Investigating the factors influencing cyclist awareness and behaviour: an on-road study of cyclist situation awareness

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Accident Research (USCAR)

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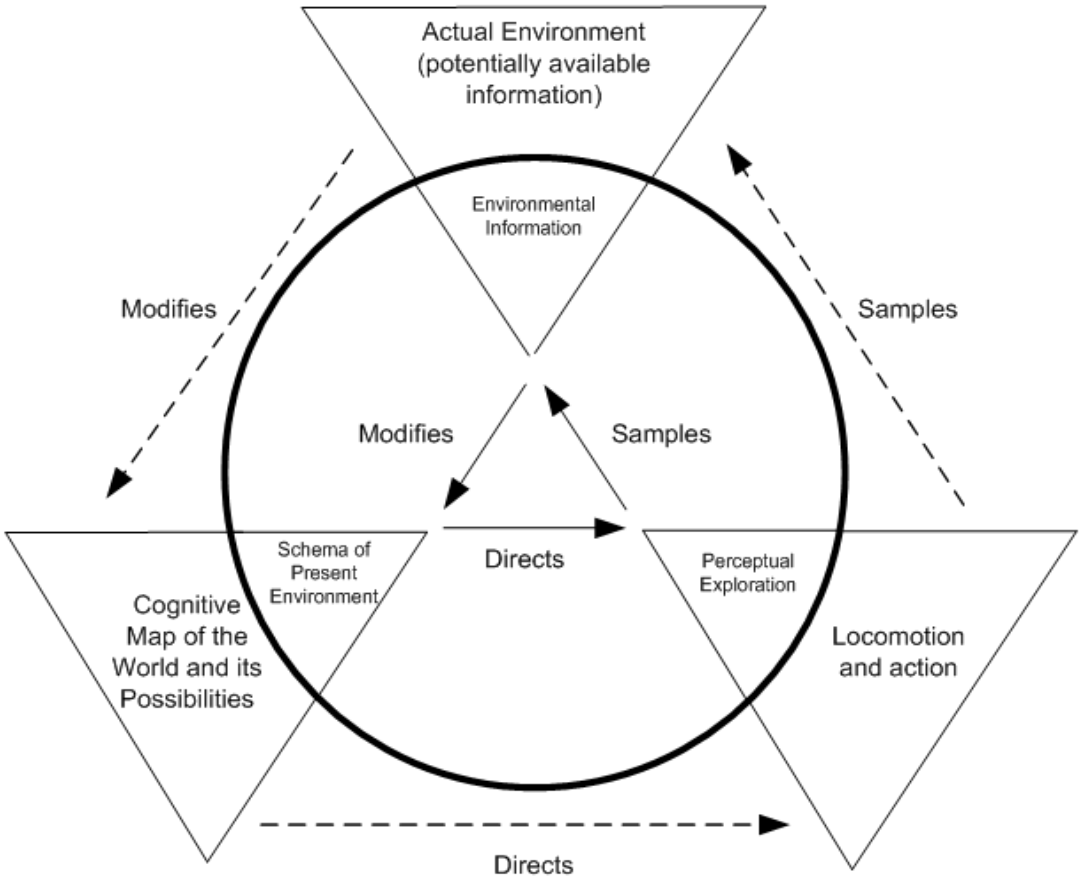
ROAD SAFETY
RESEARCH, POLICING AND EDUCATION
CONFERENCE 2013

Background

- Increased active transport has various environmental, physical and psychological benefits
- Cyclists have greater risk of death than drivers (Pucher & Dijkstra, 2003)
- Situation awareness a key factor in driver-cyclist collisions (but mainly considered from the drivers point of view)
- Little research examining cyclist cognition and decision making or the influence of road design on cyclist cognition and decision making (***in the wild***)

Situation awareness and the perceptual cycle



Neisser (1976); Smith and Hancock (1995); Salmon et al (2009)

Salmon et al (2013)

On-road study of cyclist situation awareness

- What does cyclist situation awareness comprise in different road environments?
- What factors influence cyclist behaviour and decision making in different road environments?
- How does road design currently support cyclist situation awareness, decision making and behaviour?

Methodology

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- 20 participants
  - 15 Male, 5 Female
  - Aged 18-58 years, mean age =32.4
  - Cycling on average 6.85 hours a week

