

Interactions between Visuospatial Attentional Demands and Working Memory Load while Driving

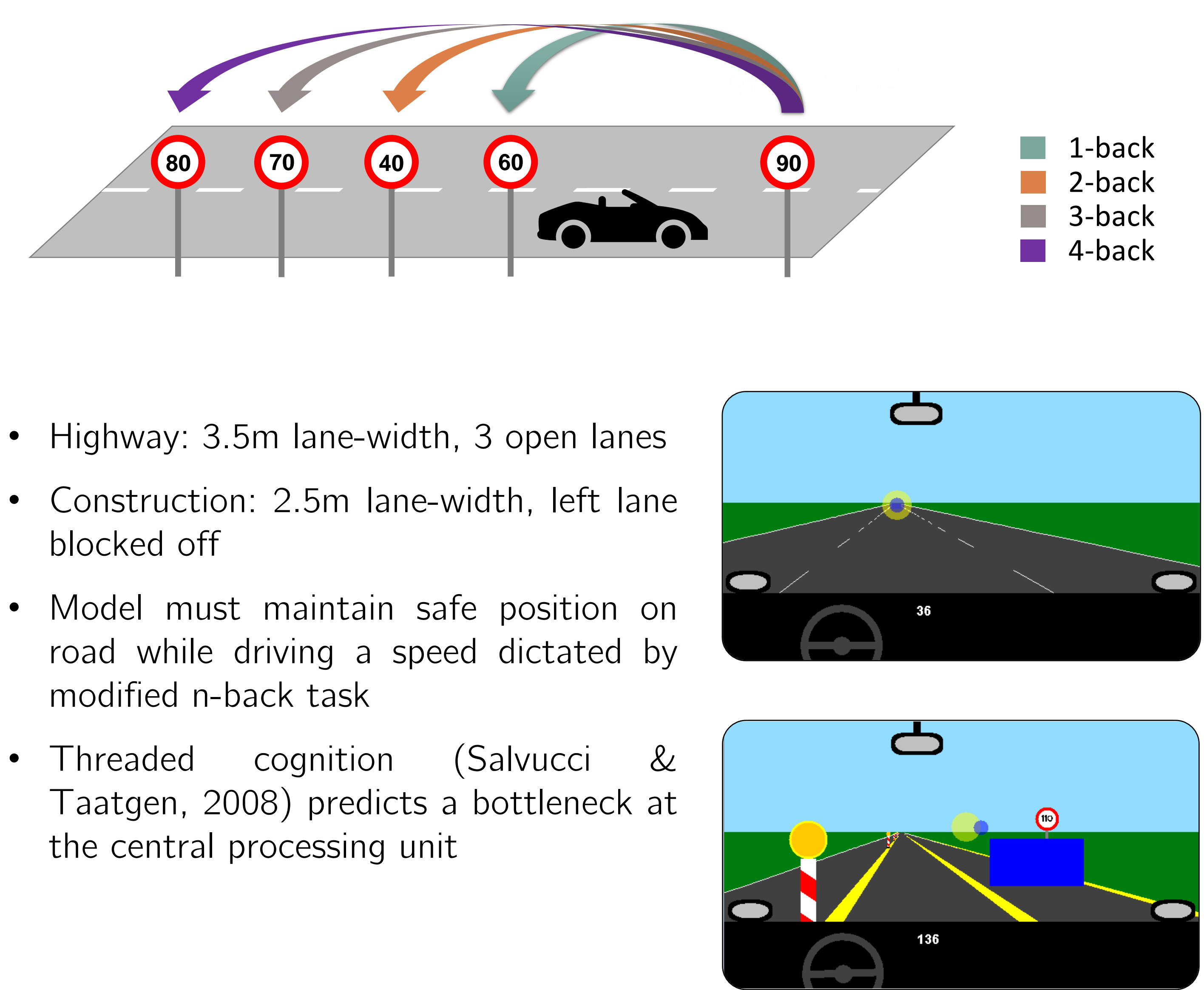
Moritz Held^{1,2}, Jelmer Borst¹, Anirudh Unni², Jochem W. Rieger²

¹University of Groningen, Bernoulli Institute | Department of Artificial Intelligence
²University of Oldenburg, Department of Psychology | Department of Applied Neurocognitive Psychology

