

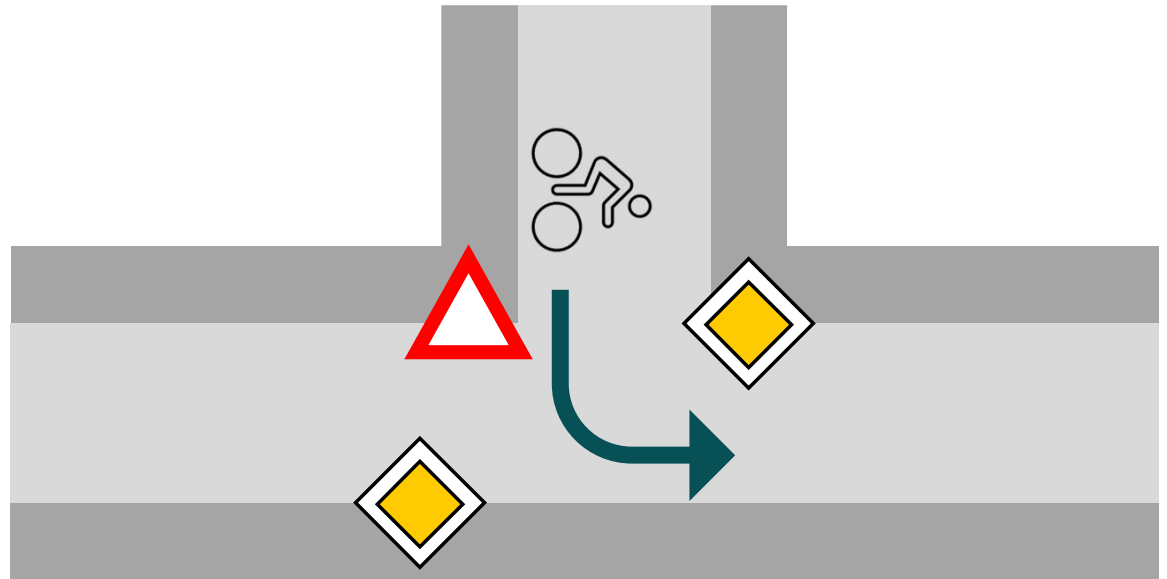
Evaluating attentional requirements at scale: A GIS-based proof-of-concept

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vti

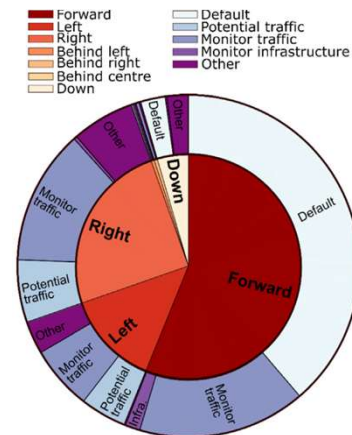
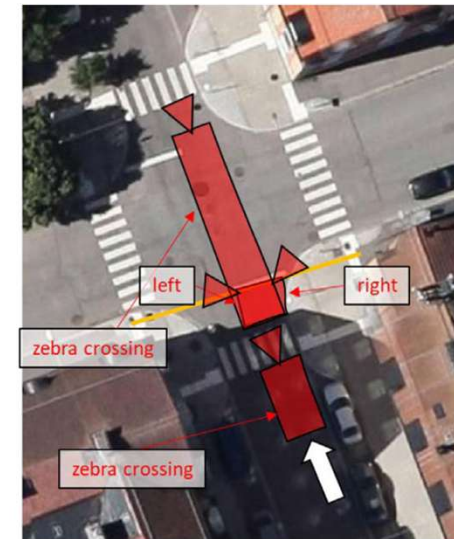
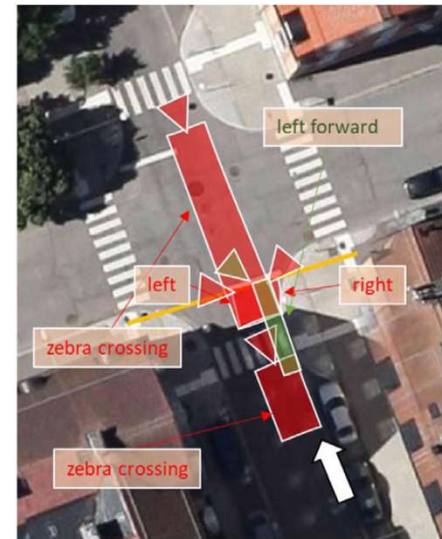
MiRA recap

