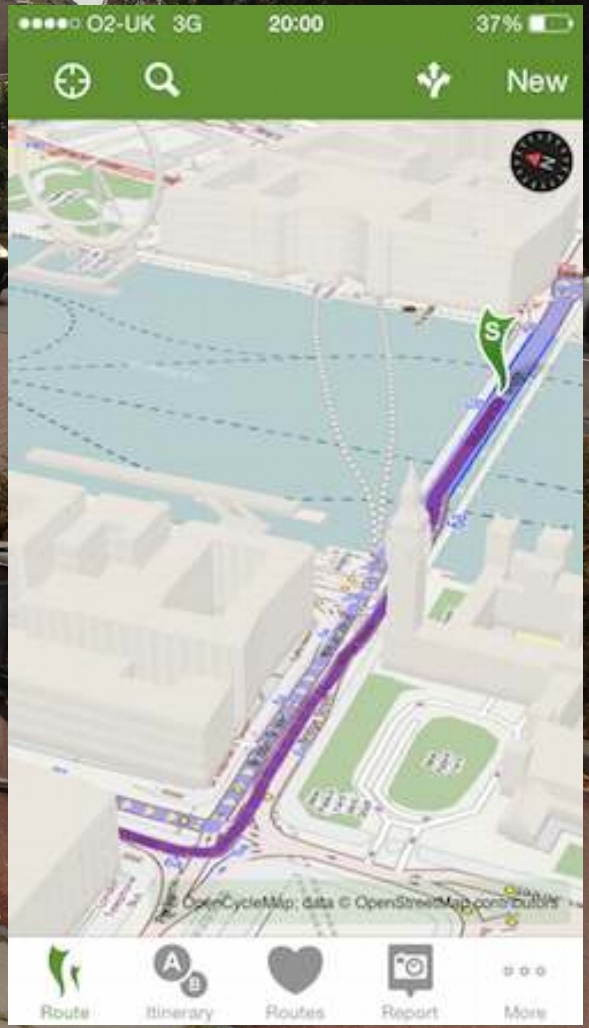
Is the OSM data model creaking?

Slides at: www.cyclestreets.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

PROBLEM: Compromises from OSM representing spaces as lines.

One conceptual space, but multiple flows

Foot Path

Zoom to this

All fields

Name

Common name (if any)

Surface

asphalt

Width (Metres)

