

*Cycle journey planning,
for cyclists, by cyclists*

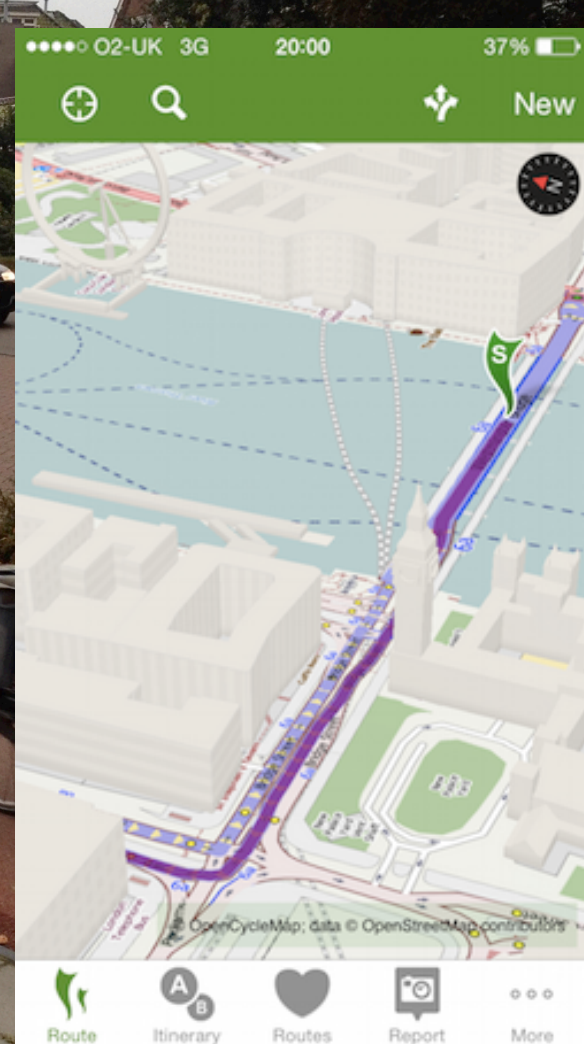


Is the OSM data model creaking?

Slides at: www.cycliststreets.net/blog

About CycleStreets

- UK social enterprise
- OSM user since 2008
- CycleStreets.net
- 3rd-party API users e.g. Citymapper
- 30+ APIs: routing, infra, photos, tracking, etc.



Custom engine

- 3 routing types
- 100s of routing rules
- Infra quality analysis
- Junction/turn analysis
- Detailed elevations
- Route relations




*Cycle journey planning,
for cyclists, by cyclists*

PROBLEM: Compromises from
OSM representing spaces as lines.






One conceptual space, but multiple flows

	Foot Path	i
---	-----------	---

[Zoom to this](#)

▼ All fields

Name	i
Common name (if any)	+

Surface		i
asphalt		

Width (Metres)		i
5		

Structure		i
<input type="radio"/> Bridge		



Two tunnels, as two lines, one unnamed



People trying to do more and more with OSM,
but is the model too basic for the real world?



How do we model this?

▼ All tags (2)



highway	▼	primary	▼		
cycleway	▼	track	▼		
+					



0. Original method c. 2008

▼ All tags (12)



cycleway	track		
foot	no		
highway	cycleway		
lcn	yes		
lit	yes		
name	Hills Road (cycle...		
oneway	yes		
segregated	light		
sidewalk	left		
surface	asphalt		
surface:colour	red		
width			

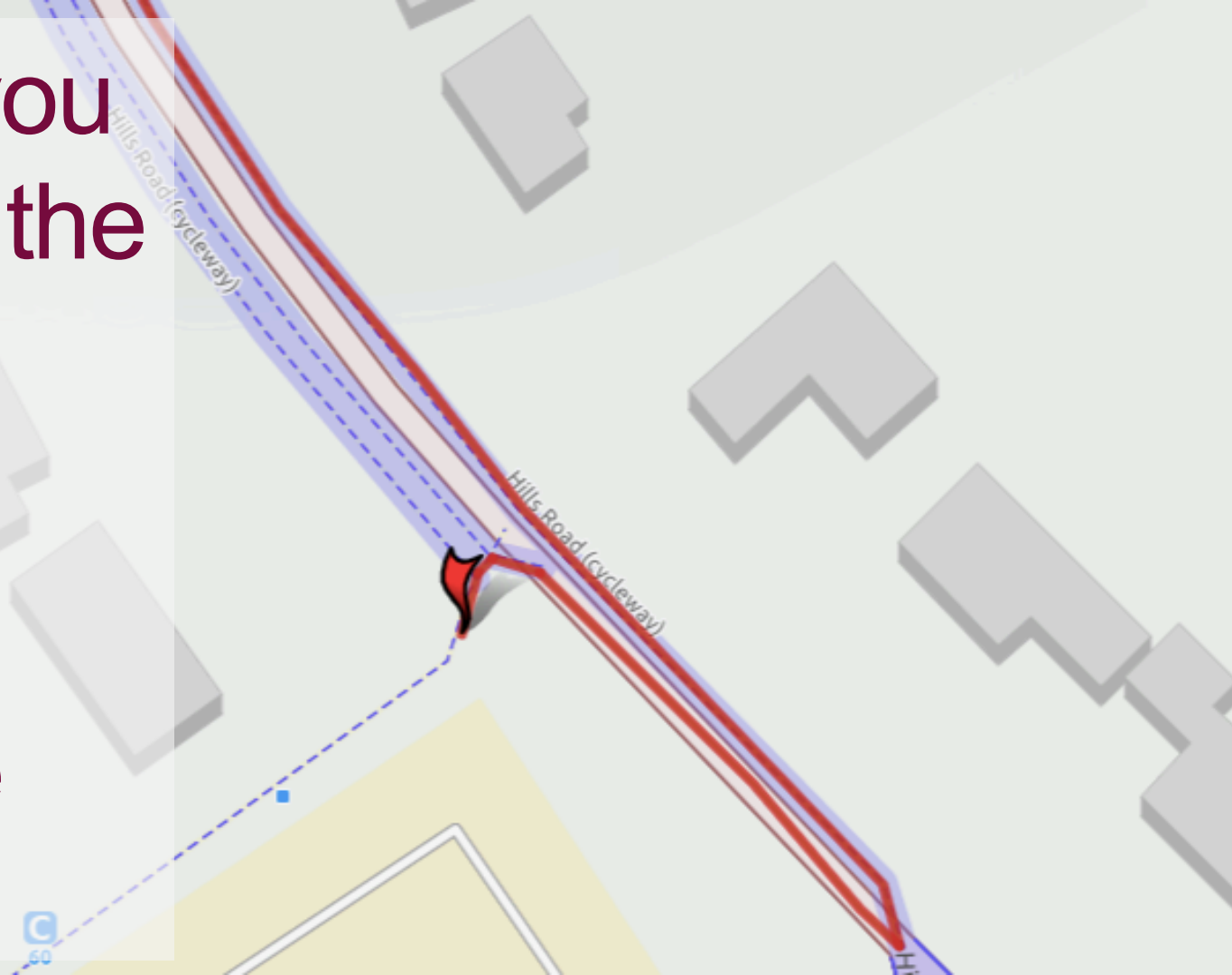


1. Separate paths approach



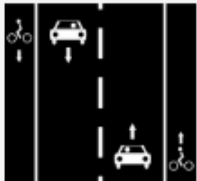

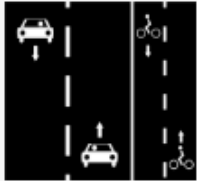

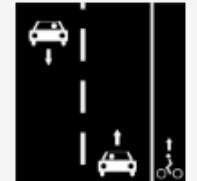
In reality you
can cross the
road.