- Infrastructure
- Rules / Regulations
- Vehicle type
- Direction



Previous project I

- Compared demands and fulfilment for driving and cycling in a few intersections, going straight
- Systematic differences in demands and in visual sampling behaviour



Kircher, K., & Ahlström, C. (2020). Attentional requirements on cyclists and drivers in urban intersections. *Transportation Research Part F: Traffic Psychology and Behaviour*, 68, 105-117. <https://doi.org/10.1016/j.trf.2019.12.008>

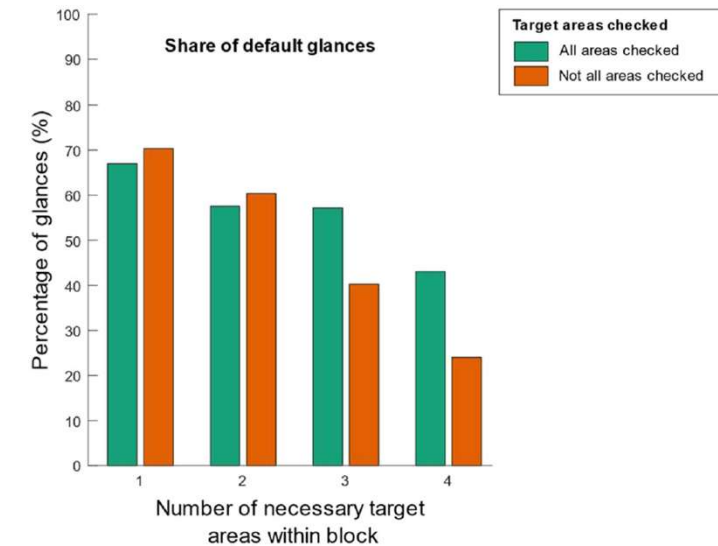
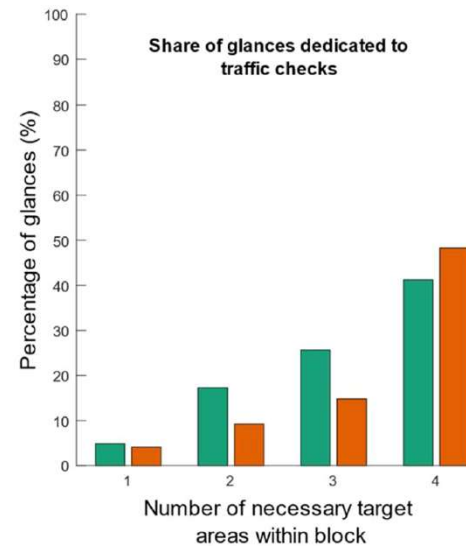
Reflection

- Low number of situations
- “Standard” number of participants
- Time-intensive analyses
- Generalisability?
- Scalability?



Previous project II

- More concurrent requirements → larger glance share devoted to requirements and therefore also ...
- Fewer “default” glances, i. e. less slack
- Tendency for “higher effort” when not “successful”



Kircher, K., & Ahlström, C. (2023). Children and youngster's gaze behaviour when cycling in familiar environments. *Journal of Cycling and Micromobility Research*, 1, 100006. <https://doi.org/10.1016/j.jcmr.2023.100006>

