

GOUDAPPEL **MOBILITY MOVES US**

Presentation traffic signals & bicycle highway

- Question example from Fort Collins
- Traffic signals
- Bicycle highways (F35 in Enschede)



Question FC: how to improve intersections for bicycles?



□ Bikeway (Wayfinding Routes)

Contact Us

Heatherridge Road / Prospect Road



Benefits of cycling (DCE-publication 32 pages)



- 17 February 2022

What kind of city do you want?



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car-network and bike-network

Solutions (green) in network car (black) and bike (red)







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TRAFFIC LIGHTS AND BIKES

- Free flow biking
- Roundabouts (short)
- Traffic Lights and bikes
- Crossing high priority roads
- 'Intelligent Traffic Lights'

Five requirements for good bike infrastructure

- 1. Coherent
- 2. Direct / fast
- 3. Attractive
- 4. Safe
- 5. Comfortable

Examples bike-infra







yet sometimes (or quite often?) cars and bikes have to meet ...

Roundabouts (and bikes)



Roundabout Enschede

First in the Netherlands

- With priority for bikes
- 25 years ago
- Very safe
- Low speed
- High capacity





Conflicts roundabout and traditional intersection



Intersection Enschede

Special bike-crossing

- Unbundled bike route
- Space in the middle of busy road
- Crossing in 2 steps
- Very safe
- Space for green





Traffic Lights and bikes

- Traffic lights in the Netherlands
- Traffic plan (program)
- Layout for bikes
- Specials ...



Traffic lights in the Netherlands

NL: standard encoding signalgroups





Some facts

the Netherlands

- ± 6.000 signalized intersections

Infrastructure

- left-turn / right-turn lanes
- bicycle lanes
- pedestrians
- bus lanes

Traffic signals

- > 90% vehicle actuated
- mainly protected phasing
- local intelligence and connected
- Priority for public transport, ambulances, police





Traffic Lights



- Each direction can get it's green in an earlier or later stage (earlier / longer)
- Alternative realization based on waiting times
- Optimal start and length greentime calculated based on detection
- No fixed cycletime: optimal cycletime
- Bikes, public transport, pedestrians have their own space in the plans (all calculated)
- Signals placed before conflict (not always for pedestrians / bikes)
- Signals: Backplate with white border
- Poles: black and white markings

Detection

- Just greentime when it's needed
- Counting traffic and calculate or 'see' length of queue and speed
- To calculate optimal greentimes
- End greentime at a safe moment
- Keep a green light when extra traffic is coming
- In what direction (ignore 'ghostriders')
- Push-buttons (bikes / pedestrians)
- Detection of bikes at a larger distance gives more comfort for bikes







Misc

- 3 5 detectors per lane, also for bikes!
- additional pushbuttons for bikes (and pedestrians)
- sometimes > 100 per intersection
- safety / no vehicles in dillemmazone
- also: Video detection and radar
- Maximum greentimes based on actual flow and calculated queus
- Alternative realization based on actual waiting times



- Public transport: KAR (Short Distance Radio)
- conditional (depending traffic situation / time-schedule
- Lights for public transport, bikes and pedestrians
- For bikes: extra 'low' 80 mm lights (visibility!)
- Information: button was pushed
- Information: countdown timers
- Information: for blind people









Traffic plans

- Credibility
- Balance waiting time capacity Balance safety capacity Conditions and policy





- Green on demand (detection)
- No conflicts: Green in earlier stage or longer
- Optimal length greentime calculated continuous
- Max greentimes to keep the cycletime under control
- Based on online counts (detection) or calculation of queuelength
- Ending greentime at a safe moment
- So greentime is flexible (and even the time of the amber)
- Alternative realisations based on waiting time
- Phases itself can swap places (online calculated for optimization)
- Whats the best spot in the plan for a bike?
- How much space is needed? Less lanes = more space for bikes or green (trees, borders, bushes, benches)
- Change the layout to reduce waiting time cyclists
- High waiting time for bikes: 2 realisations per cycle



Bike curious? Dutch Style Cycling in the US - 17 February 2022

Timings

Cyclists

- Minimum greentime of 4 or 5 seconds
- Possibility to extend the green time based on detection
- Maximum length around 15 seconds
- After green > amber (3 sec) and the clearance time