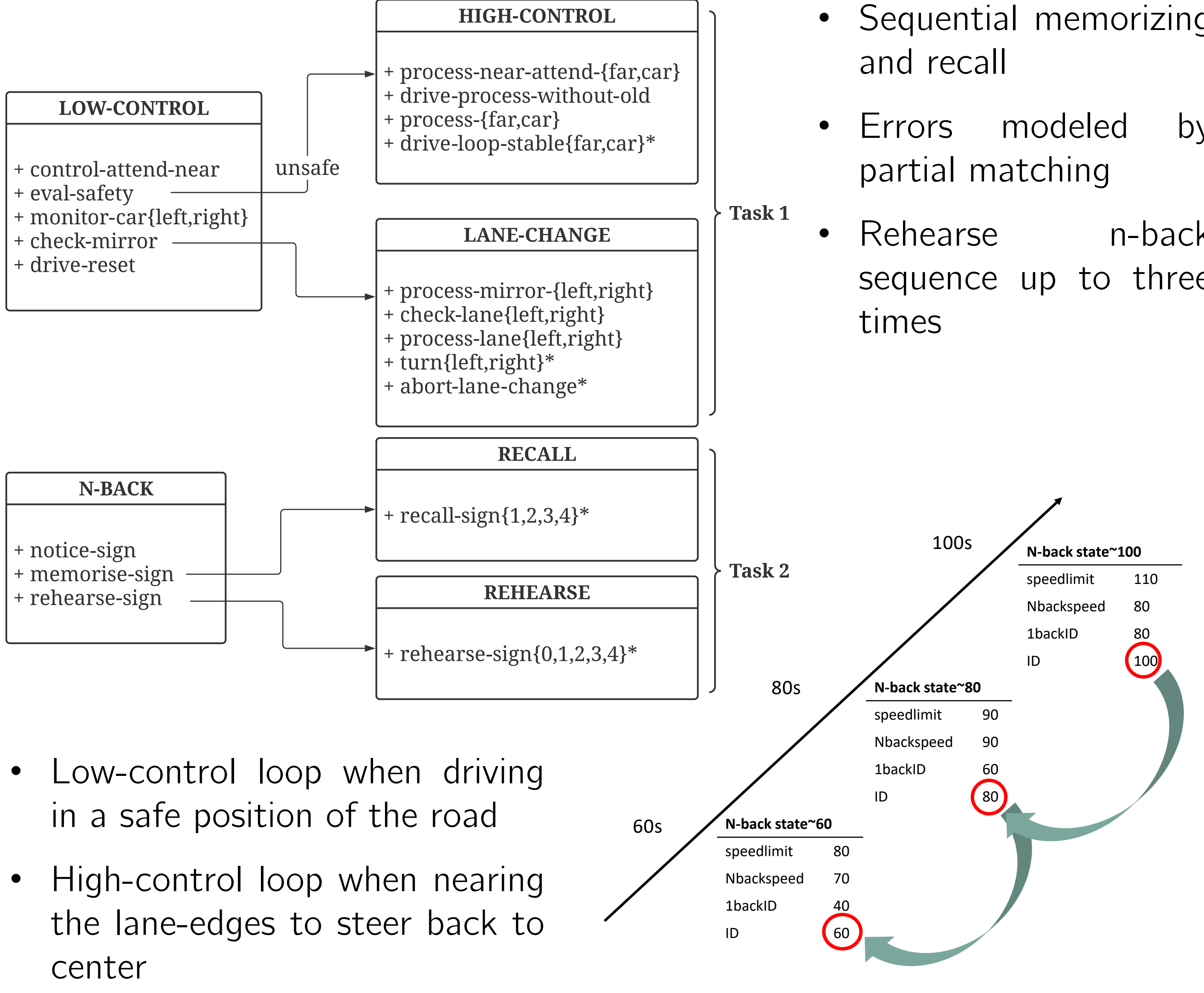
Introduction

A long-held belief in autonomous driving research is that more automation will equate more safety. A contrary approach is adaptive automation, which in the context of driving describes an interactive man-machine system that adapts the level of intervention by the machine depending on the momentary cognitive load of the driver. To realize such a system, the cognitive workload must be able to be predicted while driving. Attempting this, Unni et al. (2017) and Scheunemann et al. (2019) found an interaction between the cognitive concepts working memory load (WML) and visuospatial attention while driving. We adapted the driving model by Salvucci (2006) to investigate this interaction.

