COMP 2003 | Game Design Document: Driving Simulator

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Overview

General Description

The Interactive Learning Project (ILP) will teach people who have little to no experience in driving the very basics of driving.

ILP Mechanics

It will have simple mechanics:

- [Prototype] Forwards
- [Prototype] Backwards
- [Prototype] WASD | Gradual turning (based on driving wheel movement)

What to teach

The information needed to learn how to safely operate a car will be provided to the user, like what steps you should take when first getting into one, the do's and don'ts, etc.

Levels/Scenarios

Levels

- [Prototype] The first level of the game will teach you the controls of the car.
- The second level will have an informational UI that explains what to look out for when driving a vehicle. Similar to how a first driving lesson would go.

Level 1 - vehicle familiarisation and controls

- Teach basic controls and how to operate the car in VR

Level 2 - basic driving on a straight road

- Practice smooth driving and lane keeping

Scenarios

- Straight road
- T-junction
- Crossroads
- Roundabout
- Motorway

VR

It is possible to implement the ILP into VR in the future.

User Customisation

- A choice between manual and automatic
  - [Prototype] Start with automatic implementation
- Choice of traffic laws or lawless driving (for testing and learning purposes)

Game Feel

The player camera will be positioned in a way that the player feels as if they were the one driving the car (i.e. in the driving seat).
They will also have the option to press “C” to toggle between camera views (e.g. driver seat POV, top down view) to aid in knowing the space a car uses, as sometimes this is difficult to see from the driver’s perspective.

Controls

[Prototype] The player will press “W” to use the accelerator, “S” to use the brakes, “A” to turn the wheel to the left and “D” to turn it to the right. They will also have the option to use “Space” to toggle the handbrake.
[Prototype] As for indicators, “Q” will be used for indicating left and “E” for indicating right.
If in manual mode, a button will have to be pressed to use the clutch and two other buttons to go a gear higher or lower.

Reasons for Selecting the Driving Simulation Project

- Existing Resources and Infrastructure:
  The University already has the necessary driving simulation equipment available, which reduces setup effort and allows us to begin development and testing more efficiently.

- Value to the University:
  The final solution has strong potential for use during University Open Days

and outreach events. This makes the project beneficial not only to our group but also to the University by showcasing interactive and engaging technology to prospective students.

- Established Client Expertise and Research:
  The client has prior experience with driving simulation research and has published relevant findings. This existing body of work provides us with a strong foundation for planning and executing our own testing phase with greater clarity and confidence.

Road Skills Included in the Simulation

According to GOV.UK, there are 27 skills that a driver is assessed for to be considered eligible to drive on the road. The numbering in this section is not consistent with the one on the official website because there are some skills we did not include here. We have done this because some of the skills aren't things that we can implement or provide an initial training for in-game, but perhaps something that can be attained through practice or under the instructions of a qualified instructor.

Control and Positioning Skills

1. Control and Instruments

You should be aware and know how to use the controls of your car when you're driving the car.

- Foot controls – accelerator, clutch and brake pedals
- The absence of the clutch is dependent on whether the user selects manual or automatic transmission)
- Hand controls – parking brake, steering wheel, indicators, headlights and gearstick.
- We will not include headlight controls, as we are not going to be implementing night-time driving that would require us to use headlights.
- Other controls – the horn, windscreen wipers, demister and heated windows.
- Only including the horn feature, since we will not be adding different weather conditions to the simulation.

2. Moving away and stopping

Drivers should be able to move away and stop every time they drive, and that's why it's so important to make sure that you know how to move away and stop safely.

- Use the MSM and PSL routines (mirrors and surroundings awareness)

- Observe what's happening around you and be aware of your blind spots.
- Co-ordinate your use of the accelerator, clutch and footbrake so that you move off and slow down safely, and smoothly.
- Use the parking brake and steering competently
- Know where and when to look, what to look for and how to act safely on what you see.
- Be able to identify suitable stopping places

Observation, Signalling and Planning Skills

3. Mirrors – vision and use

Drivers must always know what's happening around them and act safely on what they see.

- Must know the uses of the interior mirror and the 2 exterior mirrors.
- Must know the areas covered by each mirror and what the blind spots are.
- Must know and make use of the Mirrors-Signal-Manoeuvre (MSM) and Position-Speed-Look (PSL) routines.