No-one
actually
cycles like
this:



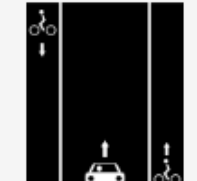



Cycle lanes in bidirectional motor car roads

A lane marked on a portion of a carriageway (UK), roadway or shoulder (USA), designated for cyclist use.

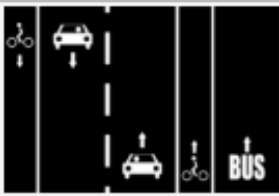
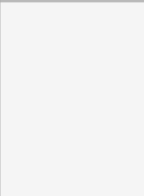
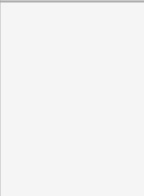
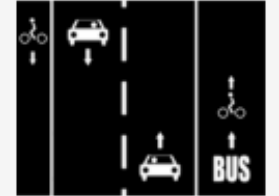
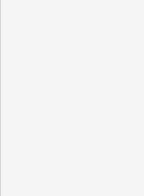




Ref	Context	Photo	OSM	Description
L1a			Way A: <code>highway=*^[1] + cycleway=lane</code> (recommended) or Way A: <code>highway=*^[1] + cycleway:left=lane + cycleway:right=lane</code> or Way A: <code>highway=*^[1] + cycleway:both=lane</code>	
L1b			Way A: <code>highway=*^[1] + cycleway:right=lane + cycleway:right:oneway=no</code> (recommended) or Way A: <code>highway=*^[1] + cycleway=lane</code> (not recommended, as this can't be distinguished from L1a)	
L2			Way A: <code>highway=*^[1] + cycleway:right=lane</code> (nb: bikes can use the normal highway on the left side)	

Bicycle
page on
wiki –
begins
OK...

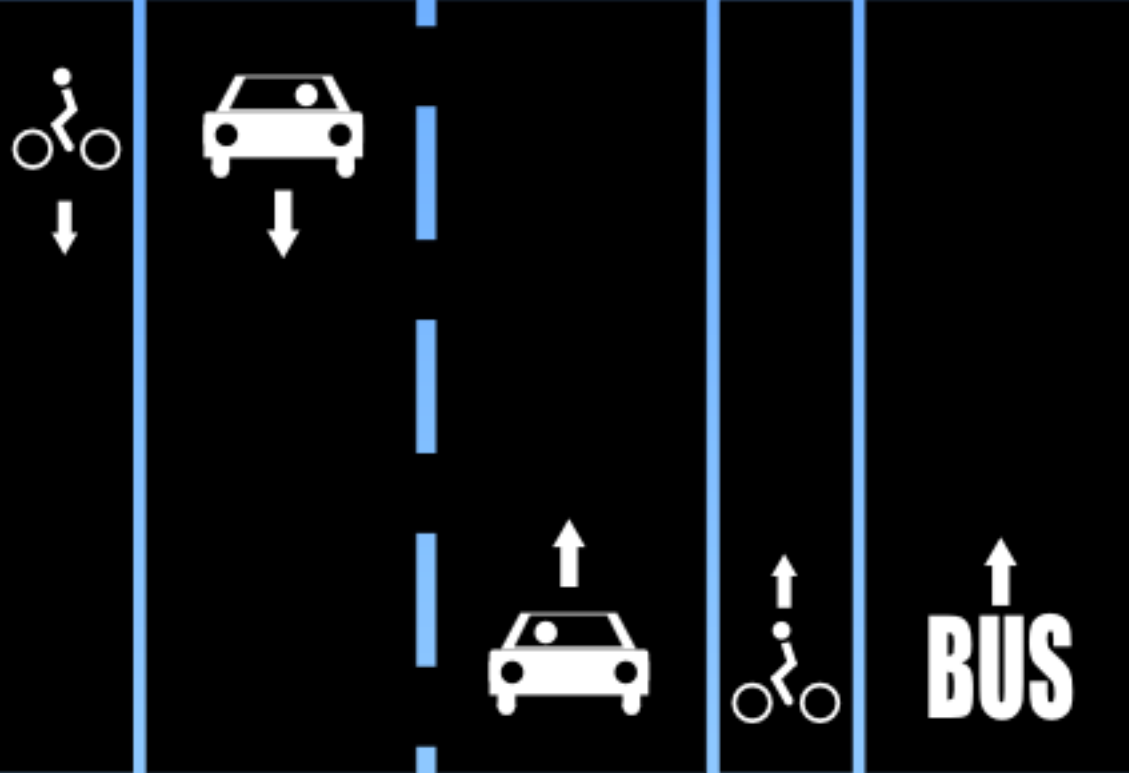
Cycle lanes in oneway motor car roads

Ref	Context	Photo	OSM	Description
M1			Way A: <code>highway=*^[1] + oneway=yes + cycleway=lane + oneway:bicycle=no</code> (recommended) or Way A: <code>highway=*^[1] + oneway=yes + cycleway:left=opposite_lane + cycleway:right=lane</code>	
M2a			Way A: <code>highway=*^[1] + oneway=yes + cycleway:right=lane</code> (recommended)	

Cycle lanes and bus/taxi lanes

Ref	Context	Photo	OSM	Description
B1				<p>Cycle lanes on left and right sides of the road with a bus/taxi only lane.</p> <p><i>Proposal (no consensus):</i></p> <p>Using the suffix for Lanes:</p> <p>Way A : <code>highway=* + lanes=3 + lanes:forward=2 + access:lanes=*no yes yes no no + bicycle:lanes=*designated</code></p> <p><code>taxi:lanes=*no yes yes no designated</code></p> <p>Note: the suffix <code>:lanes</code> could be used for all the other examples, but is used usually only in situations where it is not possible to tag the</p>
B2				<p>Cycle lanes on left and right sides of the road after a bus/taxi only lane in right side.</p> <p><i>Proposal (no consensus):</i></p> <p>Way A : <code>highway=*^[1] + lanes=3 + lanes:forward=2 + lanes:right=1 + busway:right=1 + cycleway=lane</code></p>
B3				<p>Cycle lane on left side of the road and a shared cycle lane with a bus/taxi lane in right side.</p> <p><i>Proposal (no consensus):</i></p> <p>Way A : <code>highway=*^[1] + busway:right=lane + cycleway:left=lane + cycleway:right=share_busway</code></p> <p>or</p> <p>Proposed_features/shared_lane</p>
B4				<p>Cycle track shared with a bus/taxi track in right side of the road.</p> <p><i>Proposal (no consensus):</i></p> <p>Way A : <code>highway=service + service=bus + oneway=yes + cycleway:right=share_busway</code></p> <p>Way B :</p> <p><i>assuming for bicycle and buses there is an obligation to use Way A in forward directions (of way A) :</i></p> <p><code>highway=*^[1] + oneway:bus=yes + oneway:bicycle=yes</code></p> <p><i>assuming bicycles may use Way B in both directions :</i></p> <p><code>highway=*^[1]</code></p>
B5				<p>Cycle lane shared with a bus/taxi lane on right side of the road (in some countries only).</p>

