

A First Investigation of Truck Drivers' Preferences and Behaviors Using a Prototype Cooperative Adaptive Cruise Control System

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Introduction

- Cooperative Adaptive Cruise Control (CACC) enables shorter vehicle following distances than traditional ACC due to enhanced string stability
- CACC can increase traffic density, relieve traffic congestion, and increase energy efficiency.
- The impacts of CACC on drivers' experience and performance are still largely unexplored.

On Road Experiments

Participants

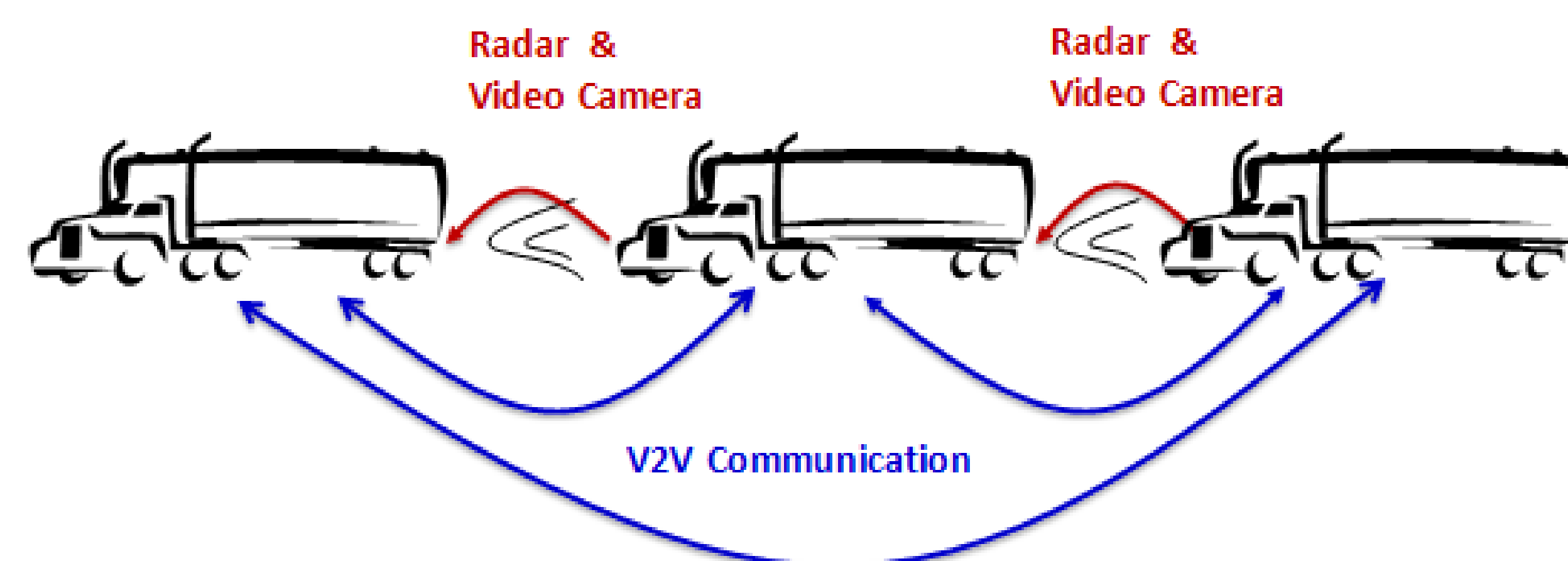
- 9 professional fleet truck drivers from the US and Canada

Trucks:

Volvo Class 8 trucks with PATH developed CACC (Cooperative Adaptive Cruise Control) capabilities