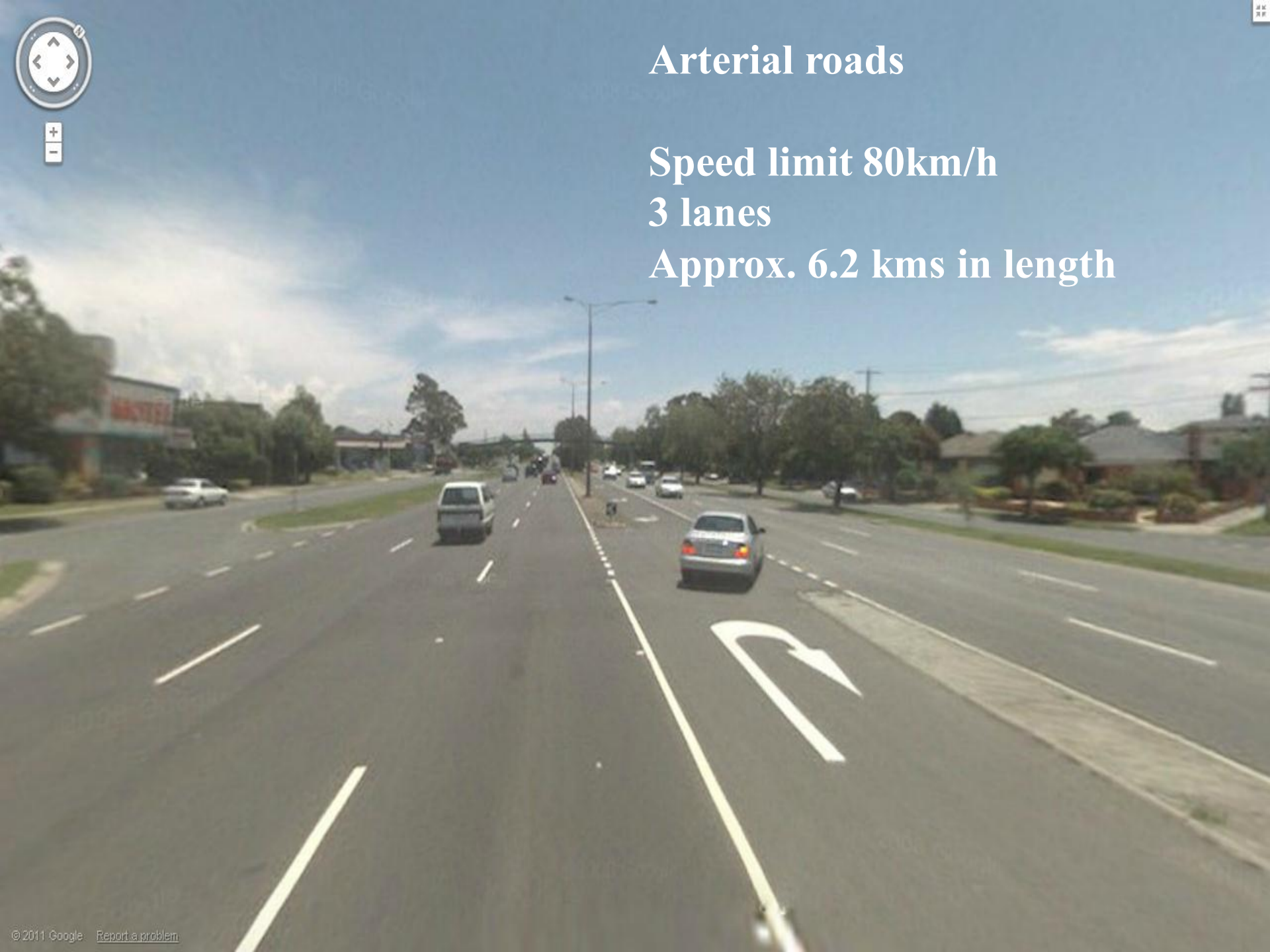
- 15km urban route incorporating major intersections, arterial roads, urban roads, residential roads and a shopping strip

- ATC9K cameras and think aloud protocols

- **Analysis of situation awareness and behaviour** at intersections and along arterial roads and shopping strip

Intersections

15 'major' intersections
Mix of fully signalised, partially signalised and non-signalised

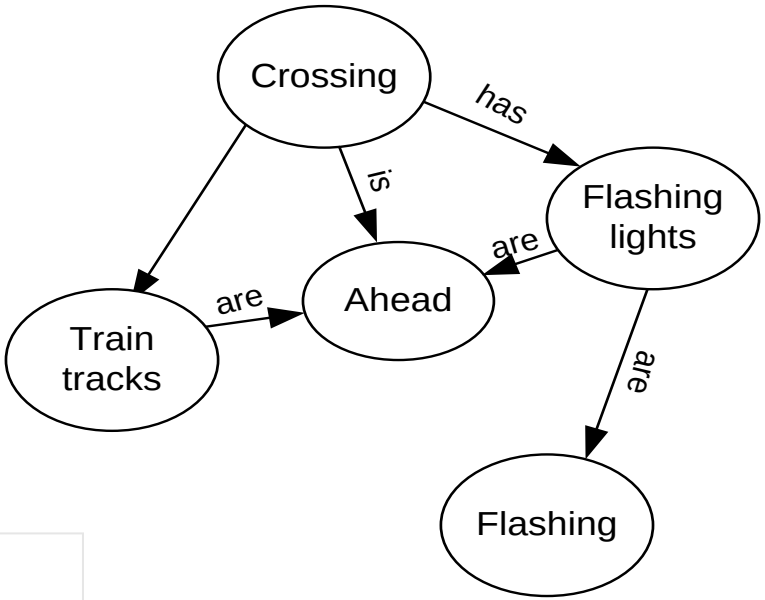

Arterial roads
Speed limit 80km/h
3 lanes
Approx. 6.2 kms in length
© 2011 Google
Report a problem