5

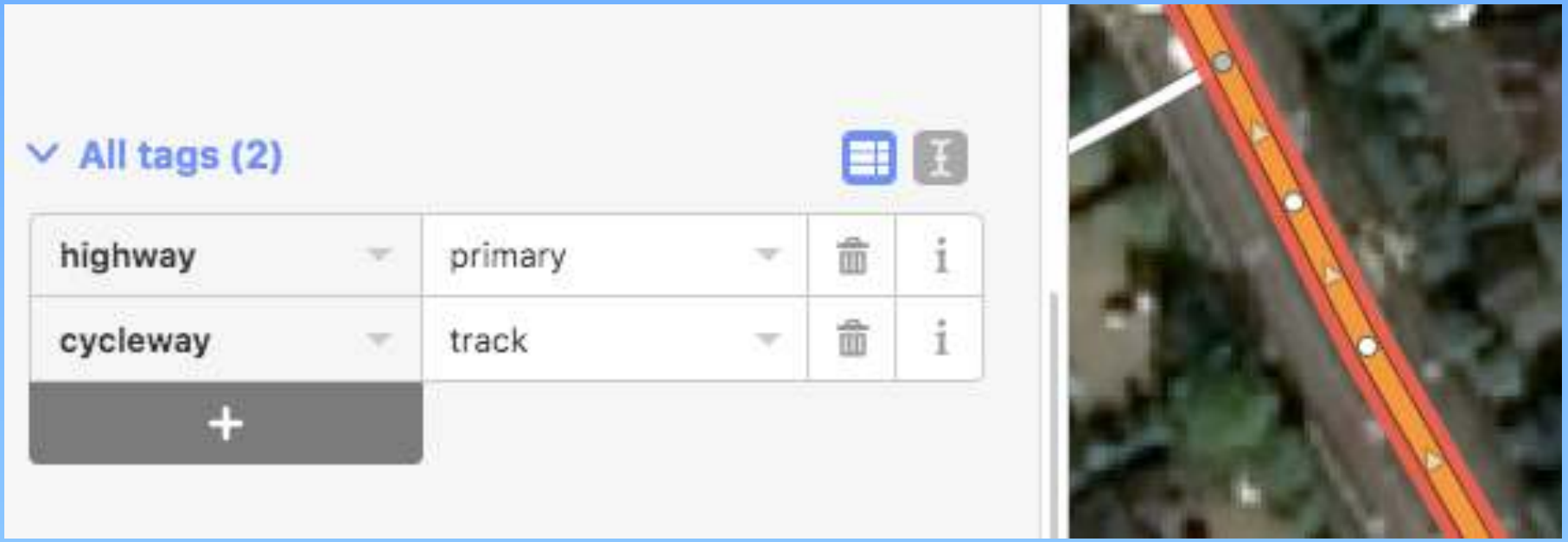
Structure

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?