... ends up
with more
ridiculous
tagging



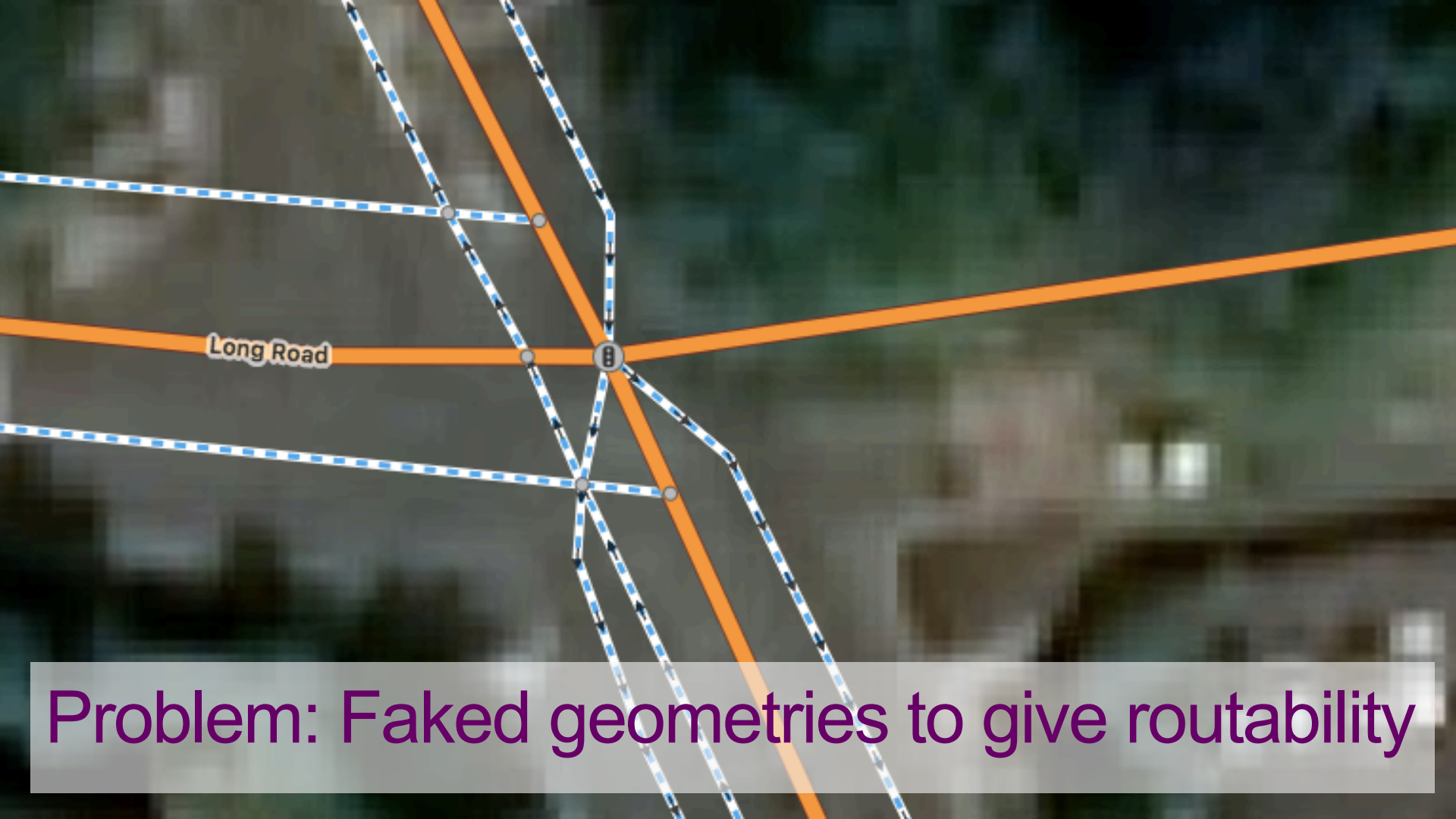
Is this
really a
usable
data
model?

Way A : highway=* + lanes=3 + lanes:forward=2 +
access:lanes=*no|yes|yes|no|no +
bicycle:lanes=*designated|yes|yes|designated|yes
+ bus:lanes=*no|yes|yes|no|designated +
taxi:lanes=*no|yes|yes|no|designated

2. Unified street approach

access:lanes=no|no|no|yes|yes|no|no
bicycle:lanes=no|designated|designated|yes|yes|
designated|no
bus:lanes=no|no|no|yes|yes|no|no
cycley:backward=track
cycley:backward:est_width=1.5
cycley:backward:oneway=-1
cycley:backward:segregated=no
cycley:left=stepped
cycley:left:oneway=yes
cycley:left:width=2.1
cycley:right=stepped
cycley:right:oneway=yes
cycley:right:width=2.1
est_width=6
foot:lanes=yes|no|no|no|no|no|yes
highway=primary

lanes=2
lanes:backward=1
lanes:bicycle=3
lanes:foot=2
lanes:forward=1
lcn=no|no|yes|no|no|yes|no
lit=yes
maxspeed=30 mph
name=Hills Road
note=there are cycle lanes in both directions PLUS a
separate cycle track
ref=A1307
source:lit=2011-03-12
surface=asphalt
Surface:color=black|red|black|black|red|black
taxi:lanes=no|no|no|yes|yes|no|no



Problem: Faked geometries to give routability

Ugly. What is this?

Should cyclists get “bear left” twice?