Shopping strip
Speed limit 60km/h
Approx. 0.5kms in length

Constructing situation awareness networks

- Situation awareness as a network of 'concepts' and relationships between them
- Co… of verbal transcripts

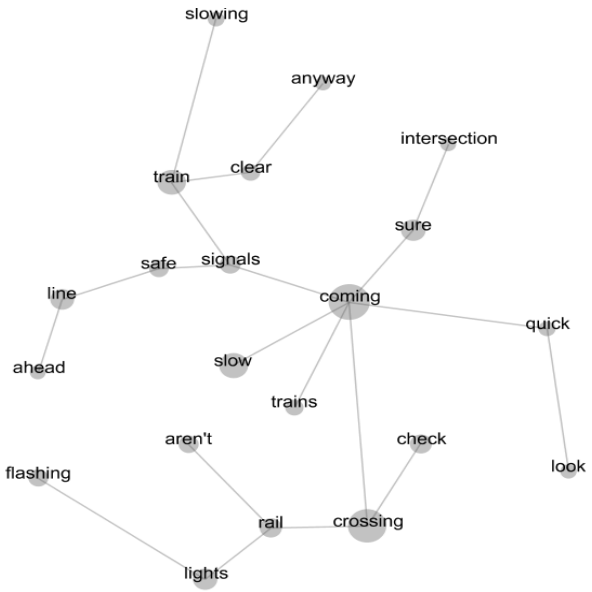
"I can see a crossing and train tracks up ahead. The lights are flashing"



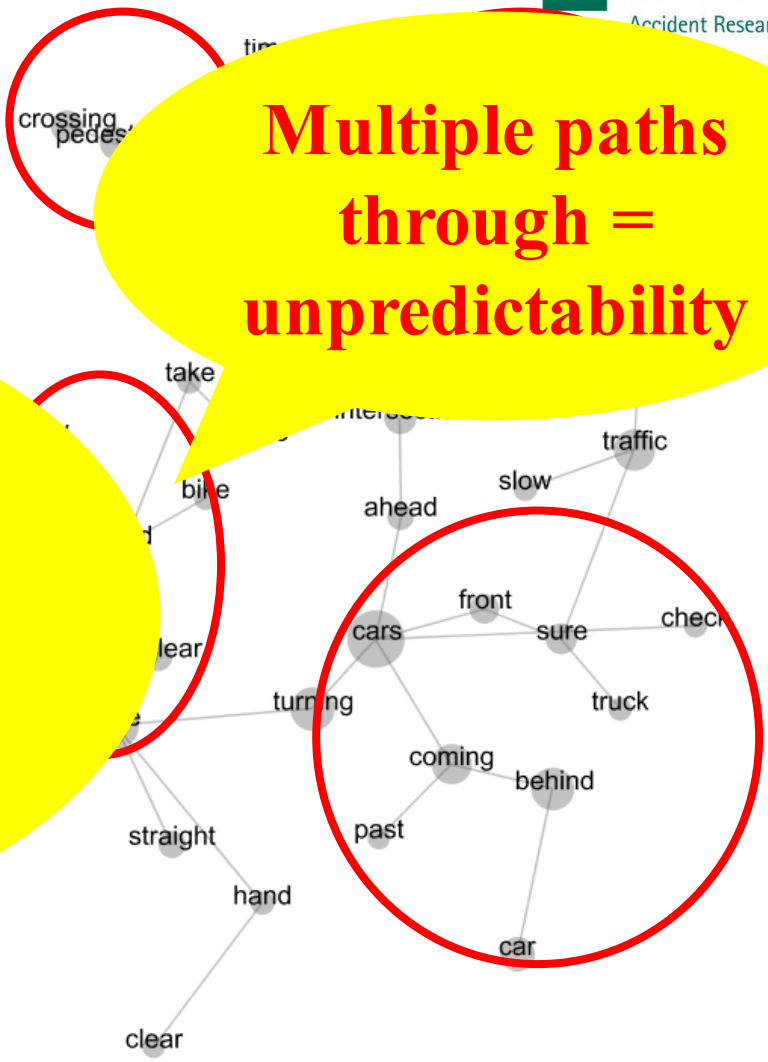
LEXIMANCER
from words to meaning to insight

Situation awareness networks

- Overall networks for each road environment (3)
- Networks for each participant in each environment (60)



Intersections (Overall)



Multiple paths through = unpredictability

Large part of awareness devoted to identifying safest path through the intersection

