

Software Lab:

An Application to Optimize Lap-times for Race Cars

Setting:

The use of autonomous vehicles is increasing, and driverless races are starting to take form. This project is aimed at driverless races where a virtual driver could be trained on a virtual race-track.

Your Goal:

Create a combined car and track model to determine optimal racing lines and speeds for a parameterized vehicle.



Your Tasks:

- Familiarize yourself with model-based design (focus on Simscape, Vehicle Dynamics Blockset, Automated Driving System Toolbox, Mapping toolbox, optimization toolbox and the unreal engine)
- Automatically determine race-circuit geometry from satellite images
- Use circuit geometry to determine optimal racing line for point mass model
- Integrate high fidelity vehicle model into race-simulator
- Use unreal engine to display the resulting optimal lap

Supervisors

- Jan Janse van Rensburg, Senior Application Engineer at The MathWorks, jjansev@mathworks.com
- Christoph Ertl, Simulation in Applied Mechanics Group, christoph.ertl@tum.de



**UNREAL
ENGINE**

References

- [1] The MathWorks, "Model and simulate multidomain physical systems," 2018. [Online]. Available: <https://www.mathworks.com/products/simscape.html>. [Accessed 20 1 2019].
- [2] The MathWorks, "Analyze and visualize geographic information," 2018. [Online]. Available: <https://www.mathworks.com/products/mapping.html>. [Accessed 20 1 2019].
- [3] The MathWorks, "Design, simulate, and test ADAS and autonomous driving systems," 2018. [Online]. Available: <https://www.mathworks.com/products/automated-driving.html>. [Accessed 20 1 2019].
- [4] The MathWorks, "Solve linear, quadratic, integer, and nonlinear optimization problems," 2018. [Online]. Available: <https://www.mathworks.com/products/optimization.html>. [Accessed 20 1 2019].
- [5] The MathWorks, "Model and simulate vehicle dynamics in a virtual 3D environment," 2018. [Online]. Available: <https://www.mathworks.com/products/vehicle-dynamics.html>. [Accessed 20 1 2019].
- [6] Epic Games, "What is Unreal Engine 4," 2018. [Online]. Available: <https://www.unrealengine.com/en-US/what-is-unreal-engine-4>. [Accessed 20 1 2019].