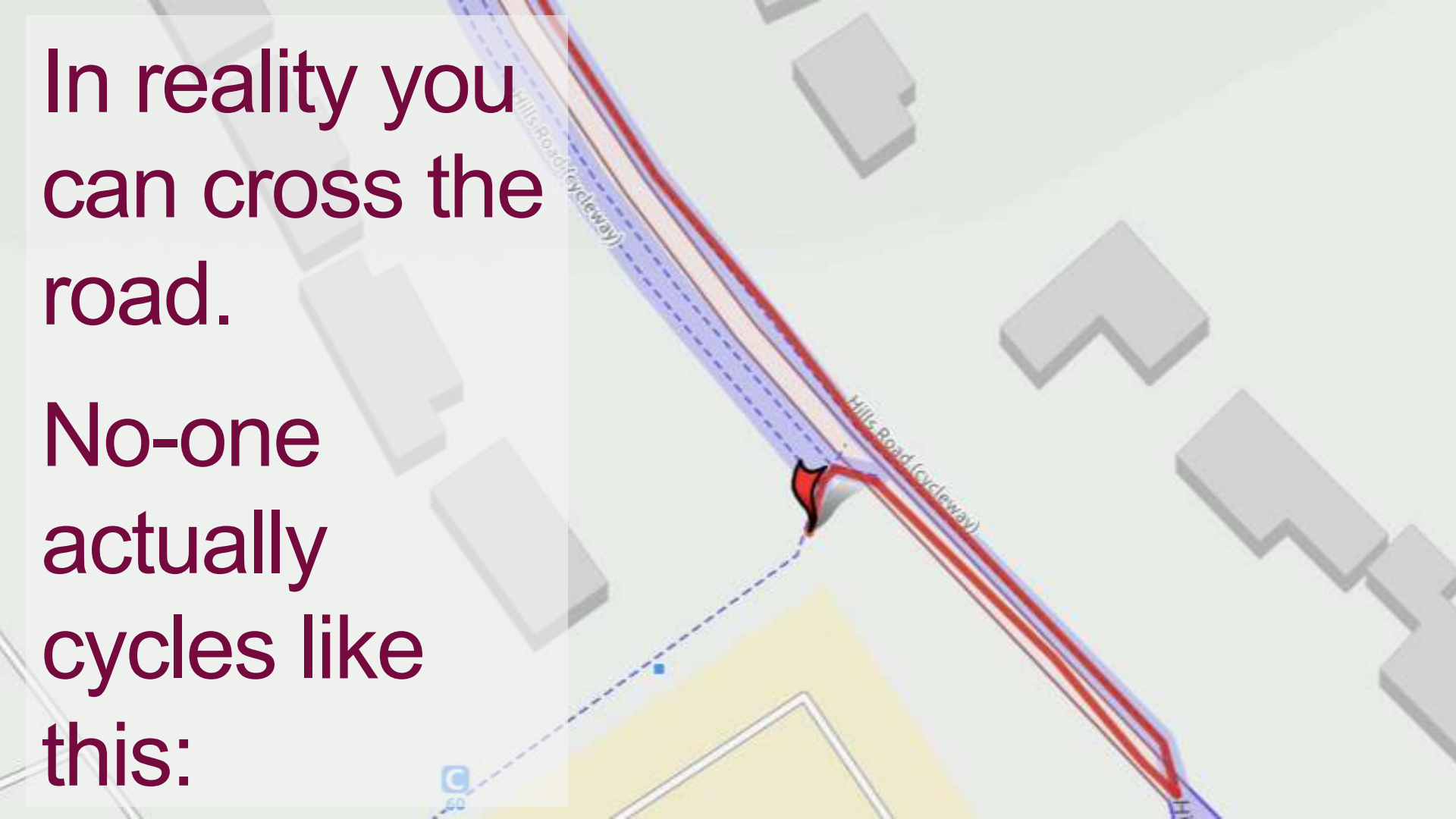


0. Original method c. 2008

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

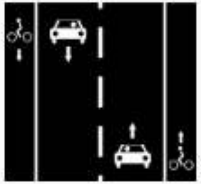
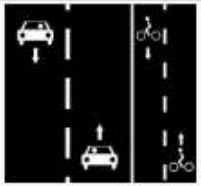
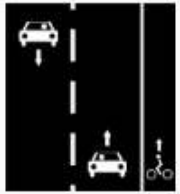


In reality you can cross the road.

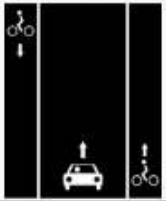
No-one actually cycles like this:

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.

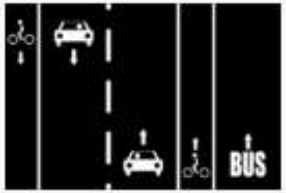
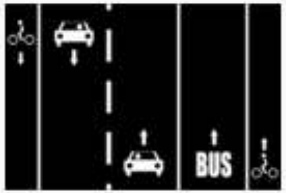
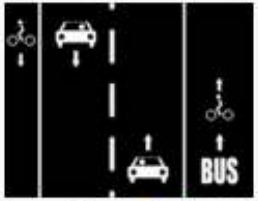
Ref	Context	Photo	OSM	Description
L1a				Cycle lanes on left and right sides of the road. Way A : `highway=*`[1] + `cycleway=lane` (recommended) or Way A : `highway=*`[1] + `cycleway:left=lane` + `cycleway:right=lane` or Way A : `highway=*`[1] + `cycleway:both=lane`
L1b				Bidirectional cycle lane on right side of the road. Way A : `highway=*`[1] + `cycleway:right=lane` + `cycleway:right:oneway=no` (recommended) or Way A : `highway=*`[1] + `cycleway=lane` (not recommended, as this can't be distinguished from
L2				Oneway cycle lane on right side of the road only. Way A : `highway=*`[1] + `cycleway:right=lane` (nb: bikes can use the normal highway on the left side)