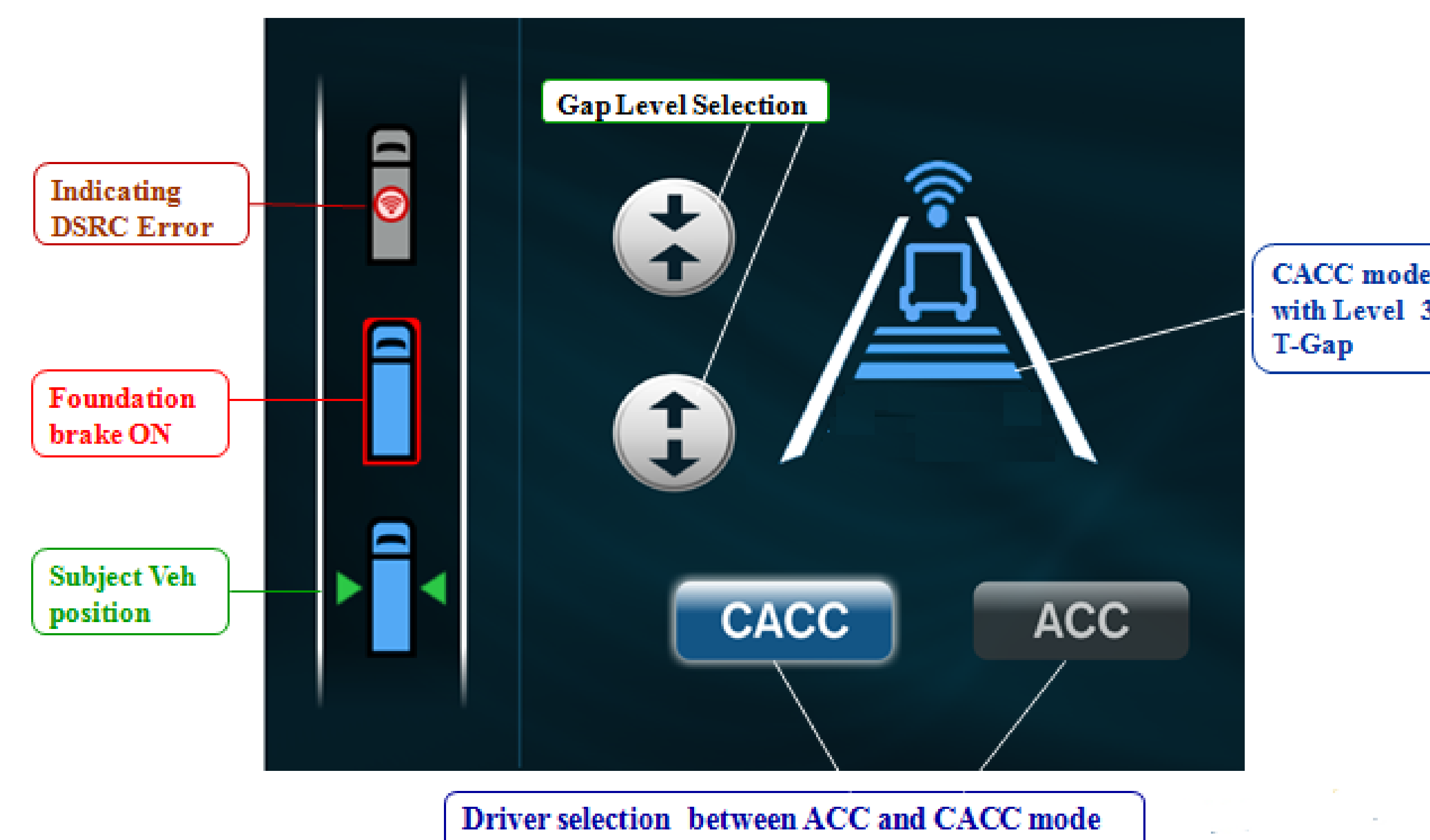
DSRC Communication



Driver-CACC Interaction



Driver-Vehicle Interface (DVI)

