1. Research Questions

- Virtual Driving and the drive to Win: Rivalry, Motivation, and Performance
- Virtual Windscreens to learn eco-driving skills: effects on fuel efficient and safe driving behaviour
- Learn how to drive: Measure the effect of racing lines, braking guidance and ghost cars

2. Why are this questions important

The tools we use to perform better in racing games may be coming to future cars. Features include racing lines with braking guidance and ghost cars.

- Jaguar 'virtual windscreen concept'

The barriers between driving simulation and motorsports are blurring.

- Gran Turismo Sport offers a FIA race license
- A lot of development in ESports from PlayStation to a real-life professional racing career
    - F1 esports
    - GT Academy

Boost competitive motivation using rivals will also boost the effectiveness of other games like exercise games.

Efficient safe driving can reduce your fuel consumption and carbon dioxide emissions by 25 percent.

Driver safety and fuel efficiency go hand in hand.

3. Setup

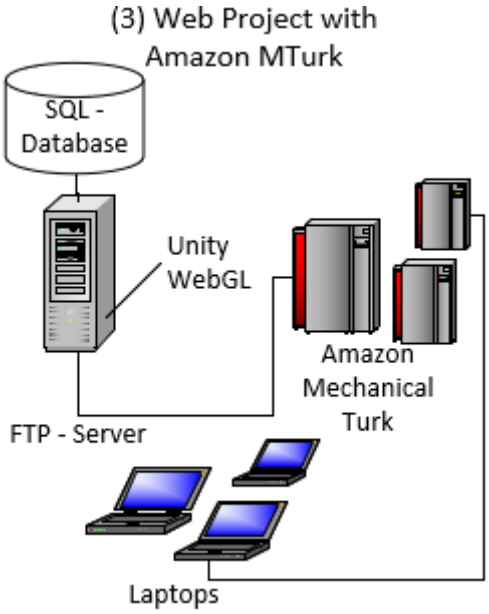

Abbildung 1: System Architecture

Use Amazon MTurk for the study.

Participants drive:

- 2-3 practice laps
  - Get player use to the game
  - Use this laps to determining player skill, break points
- 2 race laps on round course
- 2 race laps on round course with obstacles to measure reaction time
- Round course / country road with focus on economic driving
  - Obstacles to evaluate risk taking and focus on safe driving.

Different Opponents/Visual Assisting Systems

- No Assist
- Only Race Line
- Ghost Car best own lap, approach of most race games
- Ghost Car based on skill, try to create a completive/close race
- Ghost Car global best / optimal

Evaluation

- Questionaries' own appraisal (Fun, Motivation, Performance)
- Lap Times
- Accidents
- Fuel Consumption
- Safe Driving: velocity, break points in difficult passages, avoiding obstacles, stay on track
- Distance to ideal race line