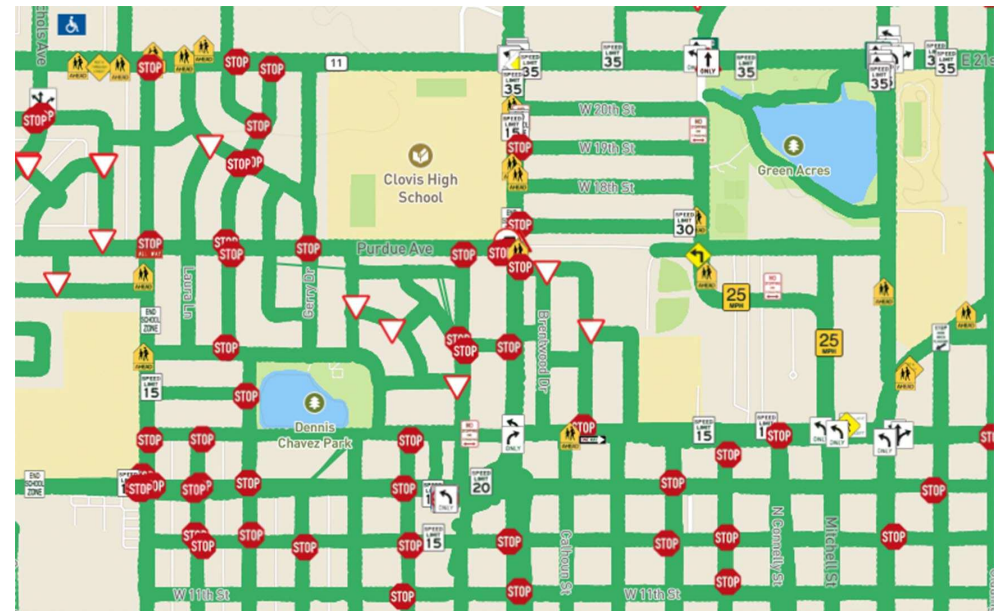
Reflection

- Higher number of different situations
- “Standard” number of participants, but low (usually one) per situation
- VERY time-intensive analyses
- Identify patterns – but which?
- Generalisability?
- Scalability?



Several open questions

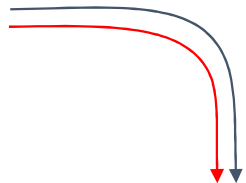
- Identify attention requirements in an automated fashion? GIS-supported?
- Identify relevant features of requirements and requirement combinations?
- Relate performance to features?
- Meaningful systematic comparisons?



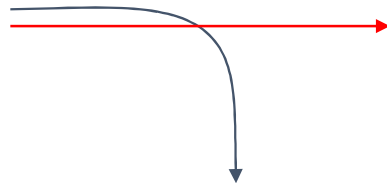
Strategy to set attention requirements

- Only (potentially) crossing streams
- Turning in same direction → not crossing
- "Necessary": intersecting traffic stream has priority
- "Useful": for active road users with priority, but motorised vehicle stream intersects one's path in another way than where the mv driver would expect mv traffic anyway