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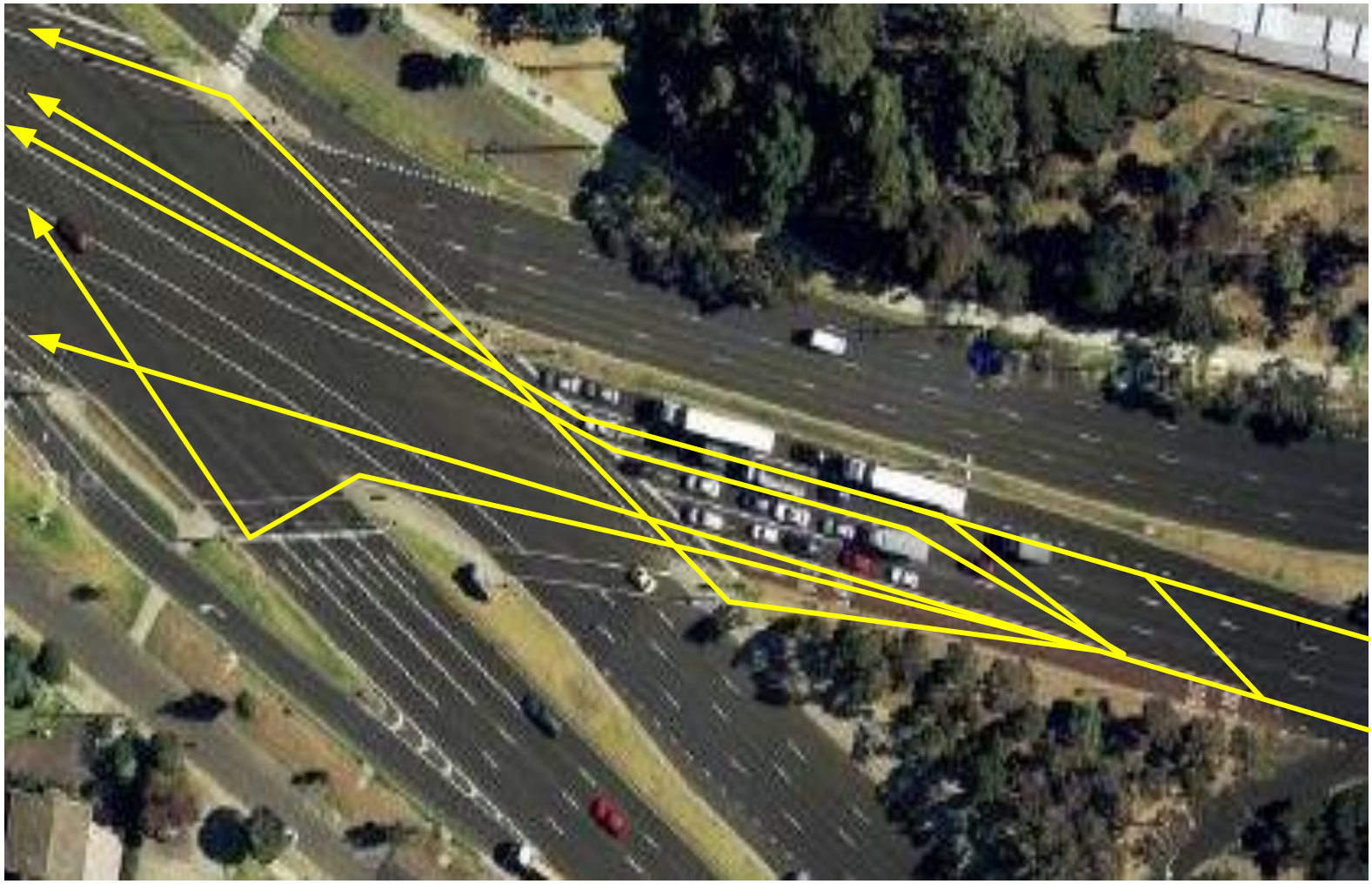
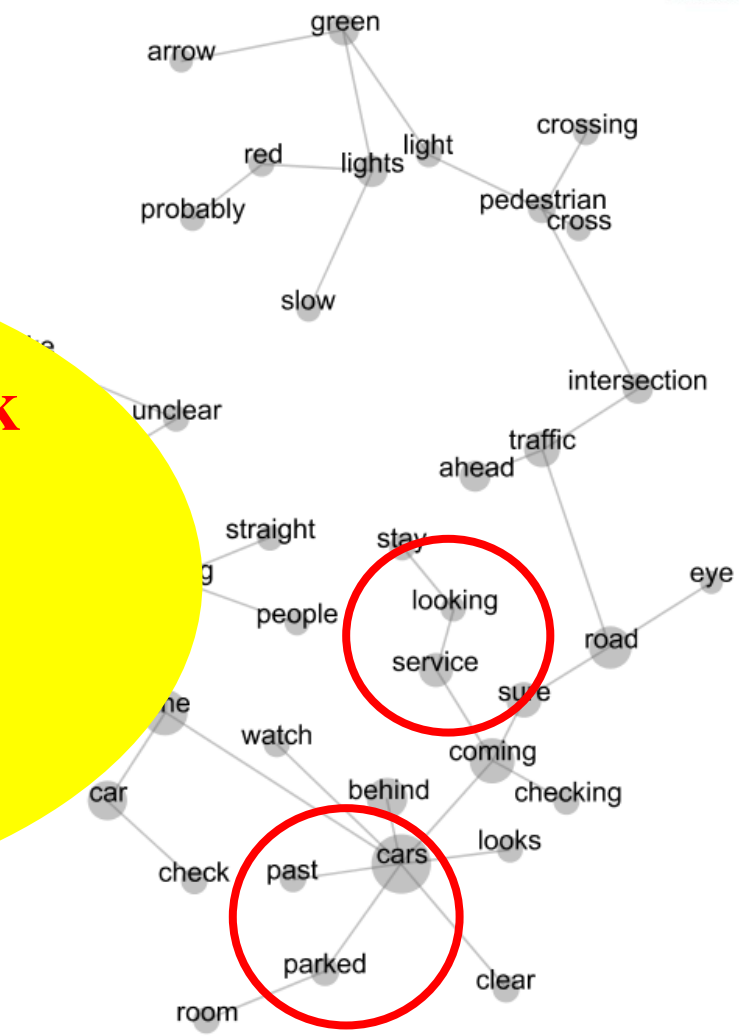
Variance in behaviour