Pedestrians

- Greentime is enough for a slow pedestrian (about 0,8 m/s) to get to 1/2 of the crossing during green
- After green-flashing the clearancetime starts
- A fast pedestrian (1,0 or 1,2 m/s) should be able to get across the point of conflict (the clearance time)
- Radar can extend the greentime and / or the clearancetime





Specials



Countdown signal





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Even in the NL we need more space

Balance

Space, Functionality,

Safety and Traffic Flow





Crossing a (high traffic)road

Different situations



No space for separate bikelane

- Minor narrow road crossing high traffic road
- Lot of schoolkids crossing
- Same phase with car traffic
- No separate signal (no own lights)
- Detection (under the bricks)
- Pushbutton to 'ask' for green
- Bikes: Right turn during red permitted





'Conflict' with cars

- Intersection with minor road
- Conflict with parallel cars (if not it would cause to ignoring the red light)
- With prestart (default 2 sec)
- Turning left = problem
- Some use the prestart, some the pedestrian-crossing or the green of the minor road or a previous intersection





Away from a (narrow) road

- Actual crossing moved away from the minor road
- Space to wait
- Space for right turn during red
- Better visibility (safety)
- No conflicts
- Detection and pushbutton





When space is available





Bikes turning left

- Bad example!
- In between the traffic
- Focus on visibility during design
- Rather not on a road with a lot of traffic
- Lead in these kind of solutions
- Attention for cars and bikes
- Probably better: Crossing on the right side en left turn after crossing the major road.
- Calculate and balance the best solution!





Coordination between separate bike crossings

- Bikes on one crossing 'asks' for green on the coordinates (following) bikelane
- Length of greentime based on detection or start / end green
- Sometimes just on certain moments of the day
- Takes extra time!



Expanded cycle stacking lane

- Advanced stopline
- Space for left-turning bikes
- No need to wait until cars drove away
- Bikes not in the blind spot of heavy traffic
- Cars have to wait for the bikes to leave (in several directions)
- Detection for bikes and cars
- Cars will see the bikes



Expanded cycle stacking lanes (not ideal example)





Simulateously green



- One greenphase for cyclists in all directions (ADSG)
- Synchronised start
- Reduces waiting time
- Diagonal crossing possible
- No coordination (time consuming) needed (good for large amount of left turning bikes)
- Cycle lanes close to the road (compact junctions)
- Difficult to integrate pedestrians
- Preferable: 2 x green during a cycle
- Waiting time motorized traffic might increase



Intersections and systems

Intersection	System
Huge intersection	2 x per cyclus green Separate lanes Coordination Tunnel/bridge
Small intersection	All Directions Simultaneously Green (ADSG) Expanded stacking lane

Topics for good junctions



Use or make space for cyclists

Demand-dependent and maximum waiting time

Two times per cyclus green if possible

All Directions Simultaneously Green ADSG

Expanded stacking lanes in front of the cars

Coordination within intersection and in between junctions

Good detection (also further away) and information (countdown)

'Intelligent' traffic lights

- Traffic Light Controllers get information about vehicles (and bikes) based on 'wifi'
- Also: heavy traffic (trucks), public transport, emergency vehicles
- More information from a larger distance
- More opportunities to plan / act in a smarter way
- Time to red / green => cloud => apps
- Also apps to 'see' cyclists, give priority to cyclists (hold the green a bit longer, end conflicting signals to reduce waiting time





Bicycle highways

Enschede: blue are the regional 'highways'





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Kommunalpolitiker aus dem Kreis Borken waren gestern auf dem F 35 zwischen Enschede und Hengelo unterwegs.Barnekamp



Increasing number of bikes on F35 after opening in 2011



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85% less accident, compared with parallel route



Bike users of the F35 near Enschede (GPS-data)



Bikers come from far away to choose the attractive Cycle highway

Slow lane, city of Eindhoven







Youtube Movies and websites

- Markenlei Junction design the Dutch cycle friendly way (NACTO) <u>https://www.youtube.com/watch?v=FlApbxLz6pA</u>
- <u>www.fietssnelwegf35.nl</u> / EN
- <u>www.brainportavenue.nl/projects/slowlane</u>



Thank you!

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