# Abstract

Racing simulators attempt to transfer the emotional and physical roller coaster of piloting a vehicle over the racetrack and competing against the best drivers of the world into the living room. Driving simulations are used in areas besides racing in teaching, entertainment, automotive development, automotive testing and research. Although, driving simulators have become very popular, only few studies have investigated the behaviour and emotions of drivers. This work has two main contributions the \textit{Virtual Rival Framework} and the \textit{Virtual Rival Ghost}.

The \textit{Virtual Rival Framework} is an attempt to design a 3D racing simulation that allows to test new concepts that increase and measures driver \textit{Engagement}, \textit{Education} and \textit{Performance}. The main objective of the \textit{Virtual Rival Framework} is to provide a sandbox for researchers and game developers. The focus is on psychological and performance evaluation of players. The \textit{Virtual Rival Ghost} is a special virtual competitor for players on the track. To enhance the drivers \textit{Engagement}, \textit{Education} and \textit{Performance} the \textit{Virtual Rival} adjusts automatically to the current skill level of the driver.

The practical work includes the development of the \textit{Virtual Rival Framework} and the \textit{ Virtual Rival Ghost}. The development is based on the Unity game engine. The resulting race simulation can be run in different browsers: Edge, Chrome and Firefox. Driving data is stored in the cloud and can be accessed and analysed online. The developed framework integrates all questionaries’ needed for the evaluation of the Virtual Rival Ghost.

A first study on Amazon Mechanical Turk was conducted to evaluate the framework and the Virtual Rival Ghost. The relationships between the Sensation Seeking personality measure and risky driving behaviour identified in previous research on real-world drivers were confirmed for virtual drivers. The two main findings are (1) players are not able to estimate their own skill level and (2) racing against a \textit{Virtual Rival} is generally more satisfying in close races.