Cycle lanes in oneway motor car roads

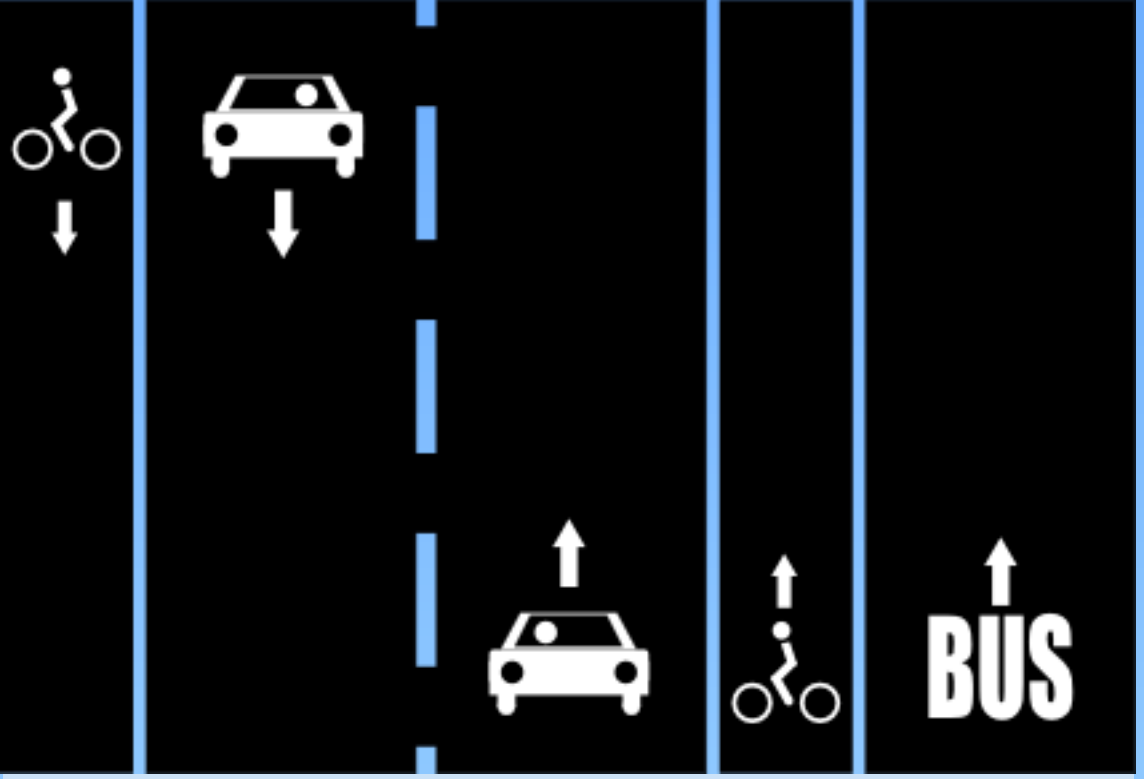
Ref	Context	Photo	OSM	Description
M1				Cycle lanes on left and right sides of the oneway road. Way A : `highway=*`[1] + `oneway=yes` + `cycleway=lane` + `oneway:bicycle=no` (recommended) or Way A : `highway=*`[1] + `oneway=yes` + `cycleway:left=opposite_lane` + `cycleway:right=lane`
M2a				Oneway cycle lane on right side and same direction of the oneway road.