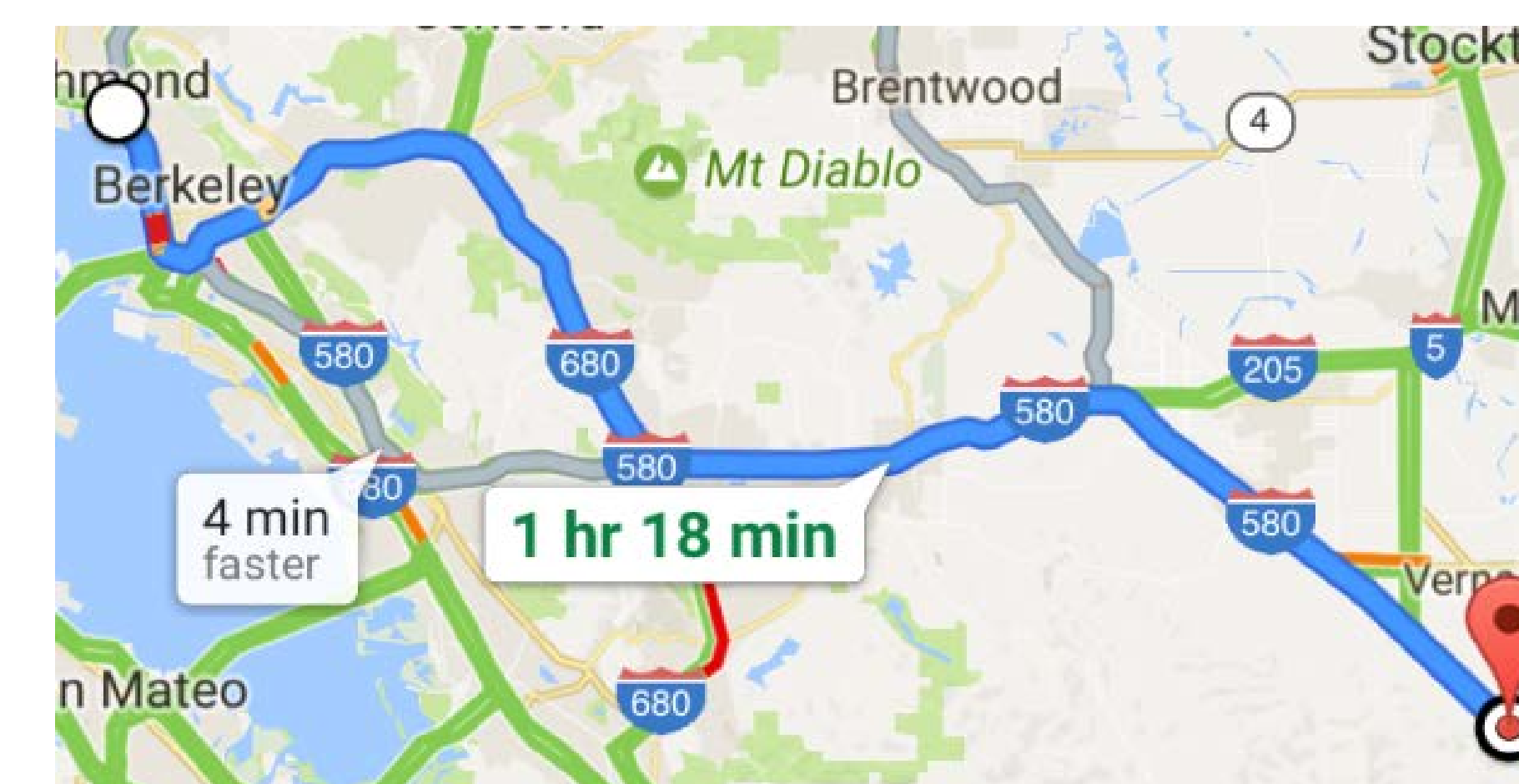


Time Gap Selection Built-in

Level	1	2	3	4	5
CACC	0.6	0.9	1.2	1.5	1.8
ACC	1.1	1.3	1.5	1.7	1.9

Test Route

From Richmond:
I580 → Highway 24
→ I-680 → I-580 →
I-5



Task Procedure for Drivers

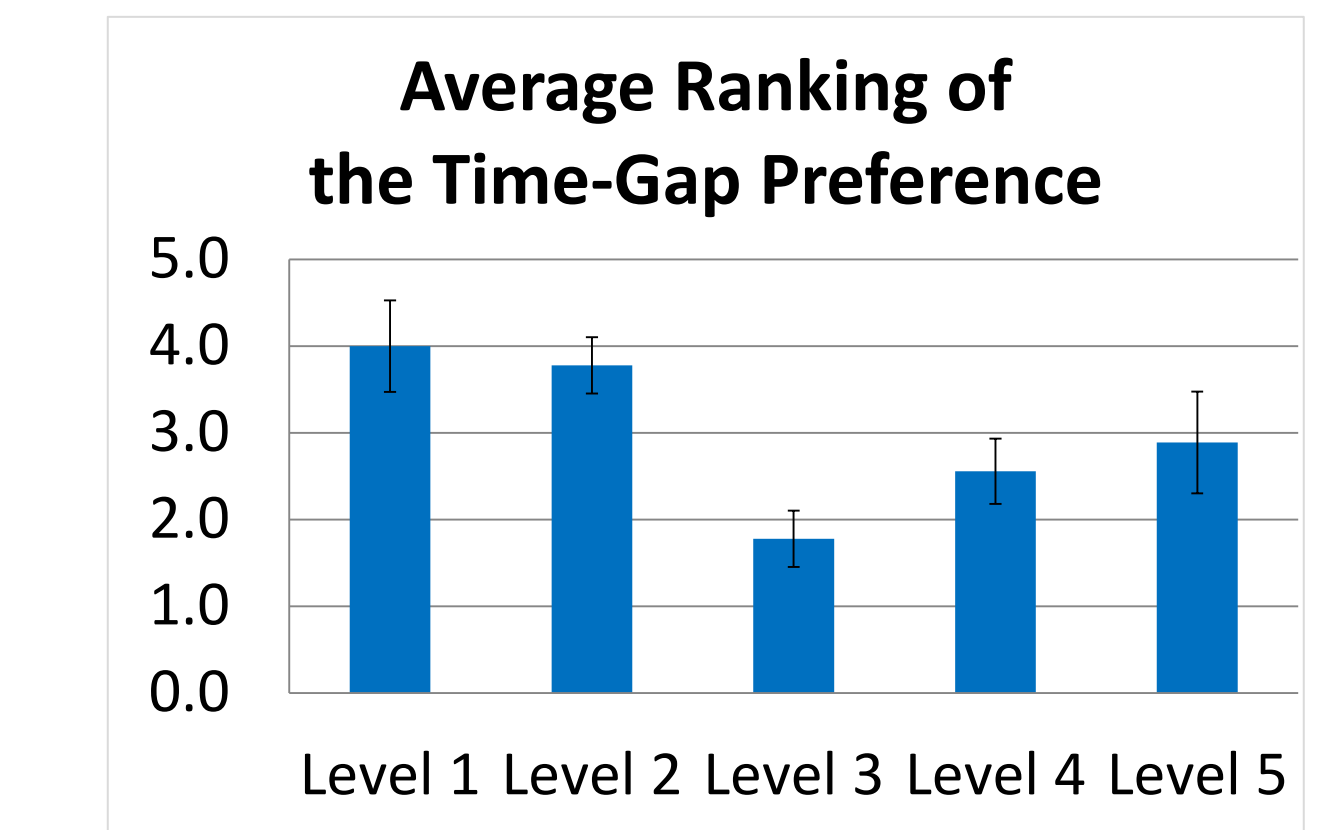
- Training before Walnut Creek
- After Walnut Creek, drivers free to choose preferred time gap
- Switched driver position at Westley
- Drove back via the same route).

Test Results

Driver Demographic

Mean Age	48
Number and Gender	9 Male
Familiarity with ACC	1.4 / 7
Familiarity with collision warning systems	2.1 / 7
Familiarity with truck platoon	0.7 / 7

T-Gap Preference: Levels 3 & 4



Truck Position Preference in a CACC String

- 5 drivers didn't notice the difference between 2nd & 3rd
- 2 noticed the difference in braking system performance
- Only 1 driver reported that truck position affected his road vision and he preferred the 3rd truck

Cut-in and Road Grade Effect

Debriefing Question	Results
Comfort with CACC response to cut-in	5.2 / 7
Trust in CACC response to cut-in	5.0 / 7
Reliability of CACC on upgrades	4.6 / 7
Reliability of CACC on downgrades	3.1 / 7

Concluding Remarks

- A first human factors study on cooperative adaptive cruise control for truck platooning
- Participants preferred time-gaps 1.2 s and 1.5 s the most
- The impact of truck position is very limited on driver vision
- Reliable CACC response to cut-in
- Less reliable CACC response to road negative grade

Acknowledgments

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