The Relationship between Driver Performance and Traffic Environments using Functional Data Analysis

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Introduction

- **Background**
  - Complex driving environments result in large variability in driving performance.[1]
  - Driving through tunnels can negatively impact the driver's workload and driving performance.[2]

- **Research Goal**
  - Examine the relationship of driver performance and traffic environments.

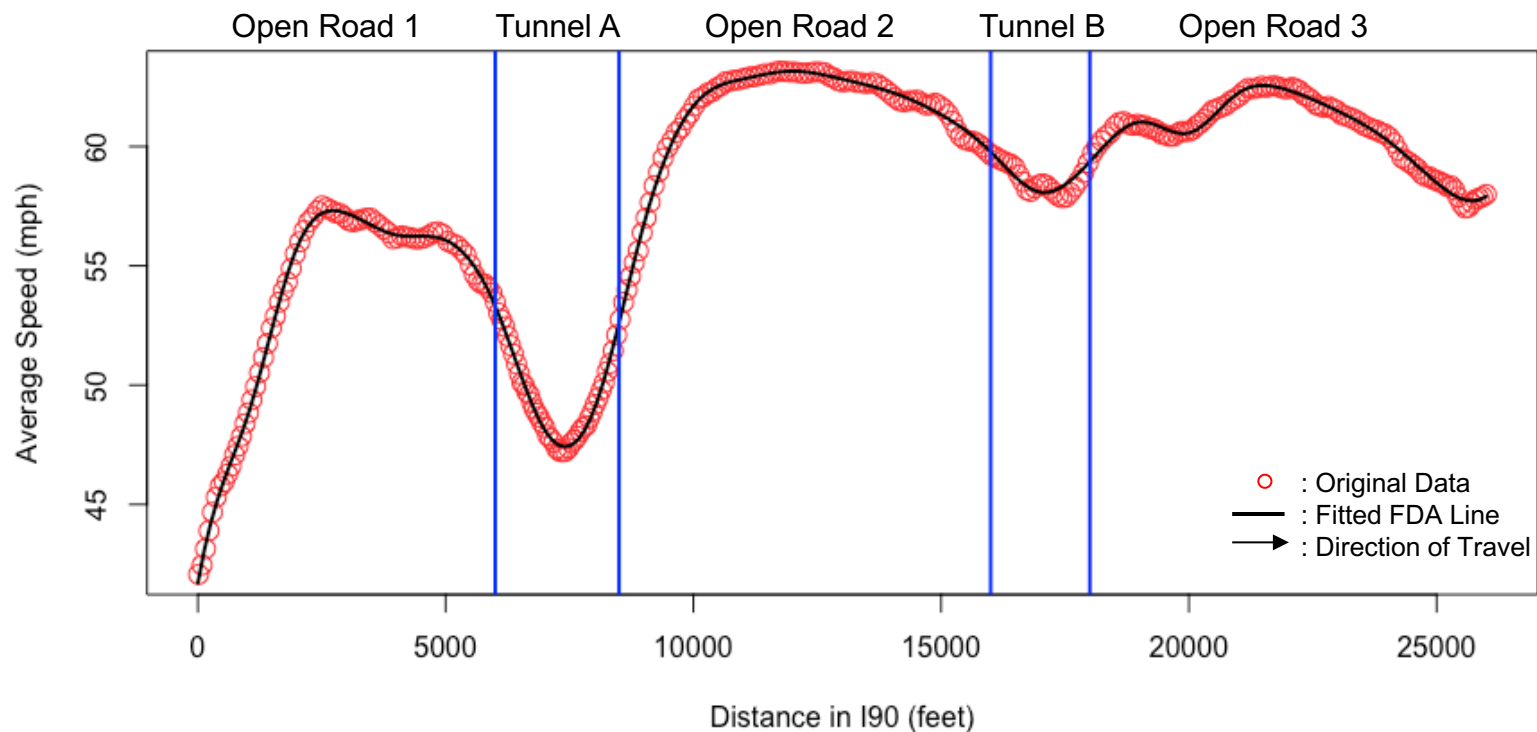

Road segments of naturalistic driving study

[1]Miller et al (2015) TRR
[2]Lemke et al (2000) TRR

Methodology & Results

- ## Functional Data Analysis (FDA)
 - Capture trend in average speed profile

- Functional Principal Component Analysis (FPCA)