Bicycle page on wiki – begins OK…

Cycle lanes and bus/taxi lanes

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

… ends up with more and more ridiculous tagging

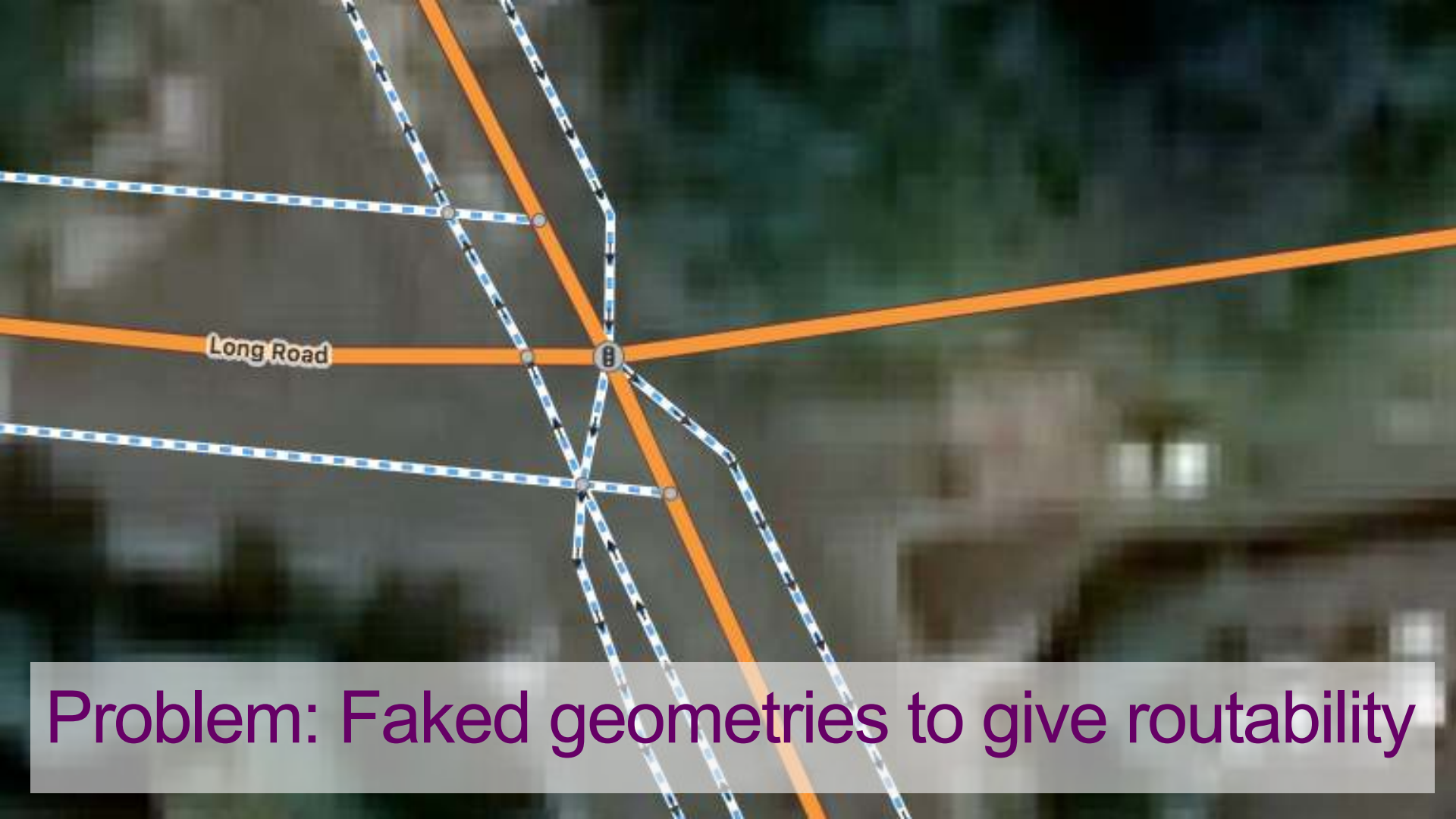


Way A : highway=* + lanes=3 + lanes:forward=2 + access:lanes=*no|yes|yes|no|no + bicycle:lanes=*designated|yes|yes|designated|yes + bus:lanes=*no|yes|yes|no|designated + taxi:lanes=*no|yes|yes|no|designated

Is this really a usable data model?