4. Signals

It's important to understand and respond safely to signals given by other motorists. You too should always give signals that are clear and well-timed to other road users so that they know what you are planning to do.

- Significance of signals
- What signals to give in the moment
- When and how to give signals
- When signals are not required

5. Other Traffic

Most of the time when you're driving, there will be other traffic on the road. You need to be able to deal safely and confidently when meeting, crossing and overtaking other vehicles.

- Must be able to handle going around an obstruction on your side of the road when there is already oncoming traffic on the other side.
- Meeting oncoming traffic on narrow roads. (Must read up on the procedure here)
- Overtaking legally and safely.
- You must make use of your knowledge of mirrors and surrounding awareness.
- Make use of your knowledge of road markings and signs.
- Must be able to drive on all road types, including one-way or two-way roads, a three-lane two-way road, and a dual carriageway and a motorway.

Junctions, Roundabouts and Crossing Skills

6. Junctions

Must be able to negotiate any junction on any type of road safely, without holding up other traffic. These are the following junctions you commonly come across:

- T-junctions and Y-junctions
- Crossroads
- Slip roads
- Unmarked junctions

You must know:

- Rules for turning at, entering and emerging from a junction.
- The meaning of any road markings or signs

7. Roundabouts

Must have a thorough understanding of the rules that apply when approaching and going around a roundabout. The roundabouts you commonly come across are:

- Standard roundabouts
- Mini-roundabouts
- Multiple and satellite roundabouts
- Traffic-light-controlled roundabouts

What you must know:

- Knowledge and use of mirrors.
- How to position the car correctly and which lane to use.
- Rules at the roundabout.
- The procedure for leaving a roundabout.

8. Pedestrian Crossings

Be aware of the basic rules that apply to all pedestrian crossings. You need to know the differences between each type of crossing. You most commonly will come across the following:

- Light-controlled crossings
- Zebra crossings
- School crossings
- Split crossings

You must know:

- The correct speed at which to approach the crossings.
- When to stop for pedestrians who are walking to cross.
- Using the mirror knowledge to ensure that there is no vehicle that is too close when you stop for pedestrians on the road.

Manoeuvres Skills

9. **Reversing**
10. **Parking**

You should be able to:

- Coordinate your hand and foot controls well.
- Not just rely on mirrors, but must observe all around.

Technical problems that we could come across in the project

- **Alignment & Comfort:** The fixed GT Racer 2.0 rig (seat, wheel, pedals) may not perfectly align with the virtual driver position, which can break immersion and cause discomfort if the user's real posture doesn't match the in-game car.
- **Input & Performance Issues**: Because we are showing a full 3D driving world in VR and reading inputs from the wheel and pedals at the same time, the system demands extra performance. If the frame rate drops or the view stutters, or lags, the users can feel uncomfortable.
- **Input mapping complexity:** Getting the steering wheel and pedals to work smoothly together with the VR headset and controllers can be tricky. We need to make sure the wheel and pedals respond reliably at all times, and that the controls feel natural and stay the same across every level, so learners don't have to "re-learn" how to drive each time.

LSEP

L - Legal

- Comply with relevant data protection rules if any user data or logs are stored

S - Social

- We want the app to be welcoming and usable for as many people as possible. That means building in accessibility options like subtitles, adjustable sound levels, and clear, easy-to-read visuals.
- Avoid stereotypes in characters or voice-overs if any are added later.
- The VR lessons should feel like a safe space where beginners can try things out, make mistakes, and learn without feeling judged or embarrassed.

E - Ethical

- We should avoid reckless or unsafe driving, as appealing or desirable. Even within a more permissive “lawless” mode, the application must communicate that unsafe behaviour carries consequences, using informative warnings and constructive feedback rather than reinforcement.
- All user testing sessions must be conducted voluntarily. If any data is collected for evaluation or research purposes, participants should be clearly informed about what is being gathered and must provide explicit informed consent before taking part.

P - Professional

- Maintain regular communication with the client, documenting requirements, design decisions, and changes.
- Follow good project management practices: plan milestones, keep version control, and document the code and design.
- Test thoroughly with real users where possible, record feedback, and iterate on the design.
- Present the final product and documentation in a clear, professional format suitable for academic assessment and client handover.