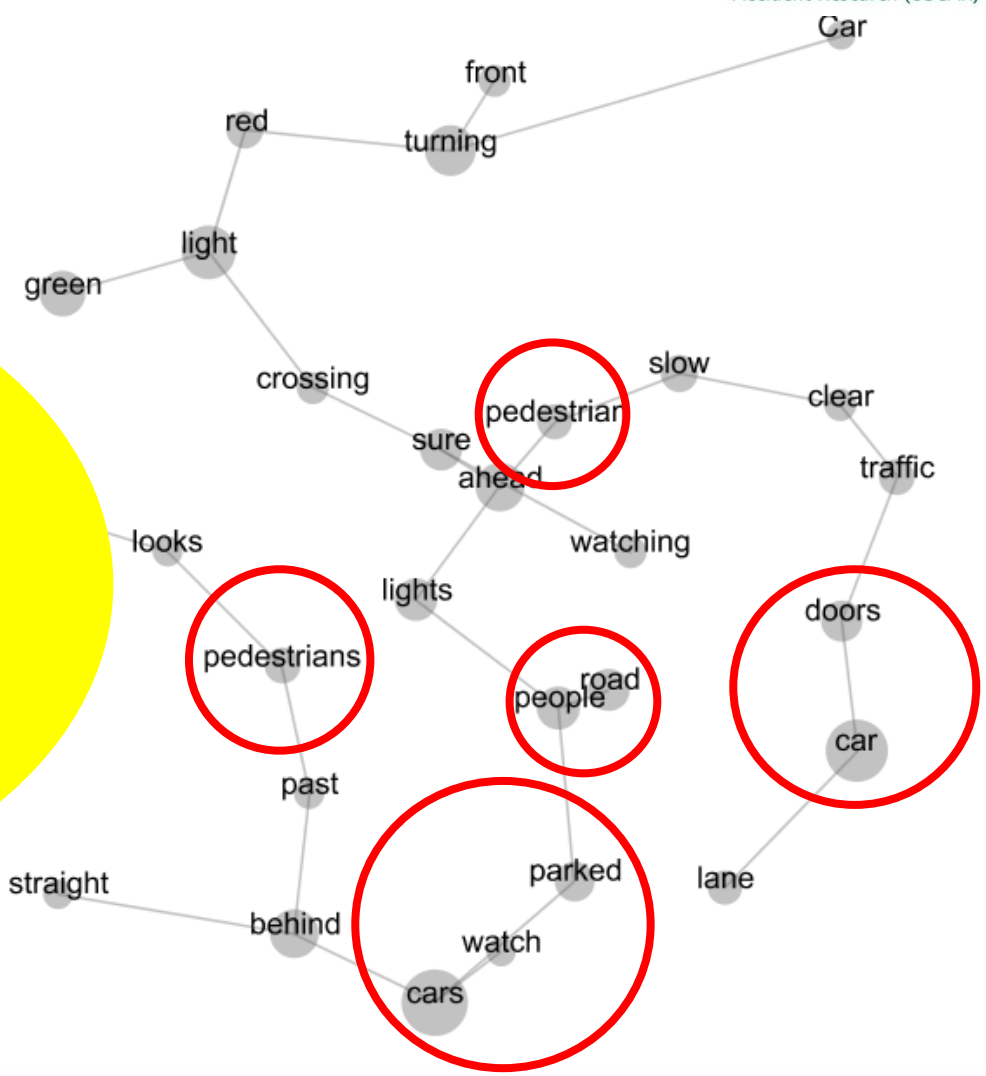
Arterial roads (Overall)

Again part of network devoted to hazard assessment and working out safest path



Shopping strip (Overall)