MANDELA
HOUSE

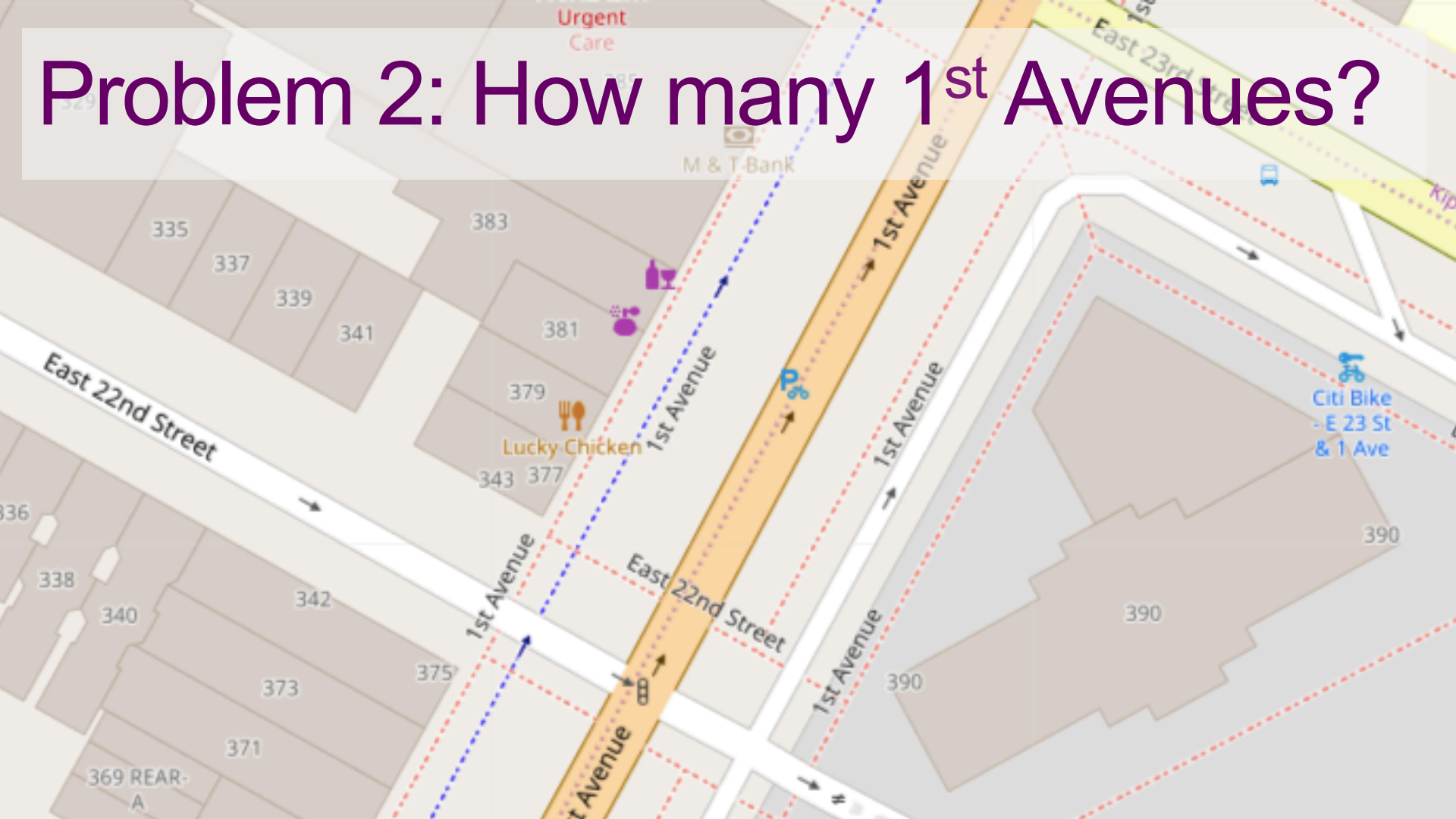
20
ZONE



WINDMILL
TO LET
PETER STANLEY



Problem 2: How many 1st Avenues?

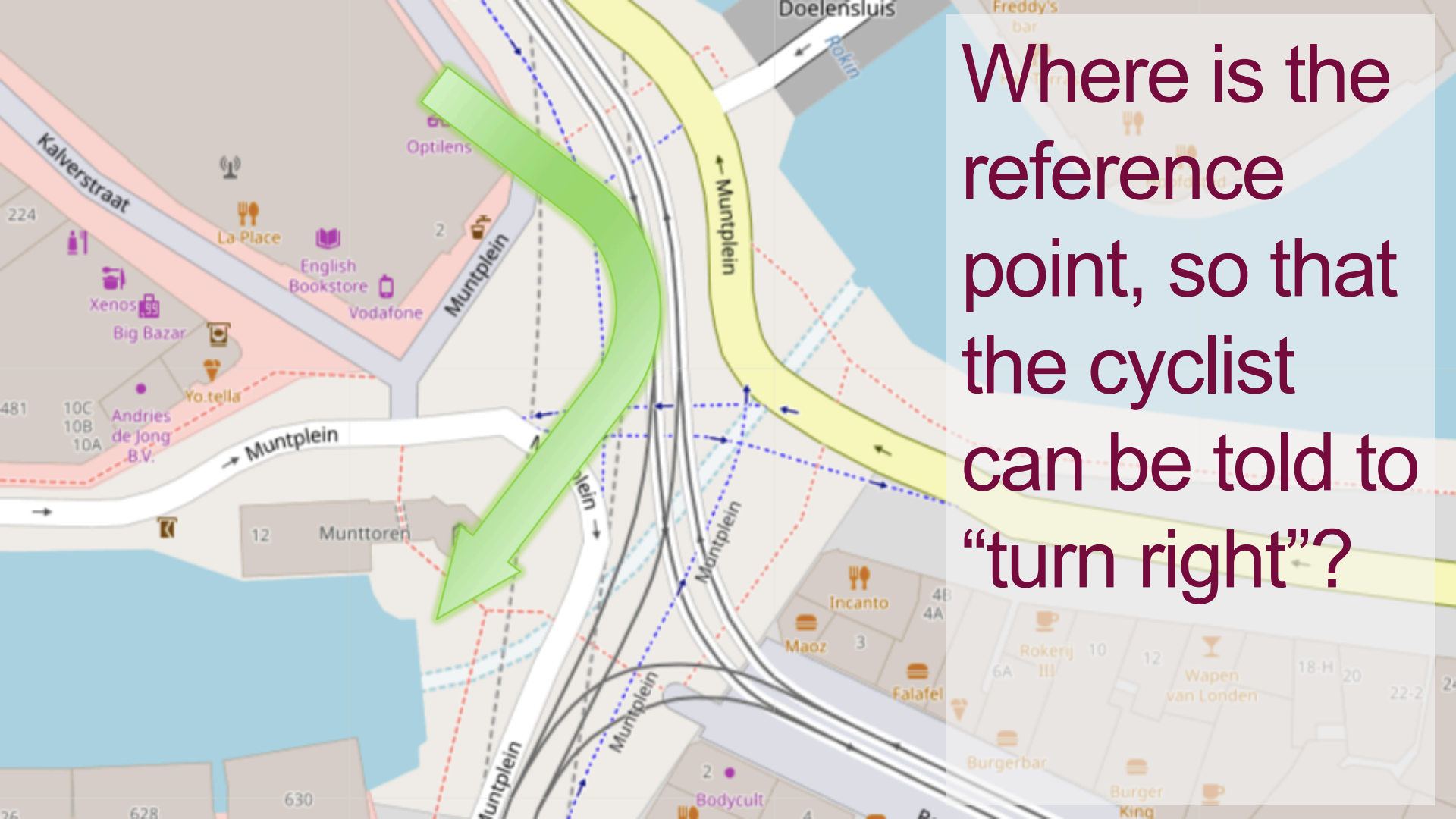




We don't
really have a
clear concept
of "street" or
"junction",
just lines &
connections




We don't
really have
a semantic
concept of
“junction”,
just lines &
connections



Where is the reference point, so that the cyclist can be told to "turn right"?