  - Locate variability in driving performance associated with traffic environment

  - First three explained 80.8% of the variability

  - FPCA Function 1

    - Most variation is on Open Road 3 and leaving tunnels.

  - FPCA Function 2

    - Most variation is in Tunnel A.

  - FPCA Function 3

    - Most variation occurs when entering the tunnels.

FPCA Function 1

FPCA Function 2

FPCA Function 3
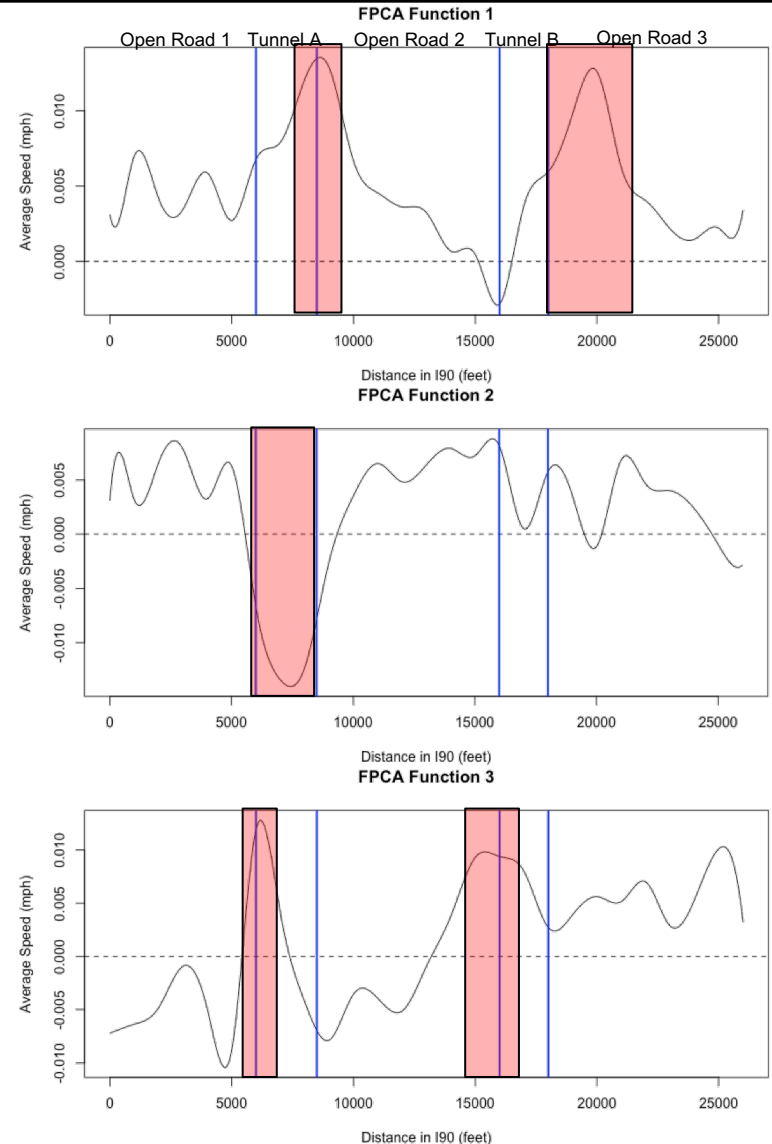
Conclusions

- Drivers tend to slow down when they enter tunnels
- Drivers tend to speed up when they leave tunnels
- Different road conditions impact propensity to speed
- The FPCA reveals where differences in driving performance is most likely to be observed