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INVESTIGATING WHICH FACTORS AFFECT LATERAL POSITION VARIABILITY THROUGH A DRIVING SIMULATOR EXPERIMENT

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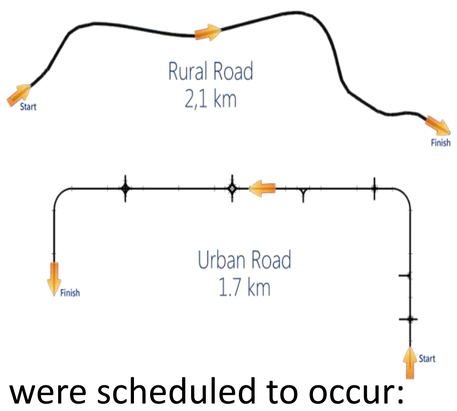
OVERVIEW

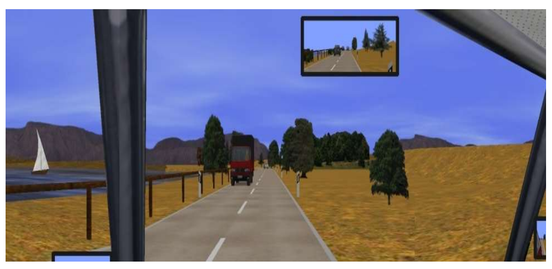
- Considering that **inappropriate lateral positioning** is a key accident contributory factor, lateral control measures are some of the most commonly used driving behaviour metrics
- **Lateral control measures** assess how well drivers maintain vehicle position within a lane
- The **objective** of the present research is to quantify the effect of several risk factors including distraction conditions, driver as well as road environment characteristics on lateral position variability through a driving simulator experiment

METHODOLOGY

- The **driving simulator** consisted of 3 LCD wide screens 42'', driving position and motion base, total field of view 170 degrees, validated against a real world environment
- The experiment started with a **practice drive** (10-15 min) until the participant fully familiarized with the simulation environment
- Afterwards, the participant was asked to drive **two sessions** (approximately 20 minutes each). Each session corresponded to a different road environment:
  - **a rural route**, single carriageway, zero gradient, mild horizontal curves
  - **an urban route**, at its bigger part dual carriageway, separated by guardrails. Two traffic controlled junctions, one stop-controlled junction and one roundabout were placed along the route



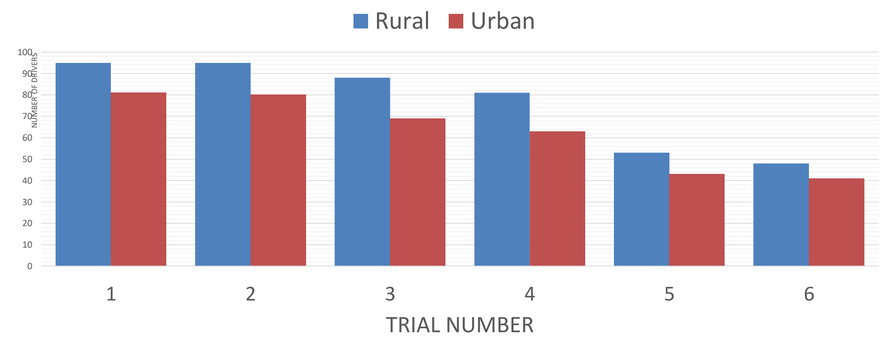
- During each trial, **2 unexpected incidents** were scheduled to occur:
  - sudden appearance of an animal on the roadway
  - sudden appearance of a child chasing a ball on the roadway or of a car suddenly getting out of a parking position



- Sample consisted of **95 participants** counterbalanced per gender and age group (young, middle-aged, older)

RESULTS

- The distribution of **driving trials** is presented per area type and order of trials



- A significant number of participants came up with **simulator sickness symptoms** during the experiment and did not manage to complete all the trials

Variables	Estimate	Std. Error	t value	Pr(>|t|)
Intercept	0,23	0,05	4,41	< 0,000
Distraction - Cell phone	0,07	0,03	2,30	0,022
Age group - Middle Aged	0,13	0,06	2,25	0,027
Age group - Older	0,10	0,06	1,79	0,074
Area type - Urban	1,29	0,03	49,71	< 0,000
Gender - Male	-0,11	0,05	-2,35	< 0,021
Random effect				
By Person ID (stdev)	0,18			
Summary statistics				
AIC	839,16			
Log-restricted-likelihood	-411,58			

- The **random effect** contributes significantly to the fit of the model

CONCLUSIONS

- Results confirm the initial hypothesis that **cell phone use** has a negative effect on driving performance and road safety as it was proved that while talking on the cell phone lateral position variability was significantly increased
- **Conversation with the passenger** did not significantly affected the position of the vehicle
- **Female middle aged/older** drivers while driving at urban areas achieved the highest lateral position variability

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