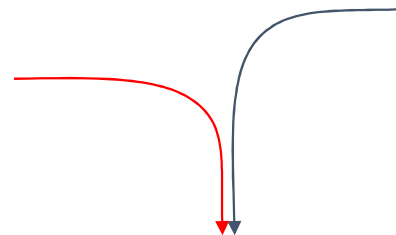
red: bicycle
blue: motor vehicle



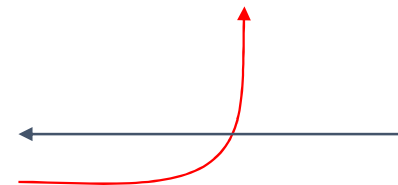
no crossing streams



mv: necessary to check for bike
b: useful to check for mv



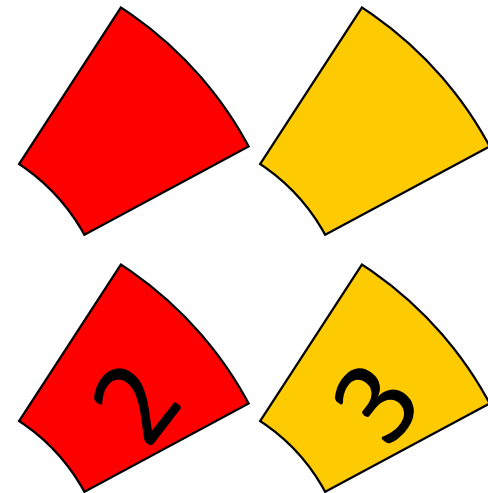
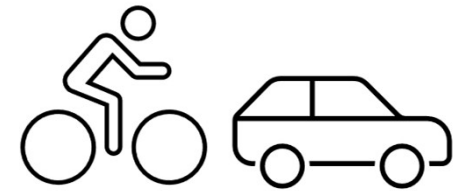
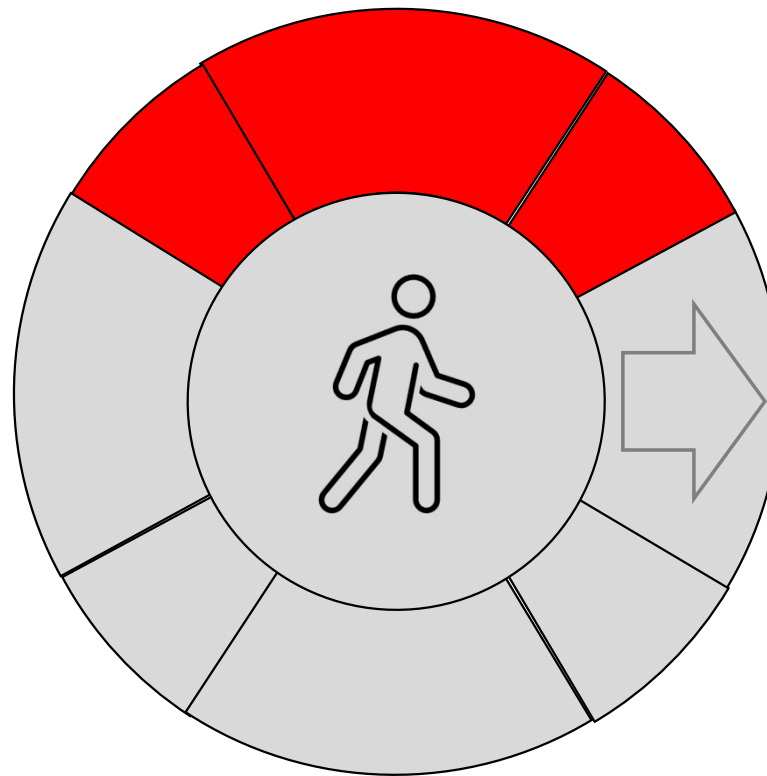
no crossing streams



