



Evaluating eye movements in an on-road study to detect driver distraction



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Abstract

Many devices used while driving pose hazards as the driver's attention is diverted from the roadway. This research aims to use driving metrics in an algorithm to detect distraction and help guide drivers' attention back to the road.

Introduction

- In 2008, driver distraction was reported in 16% of all fatal crashes contributing to 5870 deaths (NHTSA, 2009)
- Activities that draw attention away from driving can increase the likelihood of a crash (McCartt et al., 2006)
- A promising approach to prevent distraction is detection and proper feedback

Methods

Data drawn from MIT AgeLab on-road study in Boston, MA on I-90 (Reimer et al., 2009)



Instrumented vehicle (MIT AgeLab AwareCar)

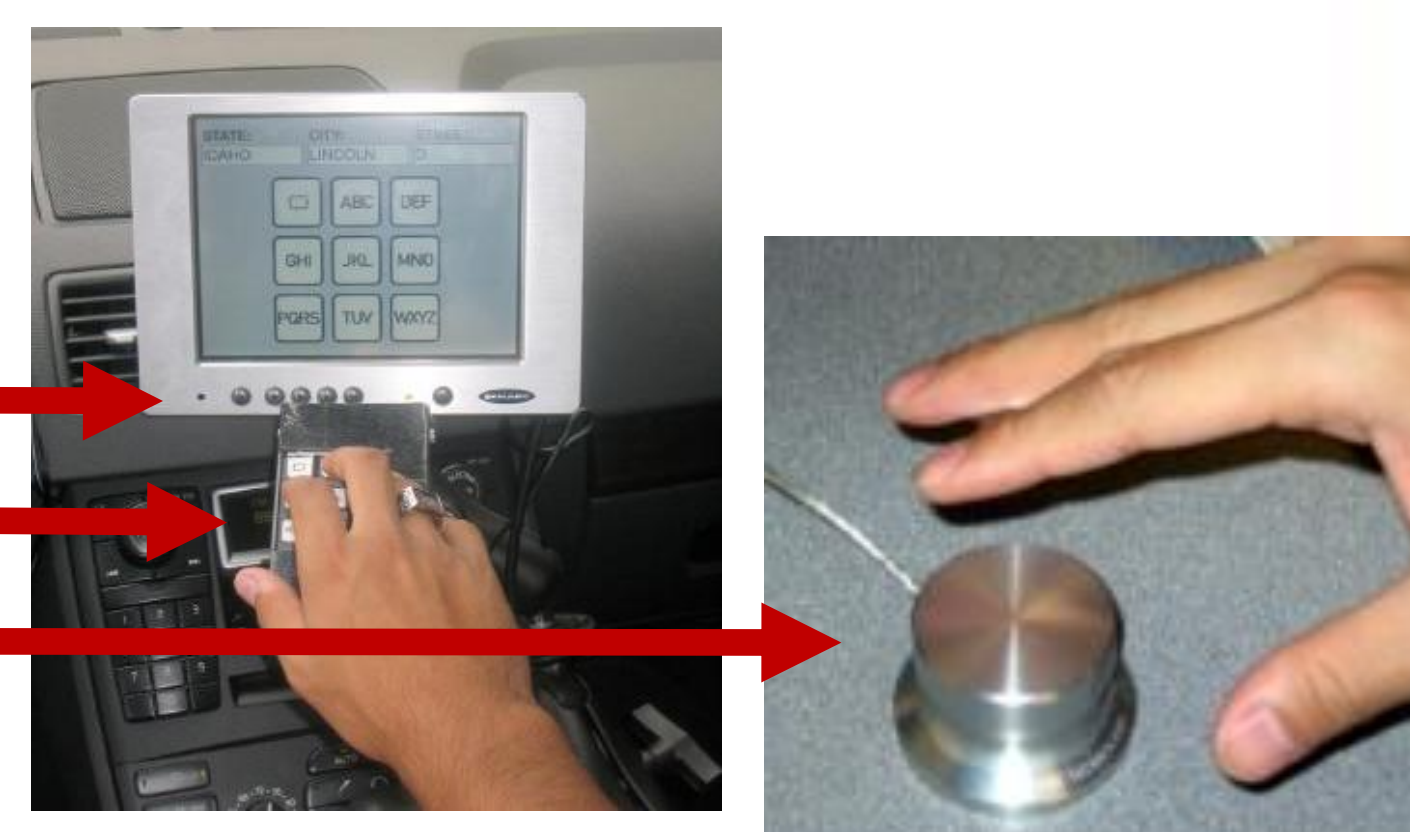


FaceLab 4.2 Eye tracking equipment

Tasks

Surrogate navigation system required destination entry using:

- (1) touch screen
- (2) keypad
- (3) scroll wheel



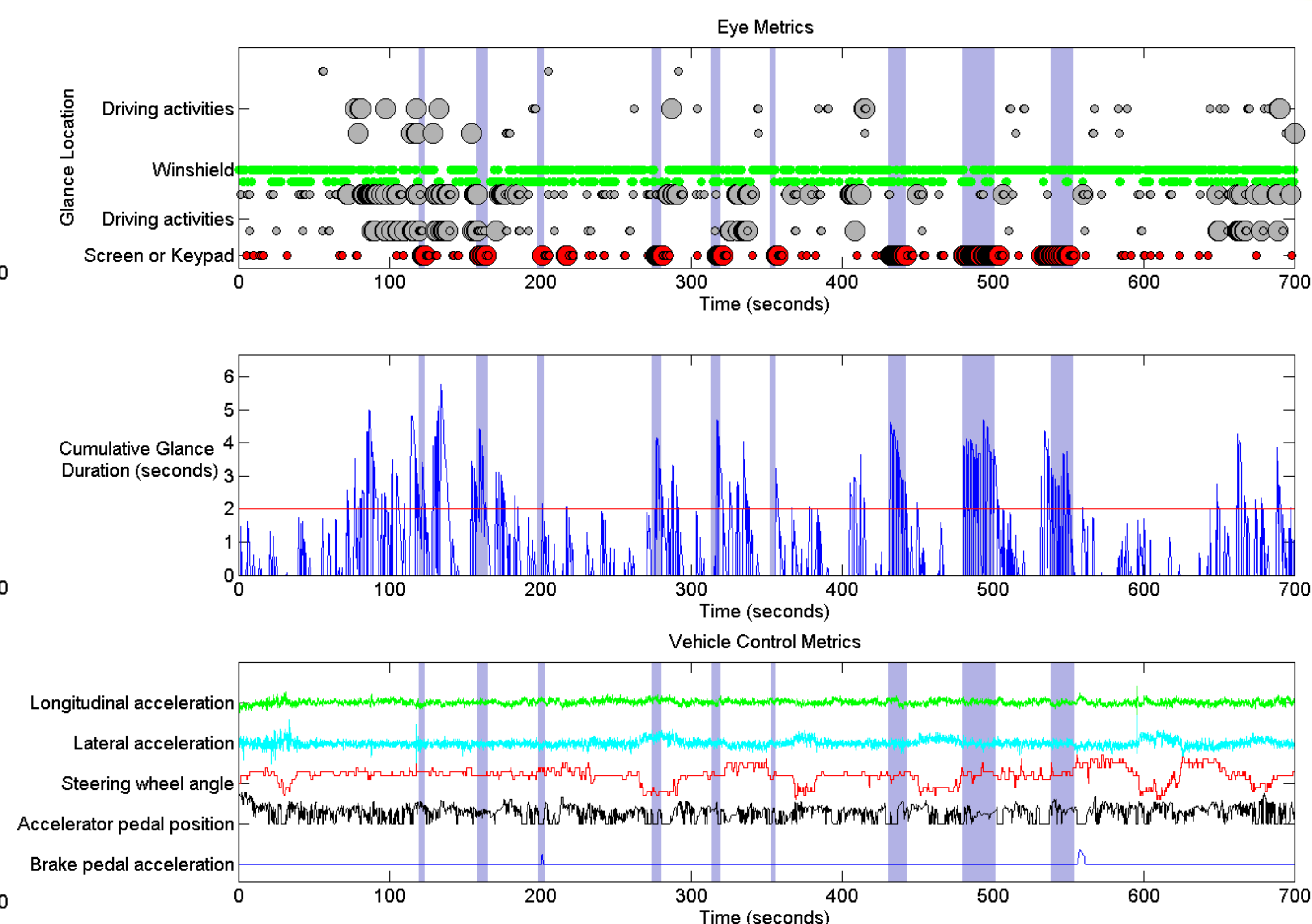
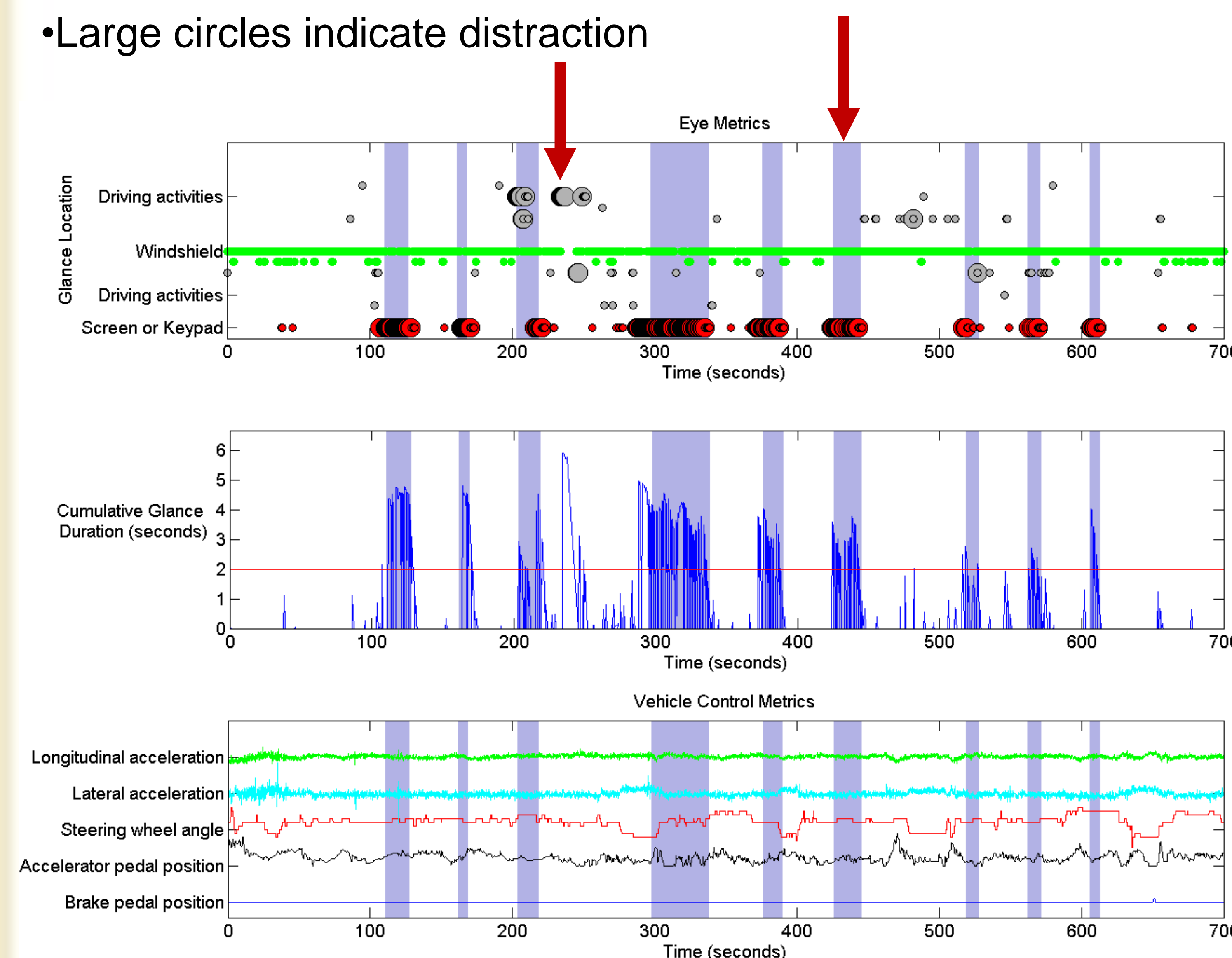
Participants

24 drivers, ages: 22-28 years old with at least 3 years of driving experience

Data Analysis

Analysis of 2 participants' data with distractions identified as cumulative glances away from the roadway lasting 2 seconds or more within a 6 second window (Klauer et al., 2006);

- Shaded areas indicate task involvement/interaction
- Large circles indicate distraction



Observations

- Negative correlation between frequency of glances at the roadway and task interaction
- Steering wheel angle was held constant during task interaction followed by occasional steering corrections after task completion
- Accelerator pedal position either held constant or was released during task interaction

Contributions

Practical contribution

- Visual attention can be used in an algorithm to detect distraction
- Designers need to consider improving design features (such as scroll wheels) to alleviate distraction
- The allocation of visual attention may be a potential indicator of distraction in other realms such as aviation and healthcare

Theoretical contribution

- Level of distraction is correlated with task engagement and task completion time
- Visual distractions cause inattention to important aspects of driving and can lead to lapses in vehicle control