Problem 3: Pedestrian routing poor

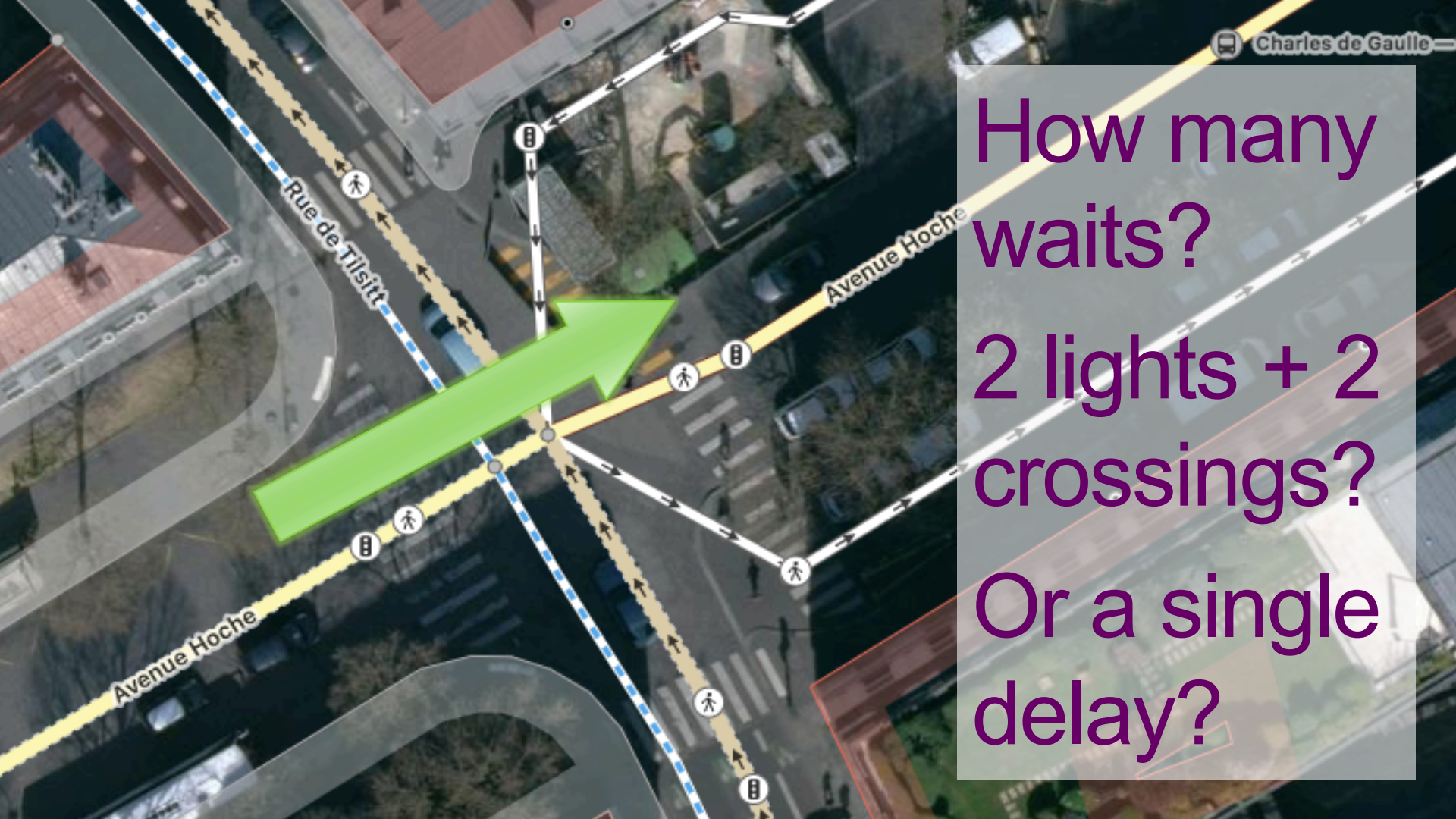


An aerial photograph of a city street intersection. A diagonal road, labeled '1st Avenue' at the bottom, runs from the bottom-left towards the top-right. It has a solid orange line on its right side and a dashed blue line on its left side, both with arrows indicating traffic flow. A horizontal road, labeled 'East 13th Street' on its right side, runs from the left towards the right. It has a solid white line on its left side and a dashed white line on its right side, both with arrows indicating traffic flow. The intersection is marked with a small circle. The surrounding area includes buildings, parking lots, and other streets. A semi-transparent grey box with purple text is overlaid on the right side of the image.

Where should
good walk
routing put the
pedestrian?
Sidewalk next to
road is wrong.