mv: priority
b: necessary to check for mv

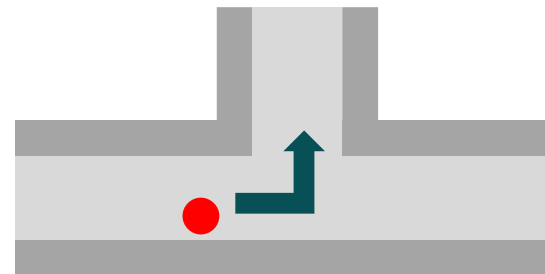
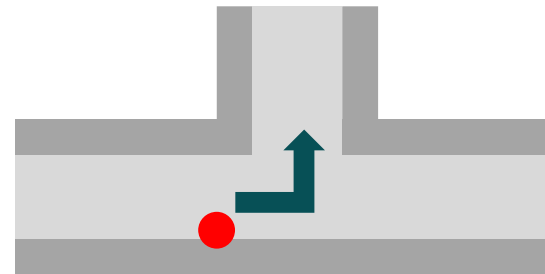
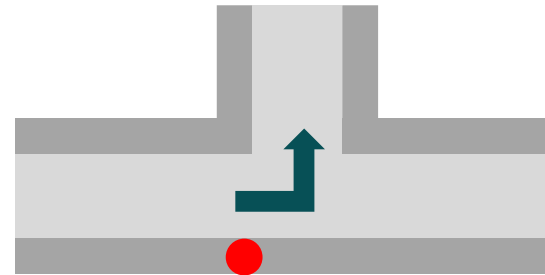
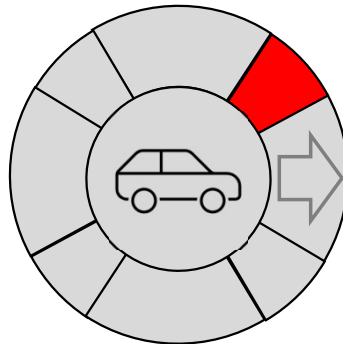
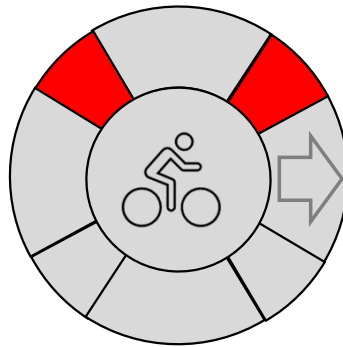
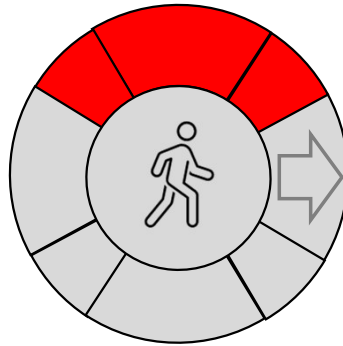
Requirement classification in practice

