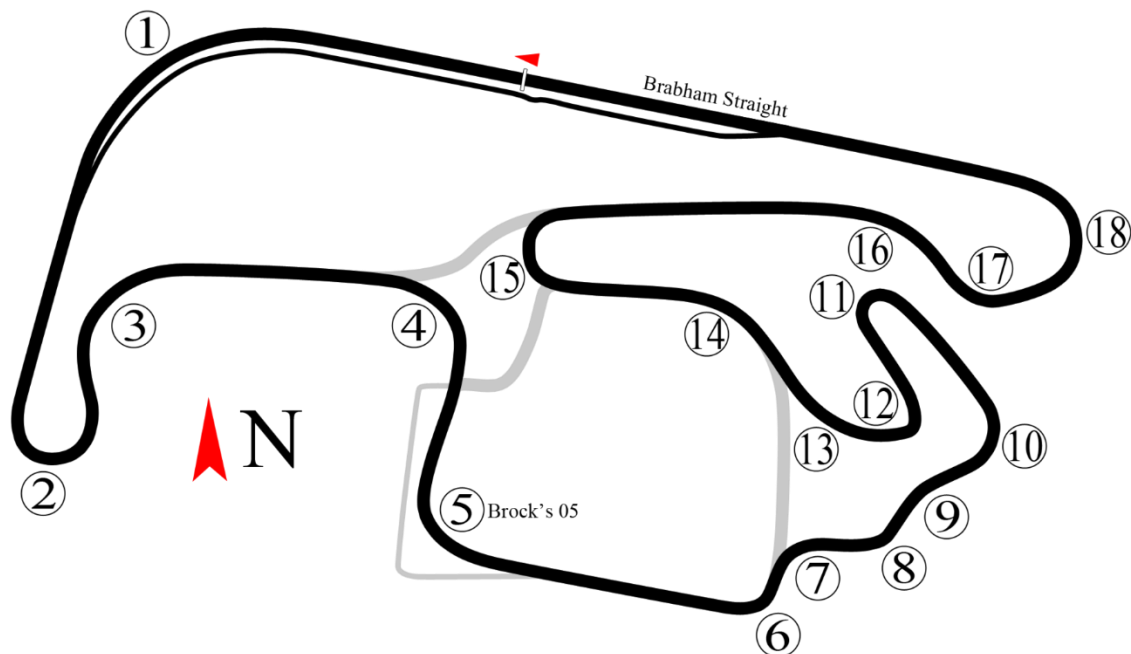
Other Information:

- Use any information relating to the Brabham Extended circuit.
- This track is not flat and will require terrain data being added at the correct points.
- Circuit contains no pit lane.
- There is no requirement to add in the 'utility' lanes.
- Circuit contains large sand and grass safety areas.
- Track width varies. Please research thoroughly.

Track 9 - Albert Park GP Circuit (F1)

| Track Name	Albert Park GP Circuit (F1) 2019
City / Country	Melbourne
Simulator ID	
Simulator Name/ Code	f1-gp-melbourne
Length	5.303 km
Number of Turns	16
Wikipedia Article	https://en.wikipedia.org/wiki/Sydney_Motorsport_Park
Other Sources	https://www.racingcircuits.info/australasia/australia/sydney-motorsport-park.html#.X3m0xmgzaJM

Other Information:

- Use any information relating to the 2019 circuit.
- This track is flat and not will require terrain data being added at the correct points.
- Circuit contains a complex pit lane.
- There is no requirement to add in the 'utility' lanes.
- Circuit contains large sand and grass safety areas. Also a lake in the middle.
- Track width varies. Please research thoroughly.

Track 10 - Shanghai GP Circuit (F1)