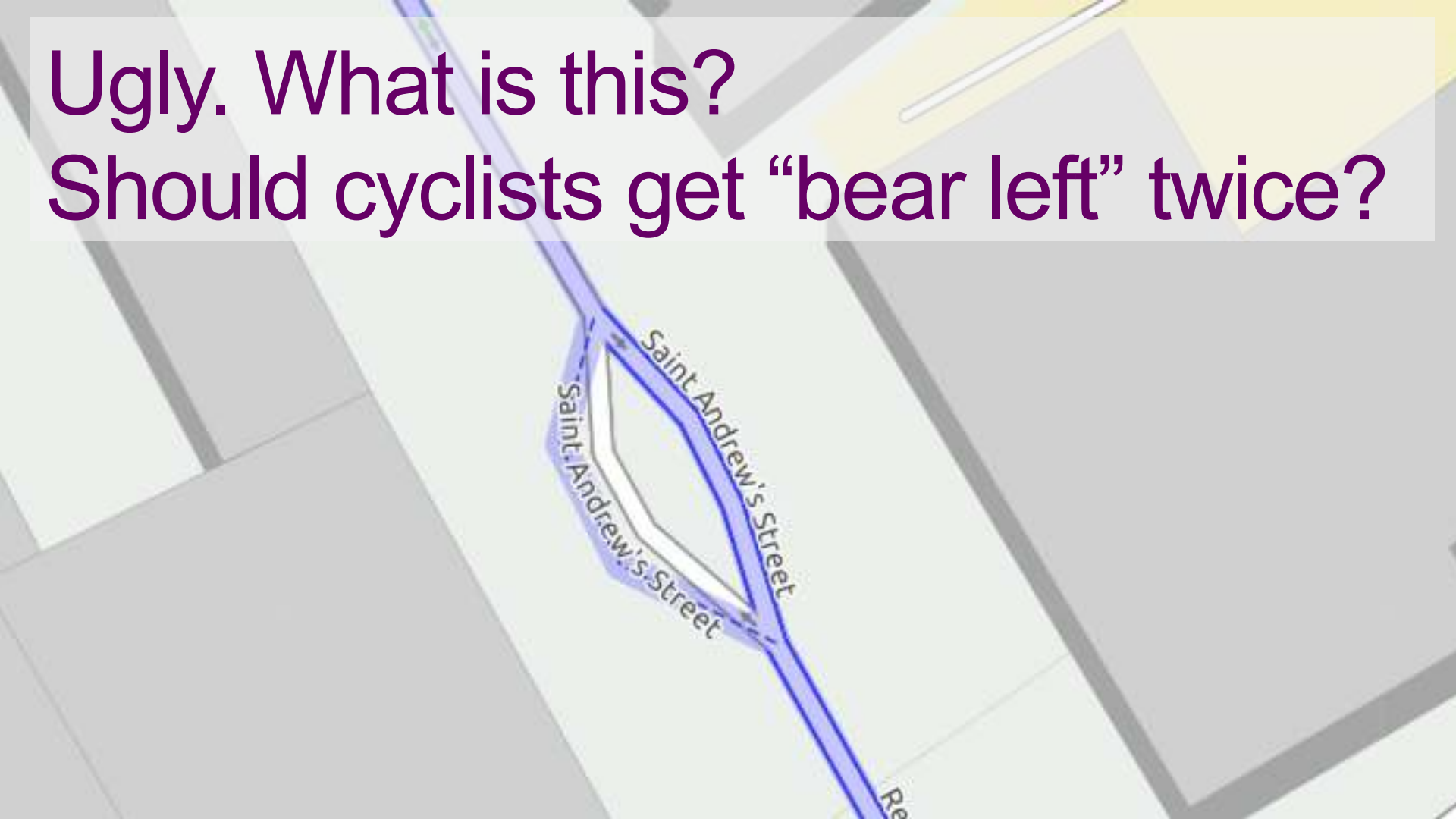
2. Unified street approach

```
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
cycleway:backward=track
cycleway:backward:est_width=1.5
cycleway:backward:oneway=-1
cycleway:backward:segregated=no
cycleway:left=stepped
cycleway:left:oneway=yes
cycleway:left:width=2.1
cycleway:right=stepped
cycleway:right:oneway=yes
cycleway: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
```