- Road-user centred for comparison
- Not considering length of zones
- Schematic subdivision into 8 fields around road-user
- Forward always valid (unmarked)
- Rearward never valid (simplification, unmarked)
- Necessary/useful
- Number of “streams” per field
- (No zone length)



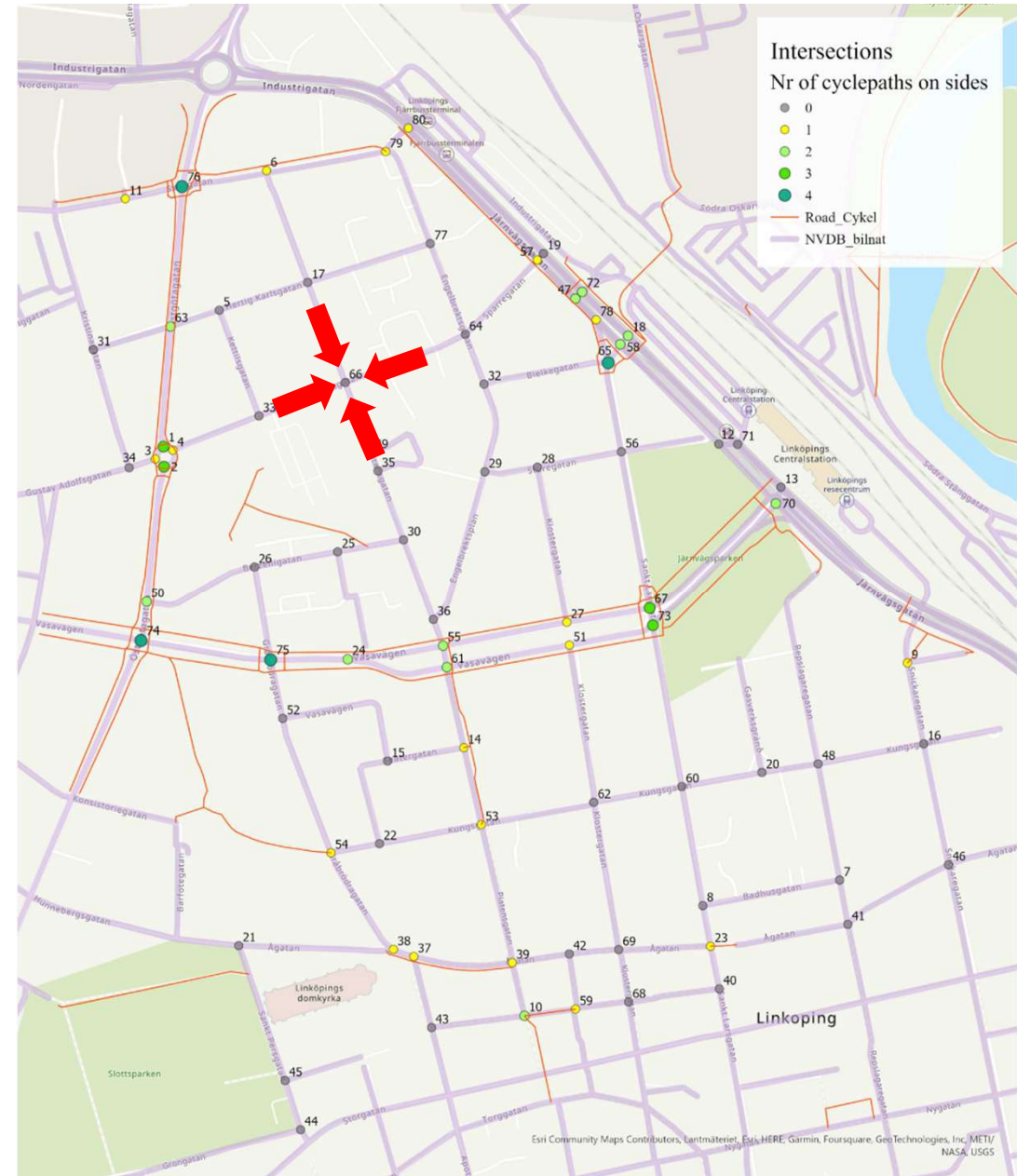
Example

- pedestrian, cyclist, car
- left-turn
- 3-way intersection
- no separated car/bike infrastructure
- no local regulation



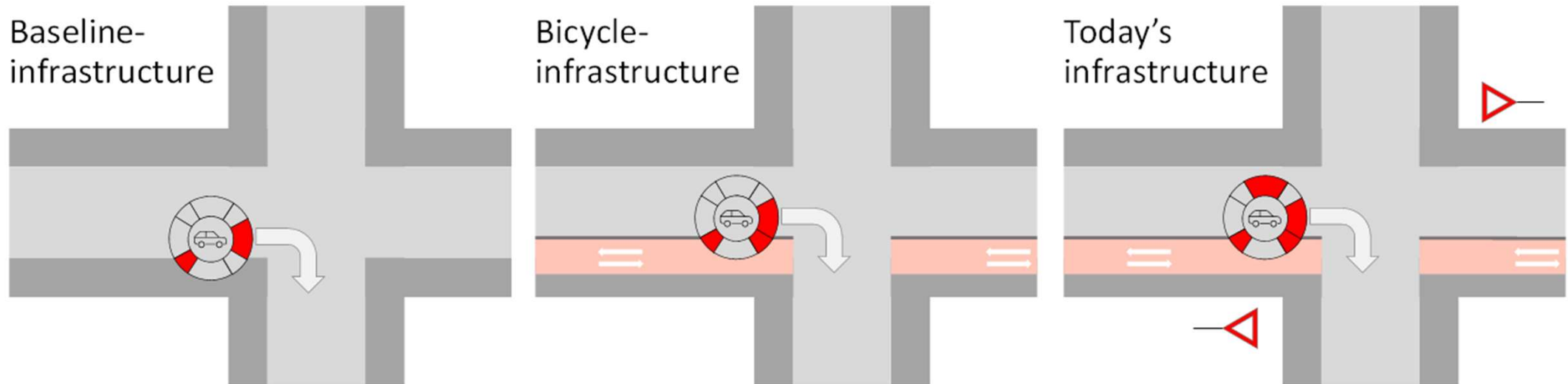
A surprise!

- Identify intersection types with GIS?
 - Linköping municipality
 - NVDB, OSM (bike lanes)
 - Google Street View → manual additions, verification
- Almost 300 different situations!
 - (disregarding traffic lights)
 - all directions
 - cycle path or not
 - different regulations
 - one-way or not
 - ...