4. First Concept illustration

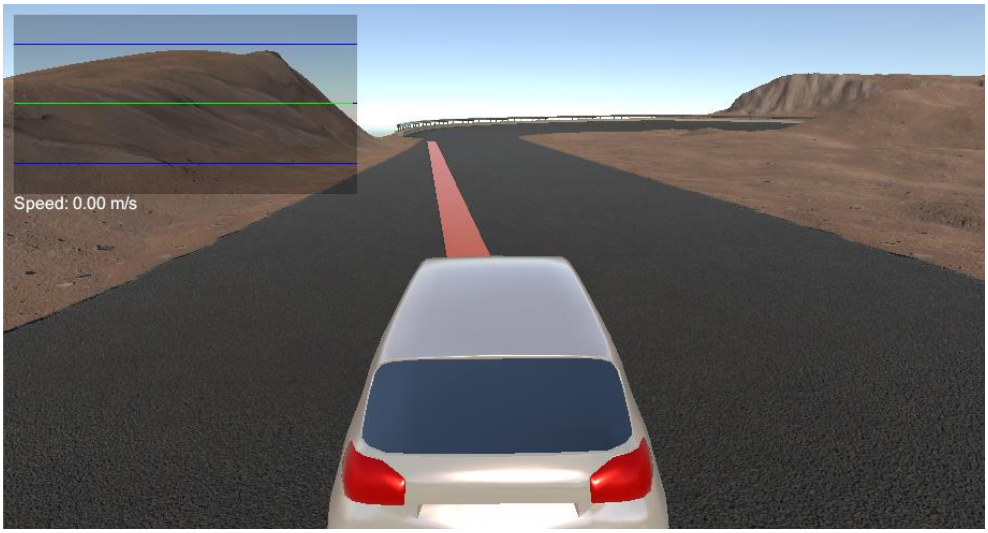

Abbildung 2: Race Line Demo

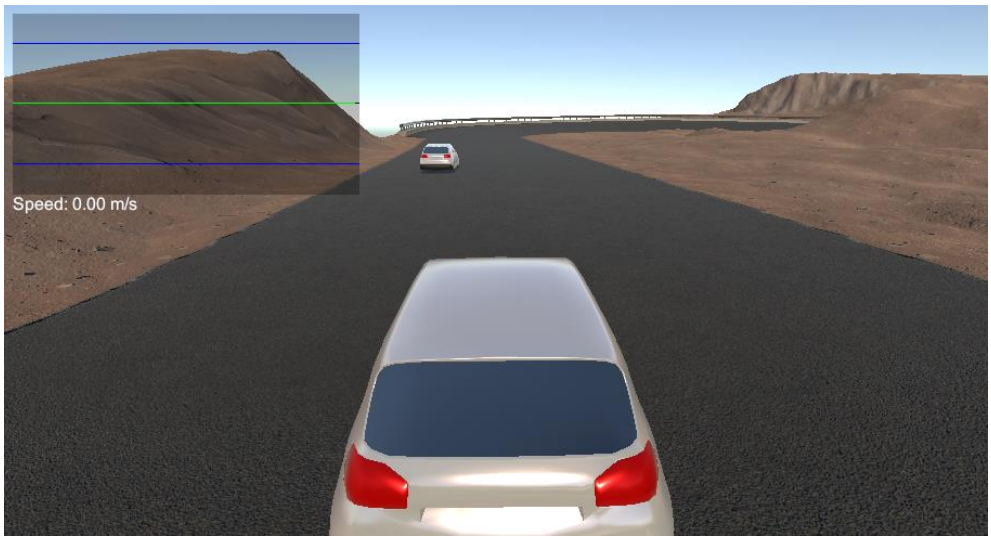

Abbildung 3: Ghost Car Demo

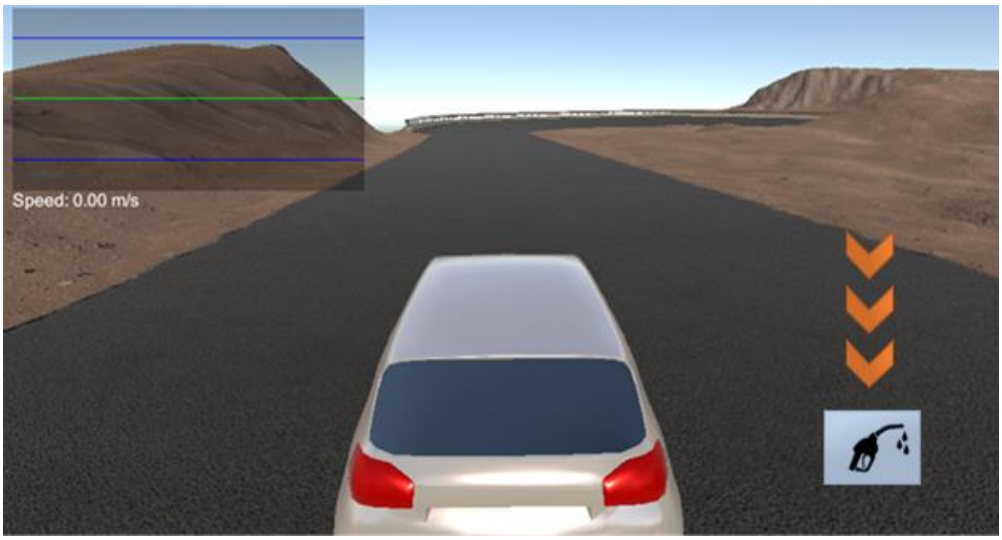

Abbildung 4: Indicate your current fuel effiency

5. Papers

A short summary of the best papers I found regarding this topic and questions my work could answer.

1 - Virtual Driving and Risk Taking: Do Racing Games Increase Risk-Taking Cognitions, Affect, and Behaviours?

Racing games activates cognitions and feelings of arousal and excitement that are positively related to increased risk taking, which in turn can lead to actual increased risk taking in simulated critical road traffic situations.

- Gender relevance?
- Frustration -> Aggression Hypotheses:
    - Whether frustration–aggression theory or desensitization accounts can also be applied to explain the impact of racing games on risk-related behaviour.
    - Being overtaken friend, might lead to higher risks

2 - What Drives People: Creating Engagement Profiles of Players from Game Log Data

Creation of engagement profiles of game players based on log data. Interesting profiles: Rivals, Multiplayer and Multiplayer Private. The Group with the focus on public multiplayer are engaged by placing in races. And also have a lot of friends.

- Understanding who players are and what about a game they value is a crucial component of game design. Seeing what people motivates in game. Encourage people to exercise regularly in fitness games.
- Engagement through leaderboard. Can we motivate players with a leaderboard.

3 - Spatial Presence and Emotions during Video Game Playing: Does It Matter with Whom You Play?