Track Name	Shanghai GP Circuit (F1) 2019
City / Country	Shanghai, China
Simulator ID	
Simulator Name/ Code	f1-gp-shanghai
Length	5.451 km
Number of Turns	16
Wikipedia Article	https://en.wikipedia.org/wiki/Shanghai_International_Circuit
Other Sources	
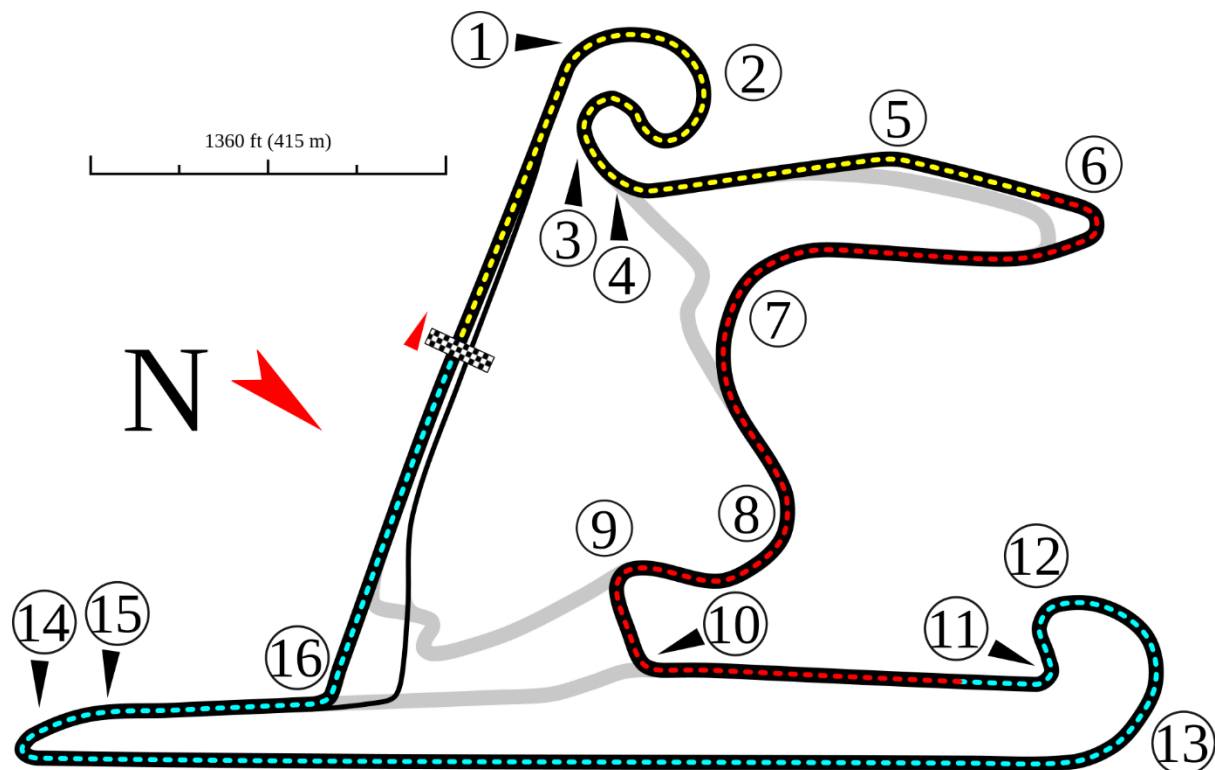
Other Information:

- Use any information relating to the 2019 circuit.
- This track is not flat and will require terrain data being added at the correct points.
- Circuit contains a complex pit lane.
- There is no requirement to add in the 'utility' lanes.
- Circuit contains large sand and grass safety areas.
- Track width varies. Please research thoroughly.

Simulator Car Models

As part of the original specification document, it stated to implement a new car model in the simulator. Details of these cars are below. Two cars model per CP31 team and one car per CP32 team are allocated below.

Team	Car Model 1	Car Model 2
CP31-17A5	Telsa Truck	RM Racer DC
CP31-13A5	Red Bull Racing RB16	Robo Car Store DC
CP32-15A4	Mercedes W11 (2020)	NA
CP32-17A2	McLaren MP4/4	NA
CP32B	Ferrari SF1000 (2020)	NA

1. All cars should be modelled 1:10 scale. If the scale of the Donkey Car already in the simulator is different, please use the scale of the Donkey Car assuming it is 1:10 scale real-world.
2. Use the existing car model and physics for all cars to speed up development time.
3. Please render the camera at the same height on a pole above each car (like the other models already in the simulator).
4. All the information for the RM Racer DC and Robo Car Store DC can be found on the #downloads channel of discord.
5. All car models should be selectable in the myconfig.py file.

	Simulator Name	Associated Link
Red Bull Racing RB16 (2020)	f1-redbull-rb16	https://en.wikipedia.org/wiki/Red_Bull_Racing_RB16
McLaren MP4/4	f1-mclaren-mp44	https://en.wikipedia.org/wiki/McLaren_MP4/4
Ferrari SF1000 (2020)	f1-ferrari-sf1000	https://en.wikipedia.org/wiki/Ferrari_SF1000
Mercedes W11 (2020)	f1-mercedes-w11	https://en.wikipedia.org/wiki/Mercedes-AMG_F1_W11_EQ_Performance
RM Racer DC	custom-rmracer	#downloads on Discord
Robo Car Store DC	custom-robocarstore	#downloads on Discord

Further Reference Material

All reference materials will be provided by the client to teams via Discord or email.

End of Document