Three scenarios in same space

- “Baseline” (only streets and sidewalks, nothing else): priority from right
- “Bicycle infrastructure” (added ped/bike-paths as of today): default bi-directional
- “Today’s setting” (added local signage of today): all local signs and rules as valid today



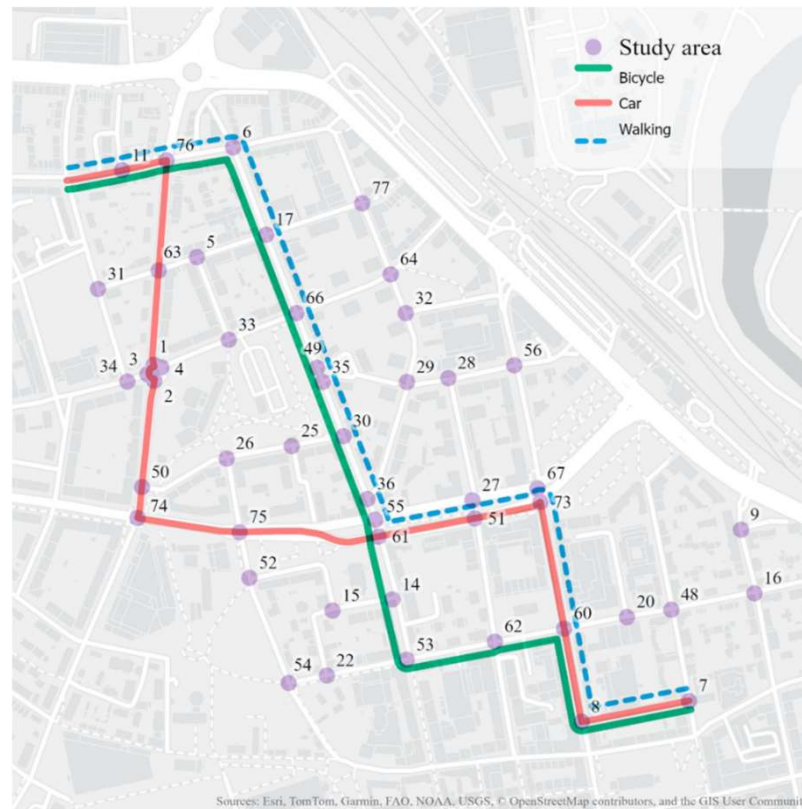
Comparisons

- Across scenarios, within and between modes
- Within scenarios, between modes
- Total network
- Individual routes, different criteria
- ...

Car

	Baseline (Necessary = 381, Useful = 0)			Cycling infra (Necessary = 445, Useful = 0)			Today (Necessary = 844, Useful = 0)		
Over shoulder left	0 0	0 0	0 0	15 0	0 0	0 0	47 0	0 0	0 0
Left	0 0	0 0	0 0	0 0	0 0	0 0	52 0	67 0	79 0
Forward left	95 0	0 0	0 0	109 0	0 0	0 0	143 0	0 0	0 0
Forward right	0 0	0 0	0 0	0 0	0 0	19 0	0 0	0 0	56 0
Right	95 0	95 0	0 0	102 0	103 0	10 0	106 0	110 0	47 0
Over shoulder right	0 0	0 0	96 0	0 0	0 0	87 0	0 0	0 0	137 0
	Turn left	Straight	Turn right	Turn left	Straight	Turn right	Turn left	Straight	Turn right

Number of necessary targets
0 20 40 60 80 100 120 140 160



What should we measure?

- Requirements per road-user type?
Count per
 - distance
 - intersection
 - time
 - something else?
- How demanding are the requirements?
 - SEEV
 - type (overt, covert, ...)
 - angle (combination)
 - etc.



What should we care about?

- Efficiency per road-user type?
- Accessibility per road-user type?
- Risk of crushing/getting crushed per road-user type?
- Certain groups, cut in a different way?
- Overall efficiency? Accessibility?
- Overall risk of crushing/getting crushed?
- ...



Not really conclusions

- GIS as technically scalable approach, but dependent on data completeness
- Potential benefit for planning, assessment, etc. (not standalone, but for aspects related to and following from attention)
- Still a lot of conceptual work to do, but *if* done it could be meaningful



The image features a teal background with a series of concentric, wavy lines that create a sense of depth and movement. The lines are more densely packed in some areas, creating a gradient effect. In the center of the image, the letters "vti" are displayed in a bold, white, sans-serif font. The letters are slightly shadowed, giving them a three-dimensional appearance as if they are floating or resting on the wavy surface.

vti