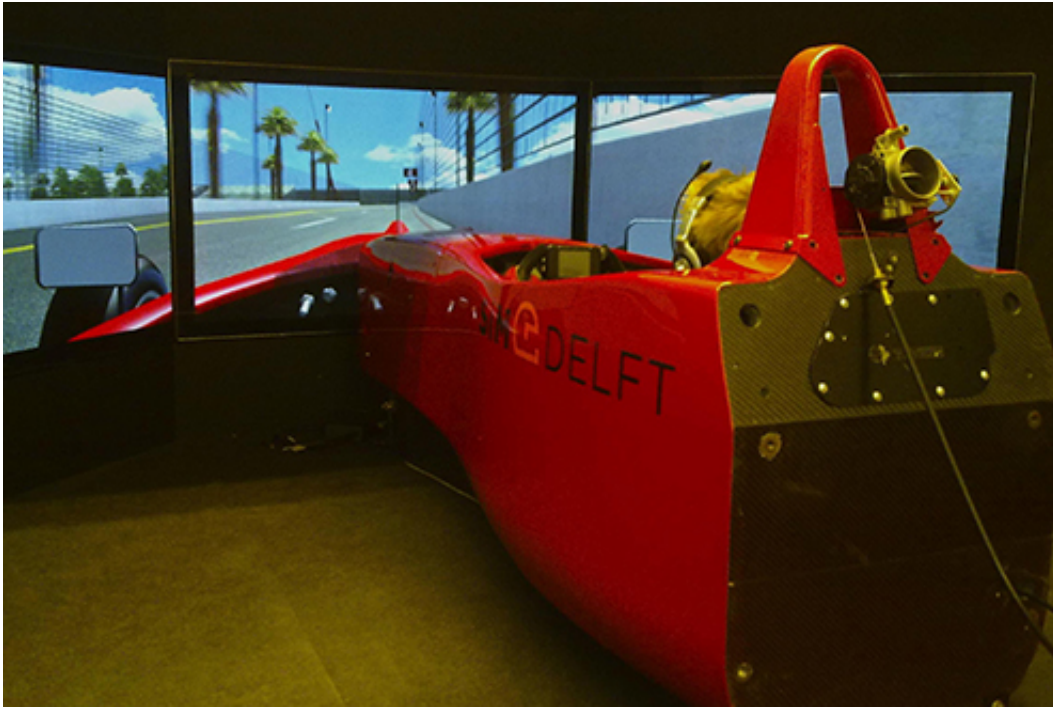


Engineer/racer designs simulation systems

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Dr. Stefan de Groot is not exactly a scientist who confines himself to the lab. The former Dutch Formula Ford racing champion and current Formula 3 race engineer took his doctorate at TU Delft this week for his research on driving simulators.

The British Carlin Capsicum racing team are very happy with him. That comes as no surprise, because TU Delft scientist Dr. Stefan de Groot represents a unique combination of qualities. For a start, he is himself a

gifted racing driver: he's been the Dutch Formula Ford champion twice, and even spent one year racing in the Formula 3 class, the gateway to Formula 1. In addition, he has been a successful racing car engineer with various teams for ten years, the last five of which for the prestigious Carlin Formula 3 team. He has an outstanding technical and theoretical background: he graduated from TU Delft in Aerospace Engineering and took his doctorate at the same university this week. Of course, his doctoral research involved an automotive subject: driving simulators. Finally, De Groot is also an entrepreneur. As an offshoot of his research into driving simulators, last year he set up a small business, SimDelft, which provides racing drivers with specific race training using two self-built simulators.

Improvements

In his doctoral research, De Groot focused on driving simulators for both 'normal' car drivers and racers. 'In principle, training with a simulator offers advantages compared to training in a non-simulated environment. In general, it's cheaper, it's safer, you can control the training environment, and data on the state of the vehicle and the driver can be collected and stored easily, without using expensive sensors.'

Seatbelt tensioning system

Together with his colleague Dr. De Winter, De Groot tested eight acceleration and speed feedback systems in order to make driving in the simulator more realistic: a seatbelt tensioning system, a vibrating steering wheel, a motion seat, screeching tyre sound, auditory beeps, a vibrating mat with two different configurations, and a pressure seat. The system that tightens the belt when accelerating significantly improves the realism of the driving performance.

Other experiments were conducted to investigate whether, by making use of its potential advantages, driving skills could be taught in the driving simulator. For example, De Groot introduced automated seat vibration as a function of the position on the road, with the aim of teaching inexperienced drivers to drive accurately in the middle of the road. In an experiment in which the grip of the tyres was varied, drivers could learn from their own mistakes without risk of injury. 'It turns out that we can use driving simulators to enable people to experience the limits of their behaviour, which is much more difficult in a real car.' The research involved close collaboration with simulator manufacturer Green Dino; many useful findings have been applied in their simulators.

Also for racers

Unsurprisingly, part of De Groot's research focussed on the value of driving simulators for racing drivers. 'We compared thirteen racing drivers' fastest lap times during simulator training sessions with the same drivers' fastest lap times during real-world training sessions. And there certainly is a significant connection. Using the simulator, you single out the good racing drivers right away.'

A racing simulator, however, is not only useful as a form of race training for racing drivers, particularly those who don't have the financial means to train on a real racetrack regularly. A simulator can also be used to carry out well-controlled tests that are difficult to conduct in reality – for example, because external factors, such as the grip of the circuit and the tyres, are constantly changing. 'The driving simulator has proved a useful tool for carrying out experiments that are difficult to realise in the real world.'

Future challenges

Last year, it was these sorts of conclusions that led De Groot to set up a small business, SimDelft, together with Vincent van der Valk (also a former Formula Ford champion). They provide training for racing drivers using two self-built driving simulators. Their service is unique in the Netherlands. 'Although we don't get any Formula 1 guys here – those teams all have their own simulators, but for the category below that, it's very interesting. Due to our racing experience and technical knowledge, we not only offer simulator training but we also give wide-ranging advice to the drivers.'

As mentioned above, De Groot is also a valued race engineer with Carlin, the British top Formula 3 team. He travels around Europe's racetracks with the team at weekends. He doesn't rule out taking his services as a race engineer to Formula 1 – the racing Walhalla – in future: 'Who knows? But for now I'm really happy at Carlin.'

More information: De Groot, S. "Exploiting the possibilities of simulators for driver training." [DOI: 10.4233/uuid:893379c9-0e8c-43d8-9f57-06149a778183](https://doi.org/10.4233/uuid:893379c9-0e8c-43d8-9f57-06149a778183)

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