Problem: Can't properly model turns



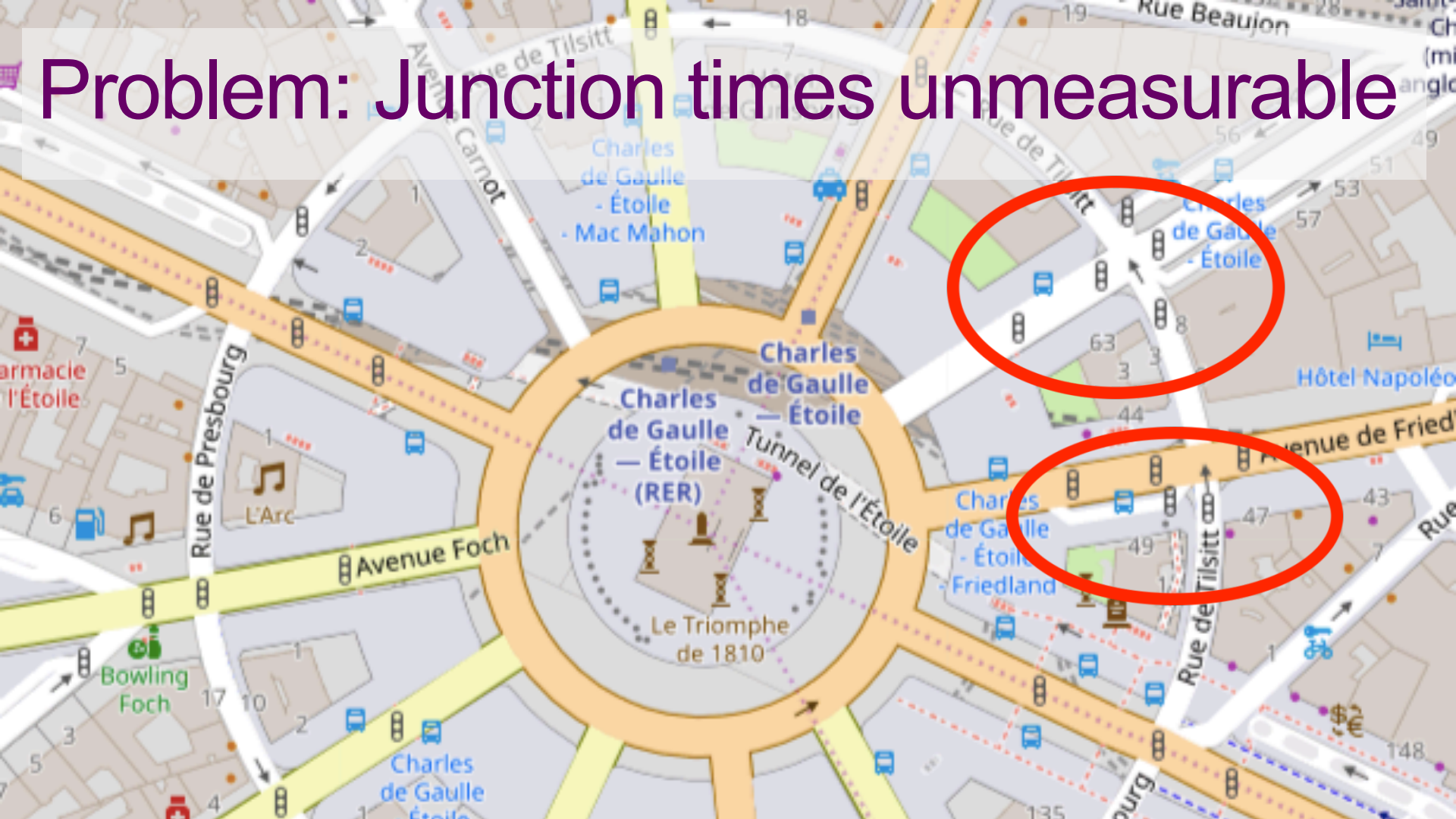


How many
waits?

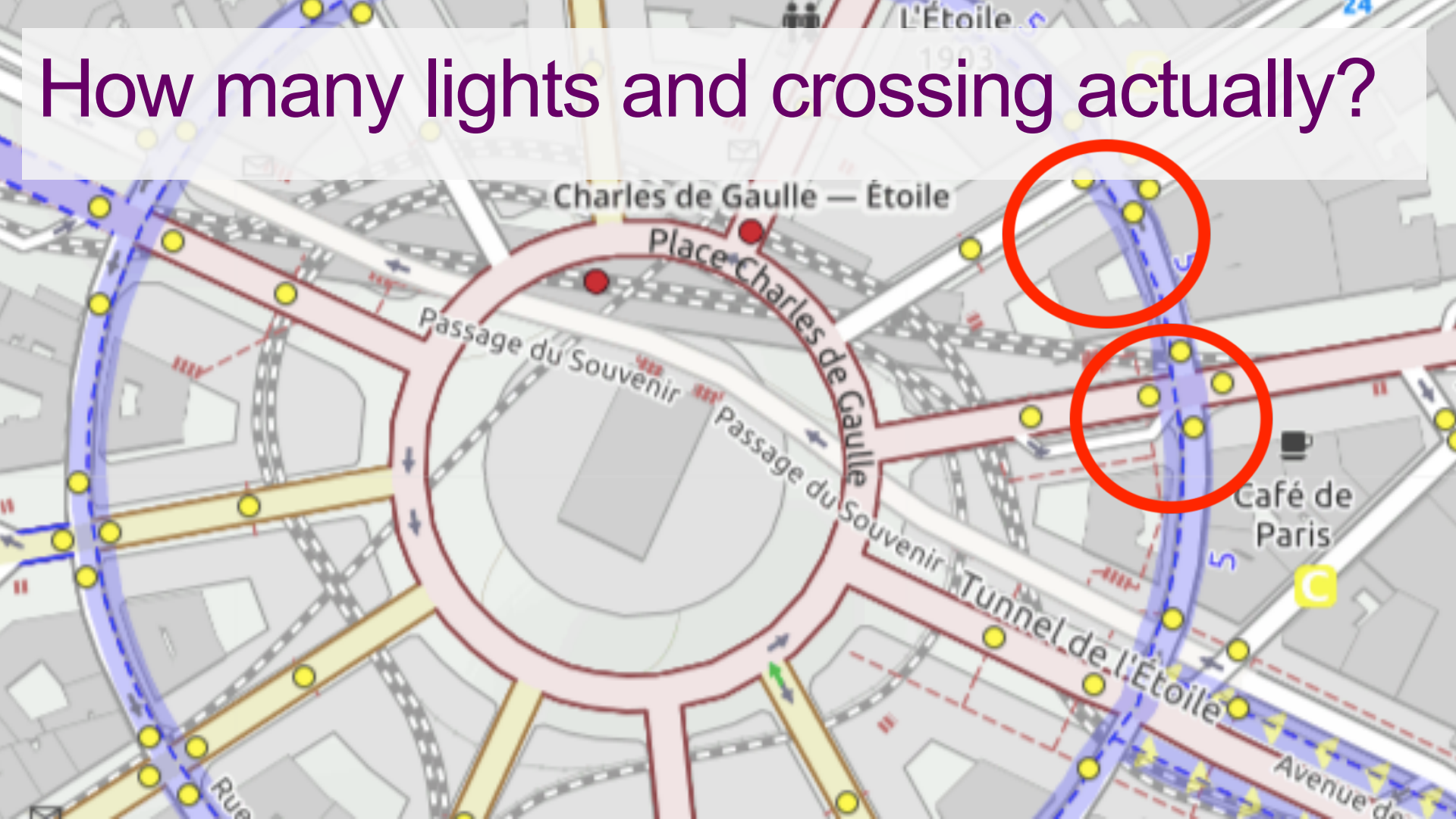
2 lights + 2
crossings?

Or a single
delay?

Problem: Junction times unmeasurable



How many lights and crossing actually?