Attention focussed on non traffic hazards e.g. parked cars, pedestrians



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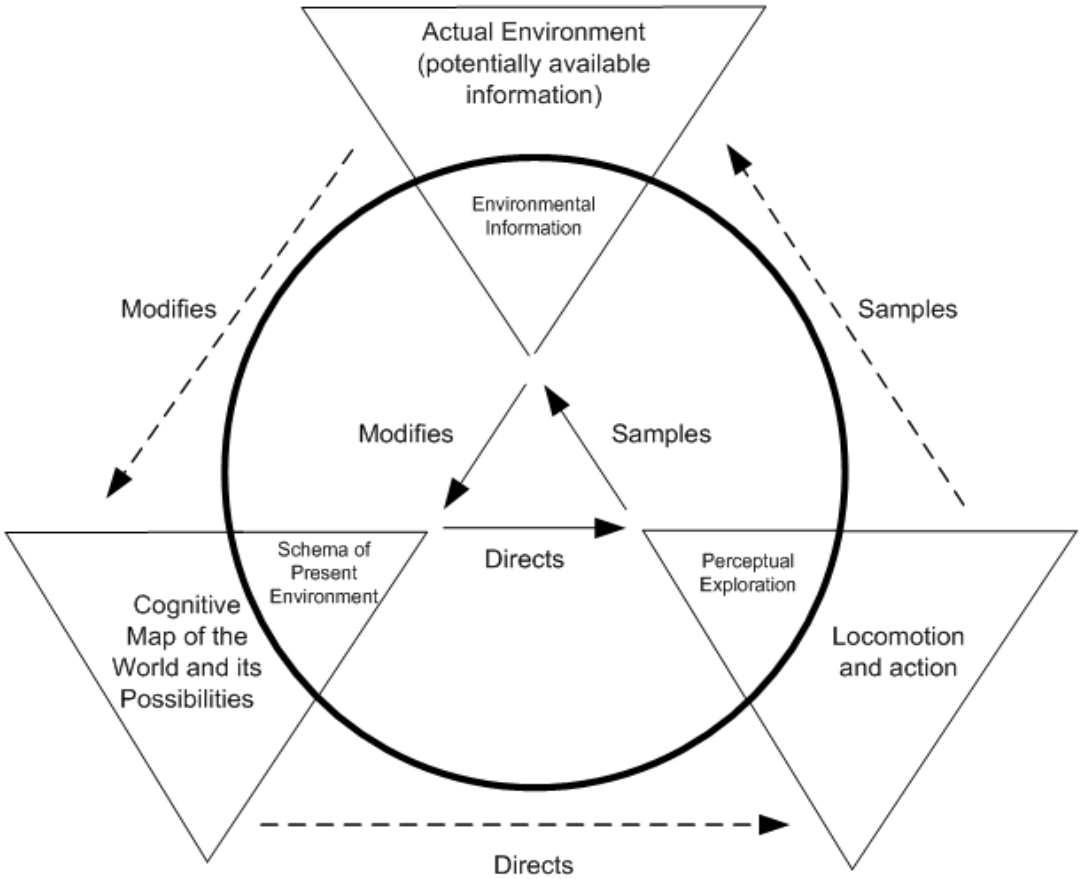
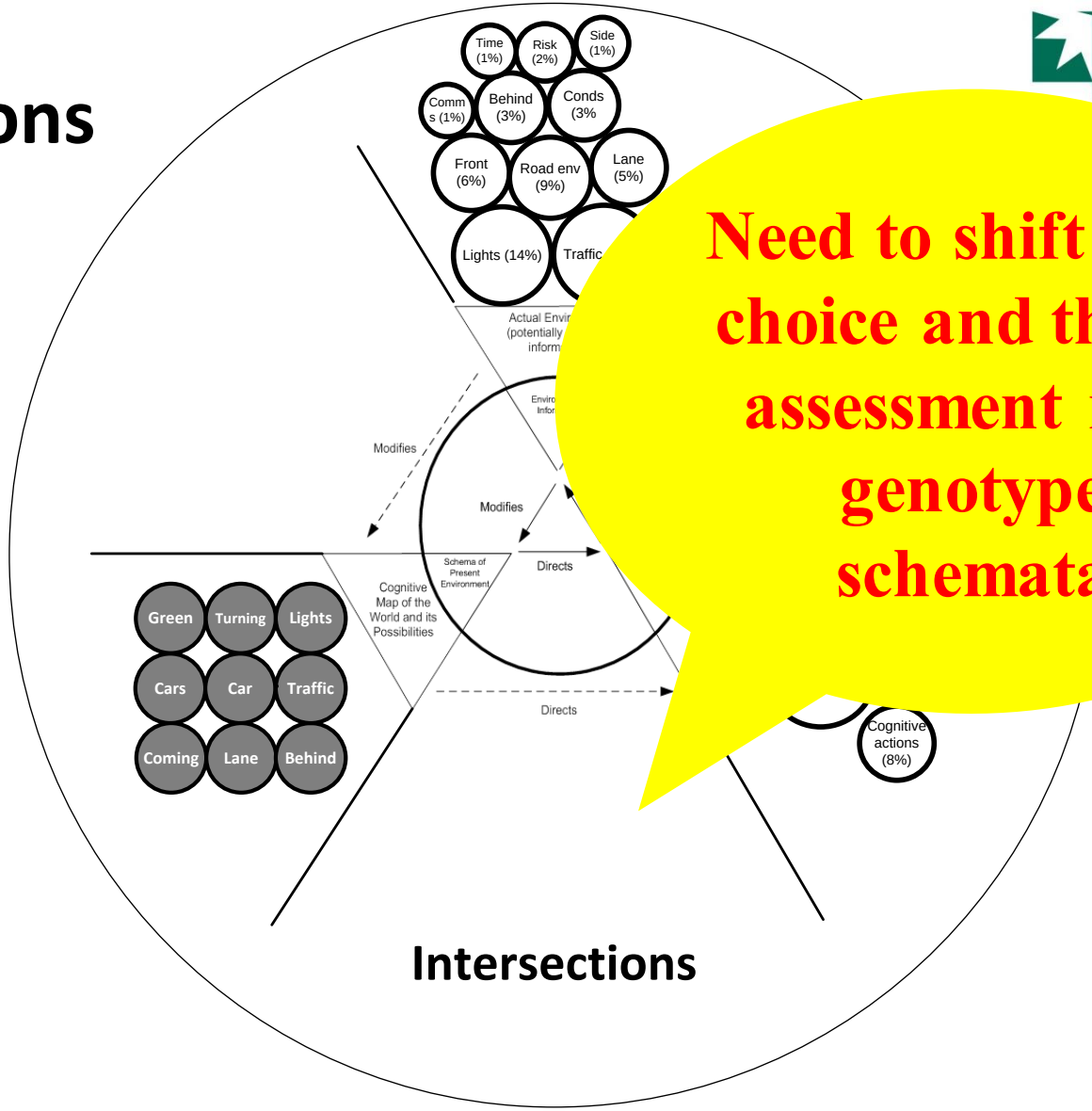
The perceptual cycle for cyclists

