Conclusion

Racing is about mastering the race track, perfect car control, high-speed decision making and risk taking. 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. Hardware and software improvements allowed a big leap forwards in terms of realism. The increasing complexity of real-world driving systems and the high grade of realism made driving simulators also popular for a wide range of applications besides racing. Driving simulations are used in teaching, entertainment, automotive development, automotive testing and research. The increased attention towards driving simulators opened a big marked and the necessity of creating new tools and concepts to improve driver \textit{Engagement}, \textit{Education} and \textit{Performance}.

This work introduces the design, implementation and evaluation of a \textit{Virtual Rival Framework} to improve and measure \textit{Engagement}, \textit{Education} and \textit{Performance}. The framework includes a customizable racing simulation where racing related studies can be performed. The simulation helps to understand players’ emotions and thought process during the race. Therefore, the key aspects of racing: competition and realism were integrated into the \textit{Virtual Rival Framework}. An additional aspect of this work was the implementation of the\textit{ Virtual Rival} ghost car. The \textit{Virtual Rival} competes against the 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 foundation for the implementation is the Unity game engine. Unity provides the physical platform on which the racing simulation is built on. The \textit{Virtual Rival Framework} incudes also mechanism to measure \textit{Engagement}, \textit{Education} and \textit{Performance}. All 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 \textit{Virtual Rival}. The questionnaire data is also stored. A first user study was conducted with 38 participants. The evaluation had three major outcomes:

\begin{itemize}

\item Players are not able to estimate their own skill level.

\item There is a strong correlation between the Sensation Seeking personality measure and risk related symptoms in virtual driving.

\item Racing against a \textit{Virtual Rival} is generally more satisfying in close races.

\end{itemize}

Overall the system allows to measure \textit{Engagement}, \textit{Education} and \textit{Performance}. The results indicate that \textit{Virtual Rival} can be used to improve racing simulations. For the next step we suggest, developing special race tracks, with track layouts, that test specific driver skills additional to contacting a second study with more participants.