DRIVING HARDWARE INFRASTRUCTURE

WeiJie Lor
Supervisors: Toktam Ebadi, Tom Gedeon
Research School of Computer Science
Australian National University
Project Objective

- Set up experimental infrastructure
- Investigate driving simulators
- Adjust simulator to suit experiment
- Calibrate hardware and software sensitivity
Project Simulator

- TORCs
  - Racing game

- Driving simulator 2012
  - Does not create realistic driving environment (e.g. lack of pedestrians)

- City Car driving
  - Supports only right-hand traffic
  - Provide realistic driving experience
  - Inexpensive alternative

- XPI Simulation
  - Requires expensive hardware
City Car Driving Simulator

Pros
- Realistic mapping and traffic rules
- Advance physics of cars and roads
- Work with electronic steering wheel

Cons
- Does not observe left-hand traffic rules
Fixing side of the road

Original

Flipped

ULTRAMON™
Electronic steering wheel

- Logitech G25 Steering Wheel
- Electronic steering wheel provides realistic driving experience
- Calibrate steering wheel with game to increase game realism
Conducted Experiment with 5 Participants

Participants were made to navigate around the city for 10 min

Drive according to Australian Road Regulation

Feedback and responses were collected from participant

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Weather</th>
<th>Traffic condition</th>
<th>Pedestrians</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario 1</td>
<td>Sunny</td>
<td>Normal</td>
<td>100%</td>
</tr>
<tr>
<td>Scenario 2</td>
<td>Rainy</td>
<td>Normal</td>
<td>100%</td>
</tr>
<tr>
<td>Scenario 3</td>
<td>Foggy</td>
<td>Normal</td>
<td>100%</td>
</tr>
</tbody>
</table>
Post Experiment Observations

- Dashboard problem
  - Dashboard was mirror flipped in the process of flipping the simulator

- Screen lag issue
  - Flipping software causes the screen to lag due to lack of memory

- Sensitive steering wheel
  - Steering wheel was too sensitive to slight movements

- Complex controls
  - Participants find it hard to understand steering wheel controls
Changes Incorporated

- Dashboard problem
  - Use Magnifier Pro to reverse mirror the dashboard

- Screen Lag Issue
  - Increase computer ram and remove/shutdown unnecessary program

- Sensitive steering wheel
  - Install suitable software drivers and calibrate steering wheel sensitivity

- Complex controls
  - Print out a control guide and assist participants to understand steering wheel controls
Conclusion

- Experiment Infrastructure is crucial for a successful experiment

- Clear understanding of experiment objectives will help in setting up the experiment structure

- Calibrating and fine tuning software and hardware requires time and proper planning

- Good experiment structure will allow better quality experiment results to be collected.
Steering Wheel Controls

- Left
- Right
- Horn
- Light

- Engine
- Parking Brake
- Belt
- Gears

- Clutch
- Brake
- Accelerator