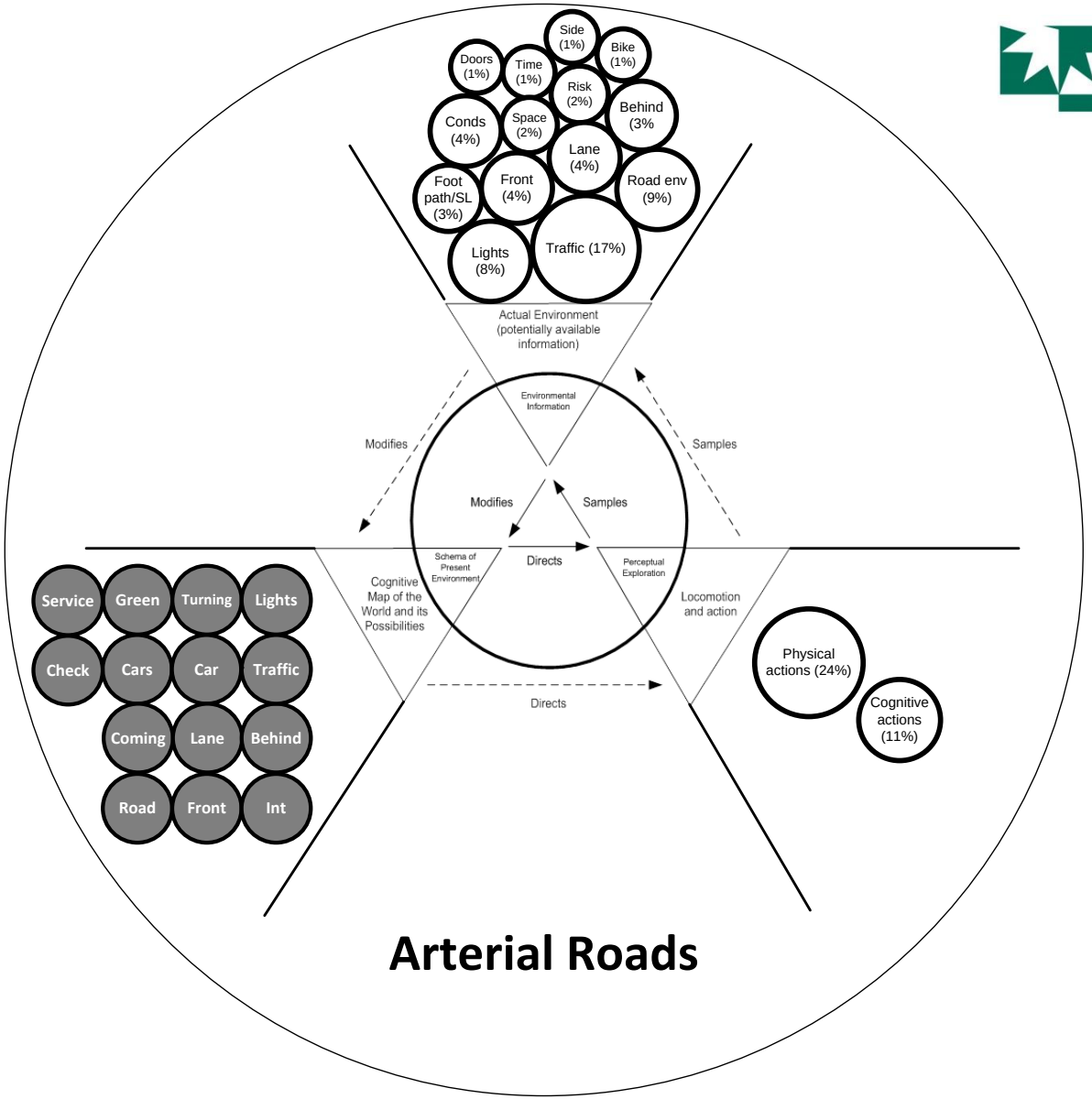


Intersections



Need to shift path choice and threat assessment into genotype schemata

Arterial roads



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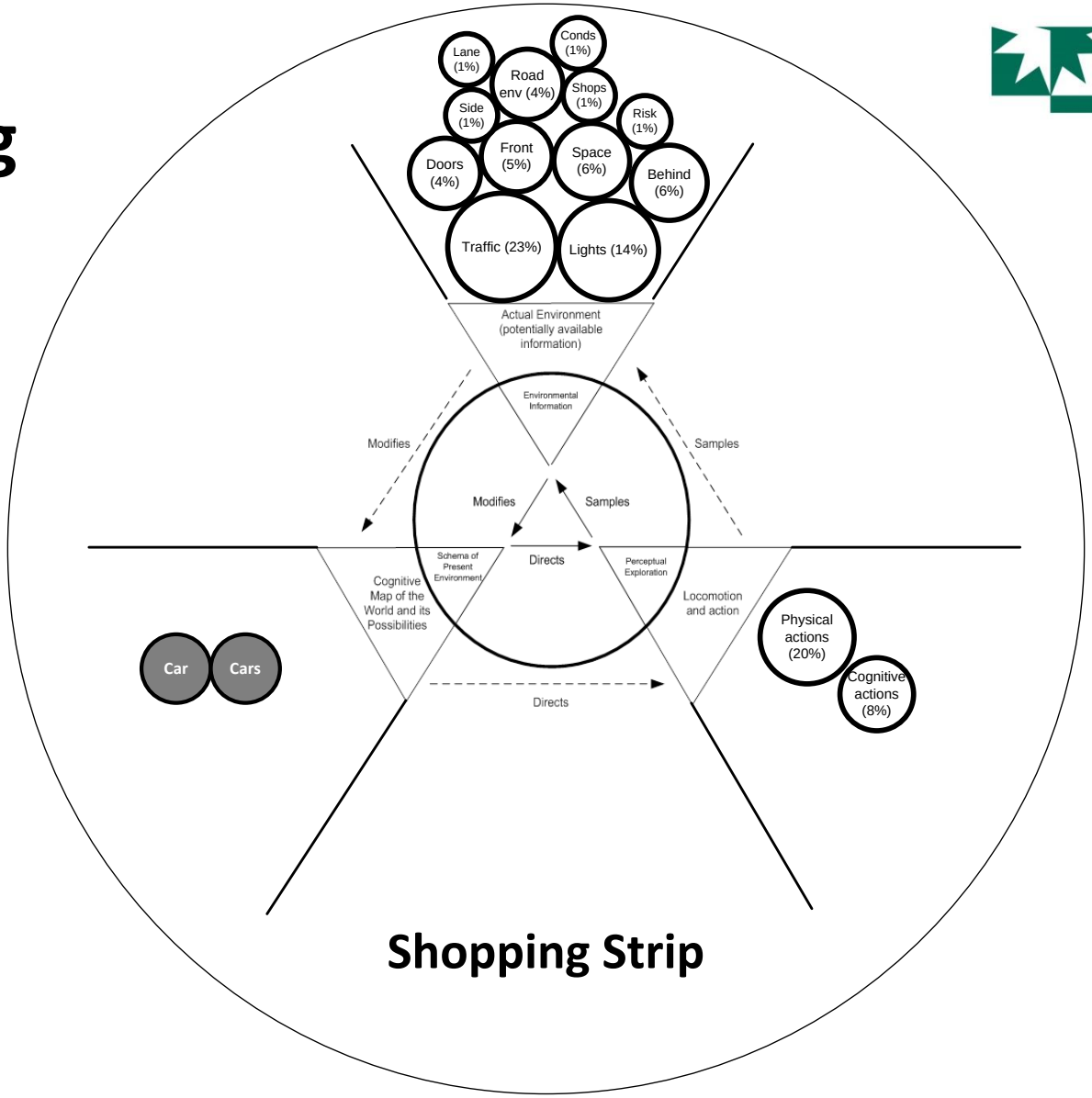
Shopping strip



Discussion

- Cyclist situation awareness comprises concepts related to other road users, own and other road users behaviour, locations, road infrastructure, conditions, time, risk, and communications

- Key focus of cyclist situation awareness is on threats/risk and on choosing safest behaviours in different road environments

- This is interesting for three reasons:
  1. Represents additional workload (often in already high workload situations)
  2. It makes cyclists highly unpredictable
  3. Threat/risk assessment and path choice is design induced

Recommendations and next steps

- Use road design to constraint cyclist behaviour e.g. dedicated cycle lanes
- Use road design to remove threats e.g. parked cars, cycle lanes etc.
- Design intersections to trigger behaviours (remove need for decision point or shift it to earlier in the approach)
- Support drivers' expectancy (schema) of cyclist behaviours
- Deeper analysis of near miss events
- Studies focusing on specific interactions between drivers and cyclists

Acknowledgements

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