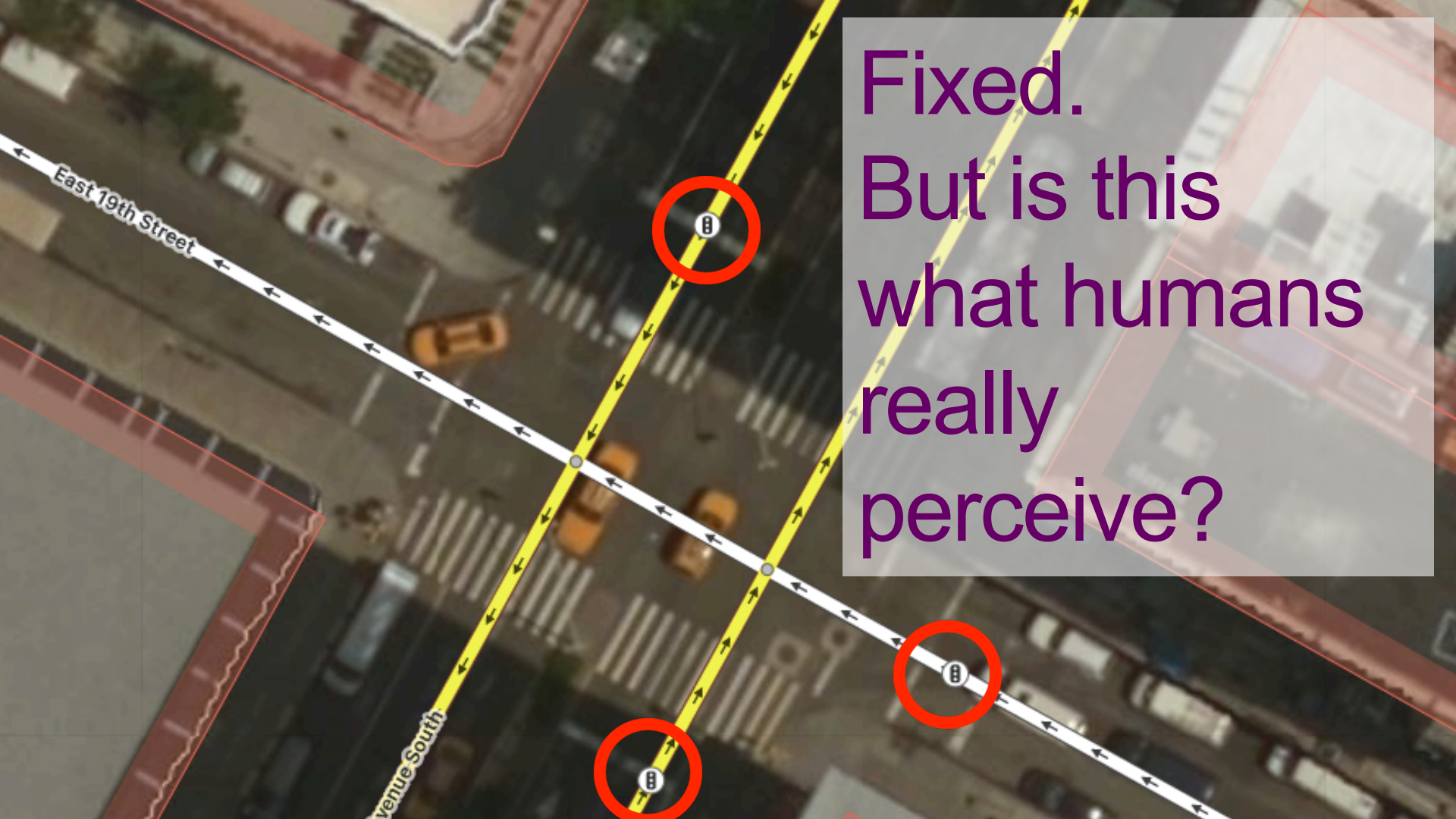
Two delays on E19th NY
– every junction has this problem

How many traffic lights for the cyclist turning right?



Should we add a fake cycleway purely to bypass the second light?






Fixed.
But is this
what humans
really
perceive?



Problem: No unified “street”
Pedestrian routing - state of the art?


Physical
location vs
routable?

An aerial photograph of a city street intersection. A white line with red dashed borders represents a proposed route. The route starts from the top left, goes down, then right, then down again, and finally curves to the right. It features several small grey circular nodes at various points. Several brown rectangular polygons are overlaid on the map, some of which appear to be building footprints or specific areas of interest. One polygon is located near the top left, another near the bottom left, and others are scattered along the route. A semi-transparent grey box with purple text is in the upper right corner.

If routable, then
shouldn't it be
this?

An aerial photograph of a landscape with a network of white and dashed lines overlaid. The lines form a complex web of paths, some straight and some curved, intersecting at various points. Several brown rectangular shapes are scattered across the map, some of which are partially covered by the lines. In the top right corner, the text "Close" is partially visible. In the bottom left corner, the text "am Way" is partially visible. A small circular icon with a right-pointing arrow is located on one of the dashed lines.

Pedestrians are
the greatest
pythagoreans


Chemisches Institut, Hörsaalgebäude

Problem: Multiple
methods (area/
point) to
represent the
same thing

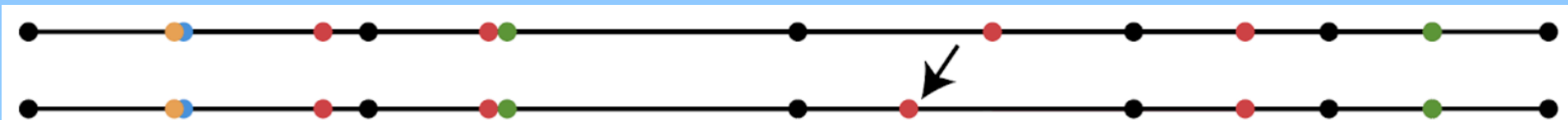
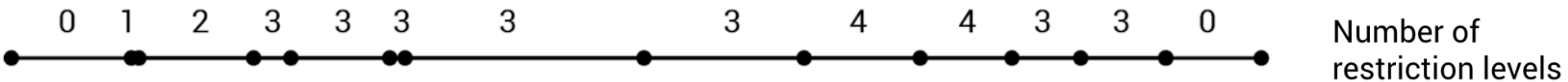
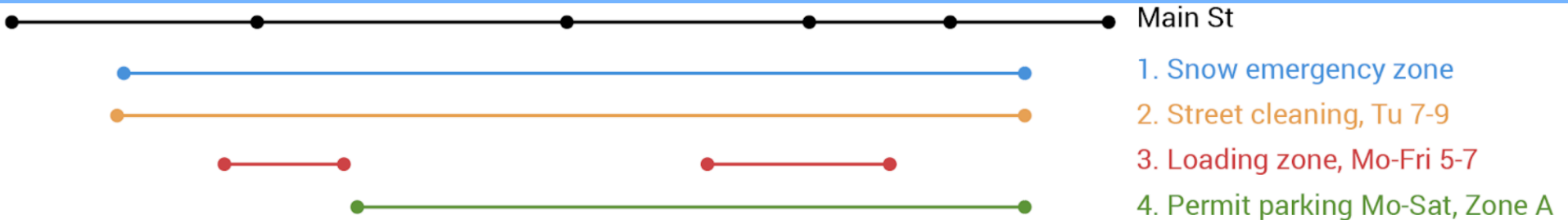


Problem: Kerbside hard to model

<https://sharedstreets.io/openstreetmap-and-curb-regulations/>



- ← “Inner curb” (e.g. sidewalk)
- ← Actual, physical curb as a barrier
- ← **Where curb regulations apply (i.e. the outer edge of the street)**
- ← Street centerline





Concept of a “Street” (two here)

Verulam Way



Tessellation

Pedestrian areas with de-facto routes

Zoom to this

▼ All fields

Name

i

Common name (if any)