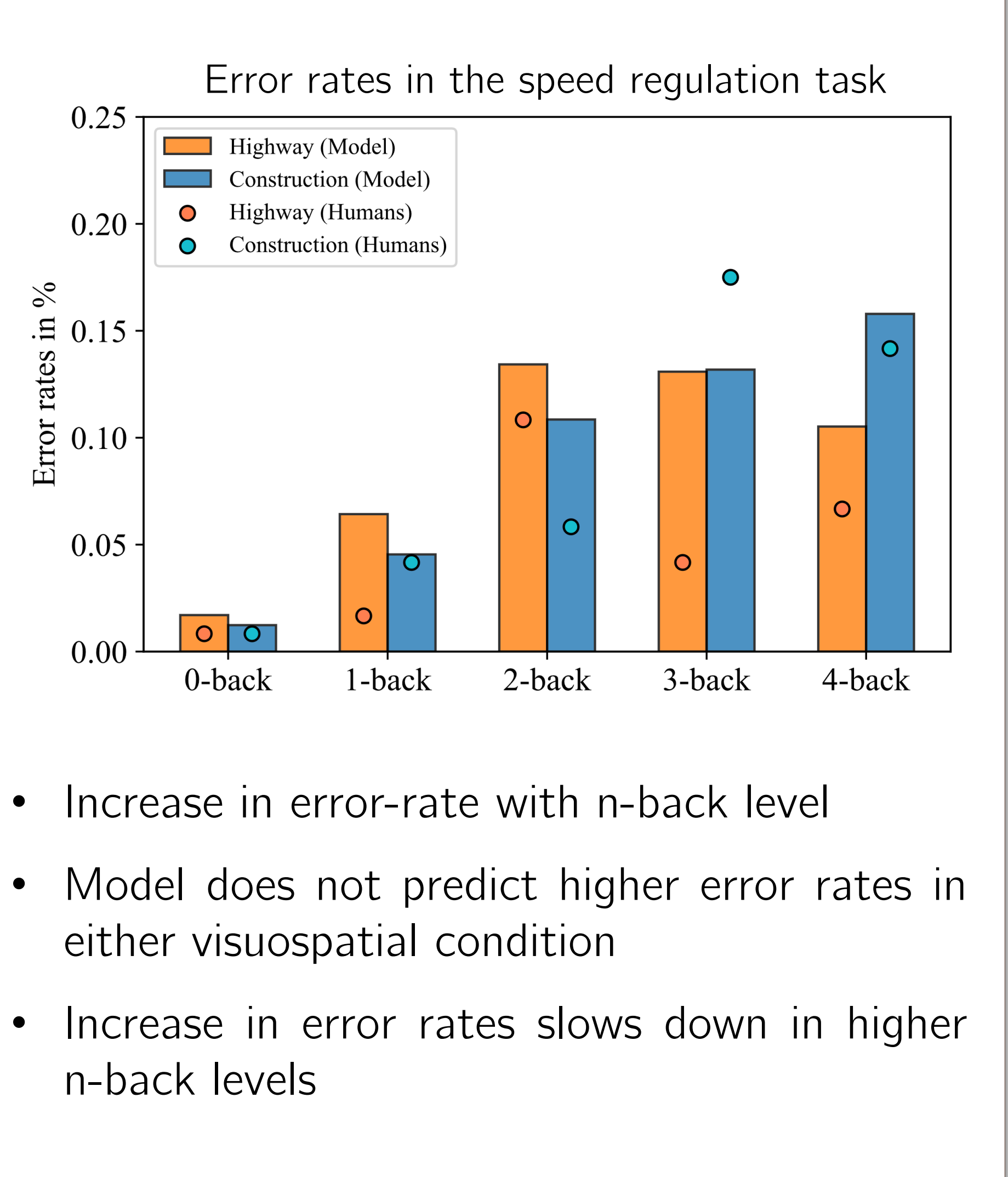
Experimental Design



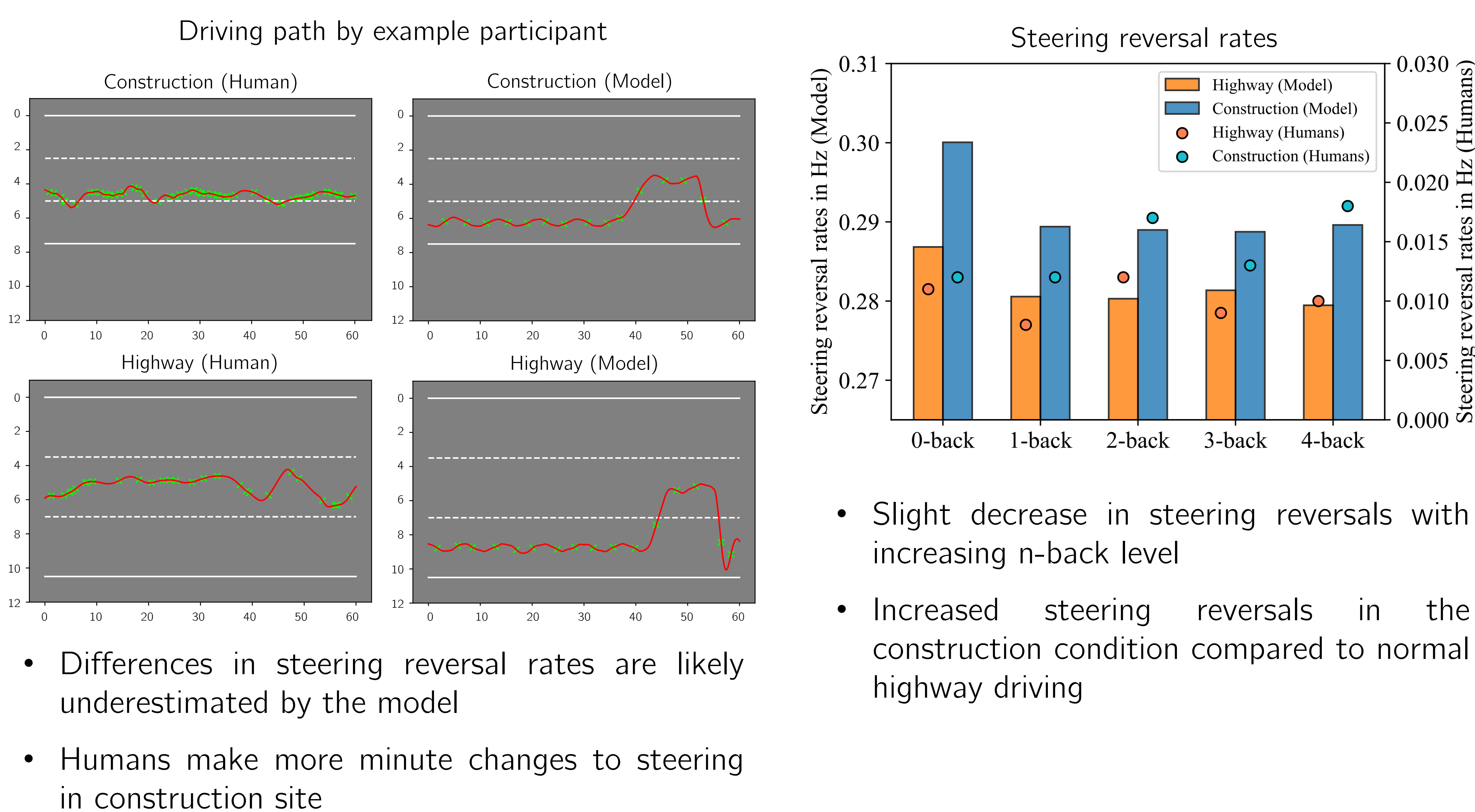
Model



N-back Performance



Driving Behavior



Conclusion

- The model is able to show how both tasks compete for available resources as driving behavior is influenced by n-back level
 - contention of resources to procedural memory by the central processing unit
- The model shows increased steering reversal rates in the construction condition.

Limitations and Open Questions

- Some model parameters had to be estimated due to lacking data
- We are analyzing new data from a study with human participants giving further insight into workload and visual demands using eye-tracking
- How does increasing the visuospatial demands impact speedometer checks?
- Do recall and rehearsal strategies remain consistent over n-back levels?