How the nature of the opponent (i.e., computer, friend, or stranger) influences spatial emotional responses. The results showed that arousal ratings were higher when playing against another person (friend or stranger) than when playing against a computer.

- Risk taking, Motivation, Frustration and Learning. Does your opponent matter? (Alone, Friend, High Skilled Player)

4 - Off With Their Assists: An Empirical Study of Driving Skill in Forza Motorsport 4

Characterize how players use and customize driving assists such as the trajectory line, automatic gear shifting, or assisted braking over time.

- Are odds of success higher for players who race against friends?
- Implications for racing game design and the progression of skill in virtual driving.

5 - Electronic Friend or Virtual Foe: Exploring the Role of Competitive and Cooperative Multiplayer Video Game Modes in Fostering Enjoyment

Analyse the effects of different multiplayer modes on enjoyment. Enjoyment is not as high in a cooperative setting as a competitive one.

- Investigate the relationship between enjoyment and challenge-skill balance
- For example, both may be maximized when players can win a close race with the ghost, rather than a blowout.

6 - The First Hour Experience: How the Initial Play can Engage (or Lose) New Players

The first time a player sits down with a game is critical for their engagement. Instead of prioritizing fun, intrigue and information should be seen as equally valuable for helping players.

- Information seeking behaviour should be evaluated by efficiency. Can playing with a friend from the beginning boost the efficiency?

7- National Road Safety Strategy – Australia

The Safe System approach takes a holistic view of the road transport system and the interactions of its various elements. It aspires to create a road transport system in which human mistakes do not result in death or serious injury.

- There is more effort put into punishing bad behaviour on the roads than rewarding good behaviour. Can we encourage responsible virtual road use better, by supporting good behaviour rather than punishing bad behaviour? (the effectiveness of this approach is unproven)

8 - Road Traffic Accident Deaths in South Africa, 2001–2006

Male mortality due to road traffic accidents was generally more than double that for females. Road traffic accident mortality peaked in age group 35–49 and was lowest youths aged 15–24 years.

- Can we see a maturation effect in virtual driving for different age groups when analysing accidents.

9 - Towards automatic personalised content creation for racing games

Create an accurate model of player driving style and a tentative definition of when a racing track is fun. Fun is learning, and games are more or less fun depending on how good or bad teachers they are.

The track should encourage the player to try driving strategies that might work, and might not. These factors can be estimated by how close the mean speed of the player on the track is to a pre-set target speed, and as how variable this mean speed is between attempts or laps, respectively.

- Games are more or less fun depending on how good or bad of teachers they are.

10 - The desire to win: The effects of competitive arousal on motivation and behaviour

Head-to-head rivalry and time pressure can fuel competitive motivations and behaviour.

- Can we build competitive motivation with a “ghost”

11 - Converting Sedentary Games to Exergames: A Case Study with a Car Racing Game

One of the major challenges in designing exercise games is maintaining engagement and motivation over time. You can employ an exercise as an interface to common, existing, sedentary games, such as a car racing game.

- Boost competitive motivation will also boost the effectiveness of exercise games.

12 - Driven to Win: Rivalry, Motivation, and Performance

Two studies of adults from the general population found that rivalry, as compared to no rival competition, was associated with increased motivation and performance, controlling for tangible stakes, dislike, and other factors.

- Explore the downsides of rivalry. By motivating, rivalry could foster a willingness to do ‘‘whatever it takes’’ to win, including risk taking.
- Maybe rivalry on a more complex and precision-based tasks like racing, the increased motivation may be less beneficial.

13 - Drivers’ ability to learn eco-driving skills; effects on fuel efficient and safe driving behaviour

Green driving, whether motivated by financial or environmental savings, has the potential to reduce the production of greenhouse gases by a significant amount.

- Learn eco driving in a race game environment.
- Evaluated both visual feedback systems and a rivalry ghost.
- Analyse the relative prioritisation of driver safety and fuel efficient driving.

14 - Modelling of the fuel consumption for passenger cars regarding driving characteristics

Influence of driving patterns on fuel consumption using a portable emissions measurement system. It shows that vehicle fuel consumption per unit distance is optimum at speeds between 50 and 70 km/h, fuel consumption increasing significantly with acceleration.

- Use VSP to model vehicle fuel consumption in a race game.

15 - The surprisingly low motivational power of future rewards: Comparing conventional money-based measures of discounting with motivation-based measures

A wide range of people's behaviours in the present are motivated by future concerns.

- Evaluation of the motivational power of the future rewards for present behaviour.

16 - Experimental Evaluation of an Augmented Reality Visualization for Directing a Car Driver's Attention

Approaches to inform the driver about dangerous situations around the car.

17 - Augmented Reality Projects in Automotive and Aerospace Industry

Guidelines for successfully deploying AR in an industrial context