+

Surface



i

concrete

▼

Lit



i



Yes

Width (Metres)

i

Unknown



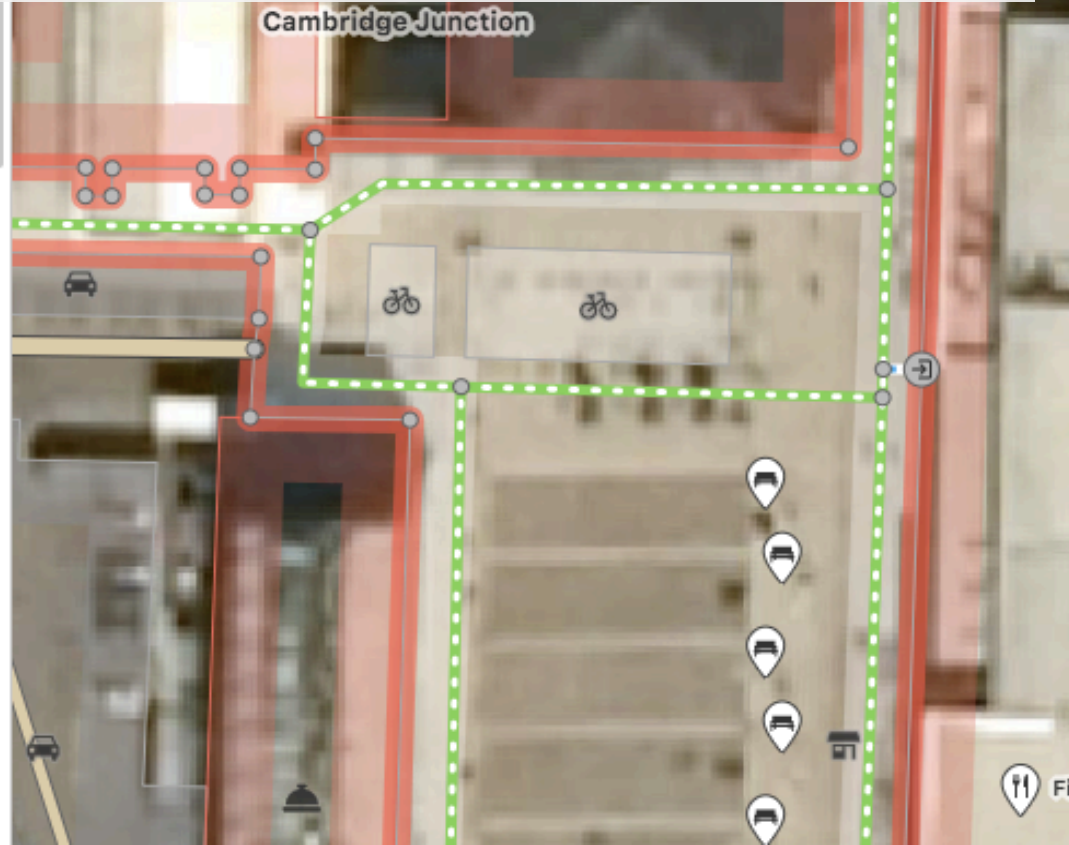
▲

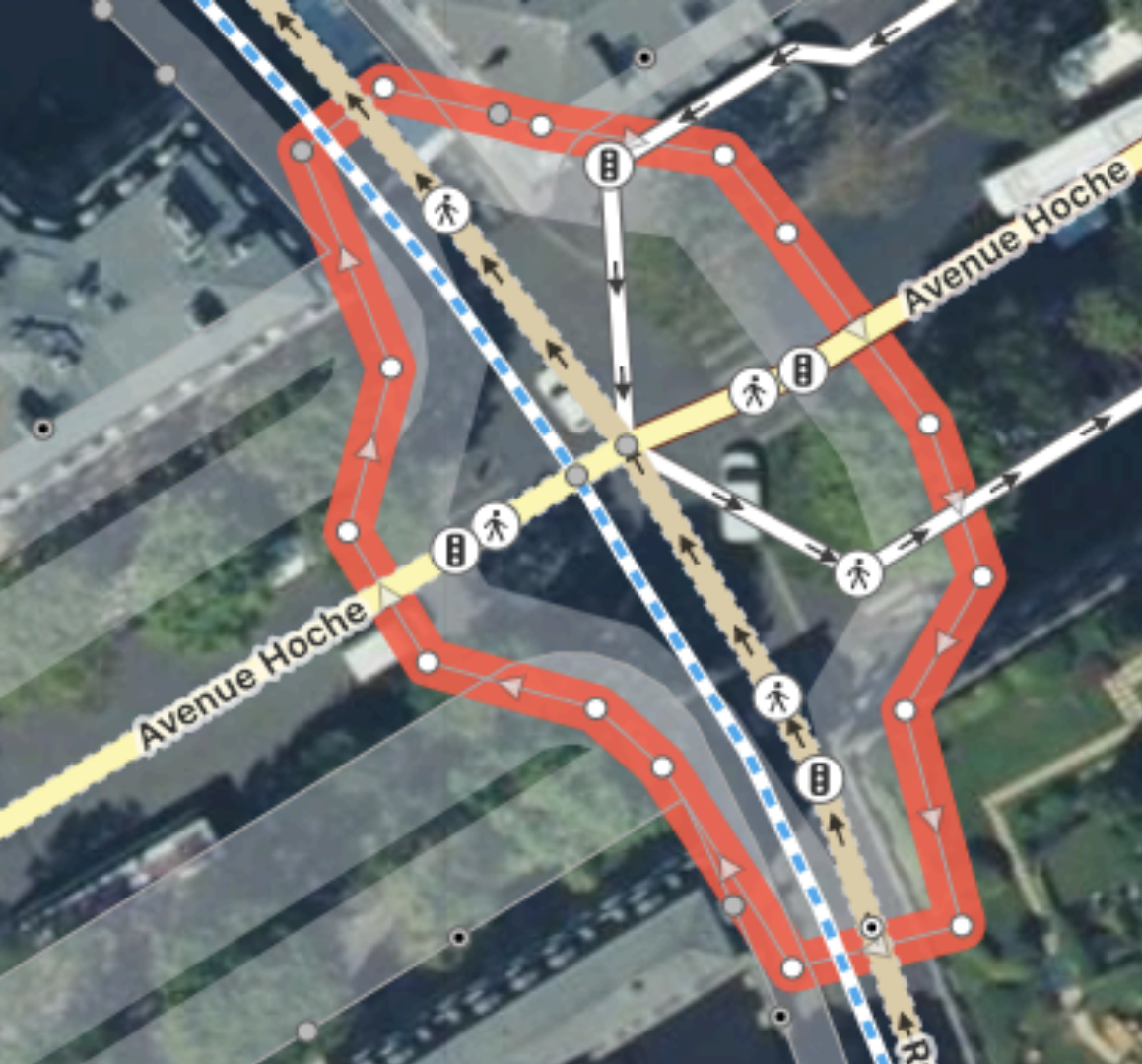
Structure

i



Bridge





Concept of
“Junction”

Surrounds all
relevant
features,
unifying them



Image: David Earl



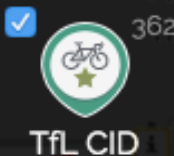
Martin Lucas-Smith
www.CycleStreets.net
Twitter: @cyclestreets
info@cyclestreets.net



id: RWG153099
_type: cycle_lane_track
On / Off Carriageway: TRUE
Segregated lane / track: TRUE
Bi-directional: TRUE
cilt_colour: NONE



Collisions



TfL CID



Traffic counts



Cyclability ratings

Bikedata

Data to support getting more people cycling.

TfL Cycling Infrastructure Database (CID)

TfL's CID is a comprehensive and attribute-rich dataset of all cycle infrastructure throughout London. The data is a snapshot in time ranging between January 2017 and May 2018.

The TfL CID schema is available, as is a GeoJSON API for developers. Raw data

PS London Cycling Infrastructure Database

https://wiki.openstreetmap.org/wiki/TfL_Cycling_Infrastructure_Database