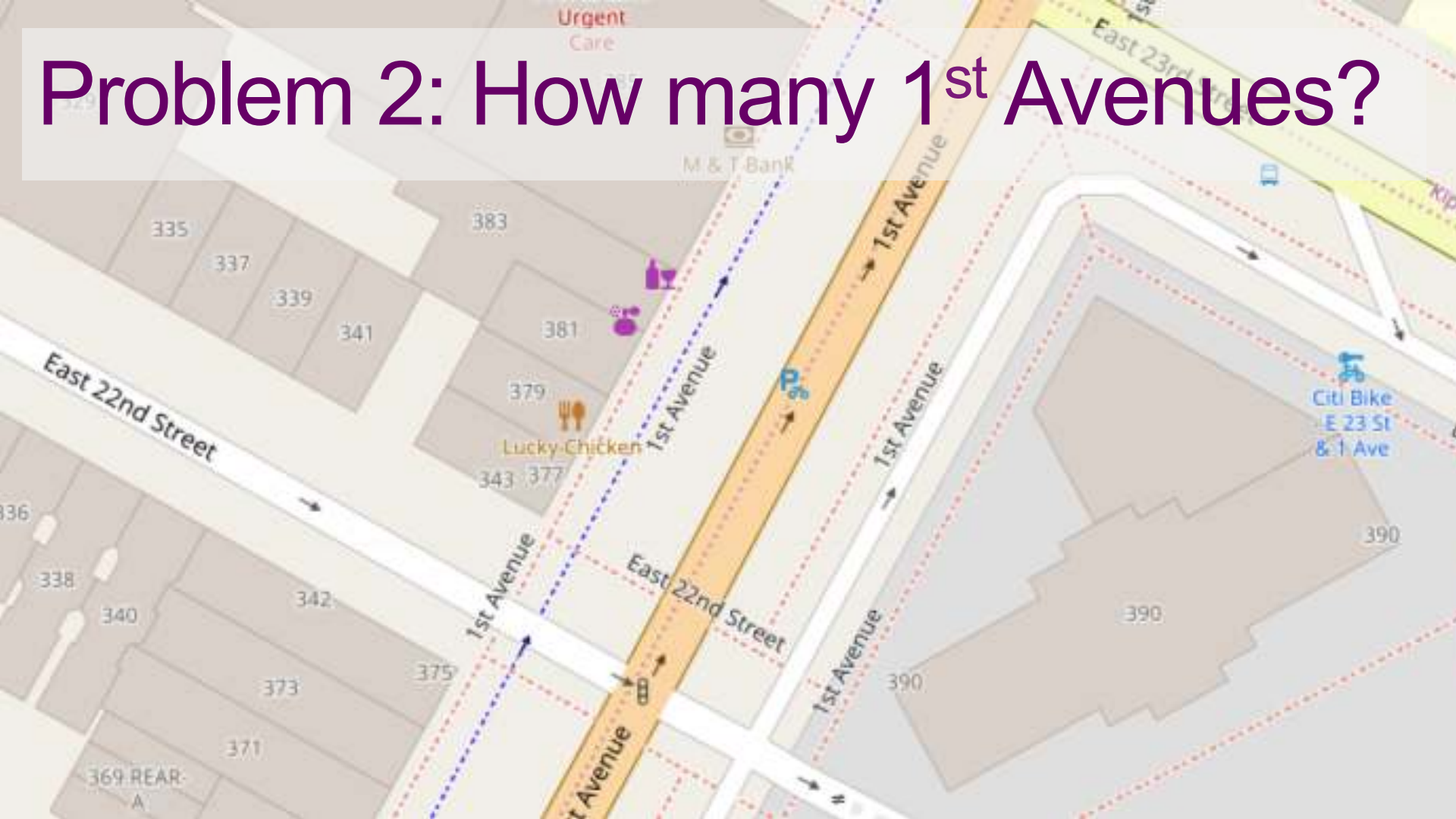
Problem: Faked geometries to give routability

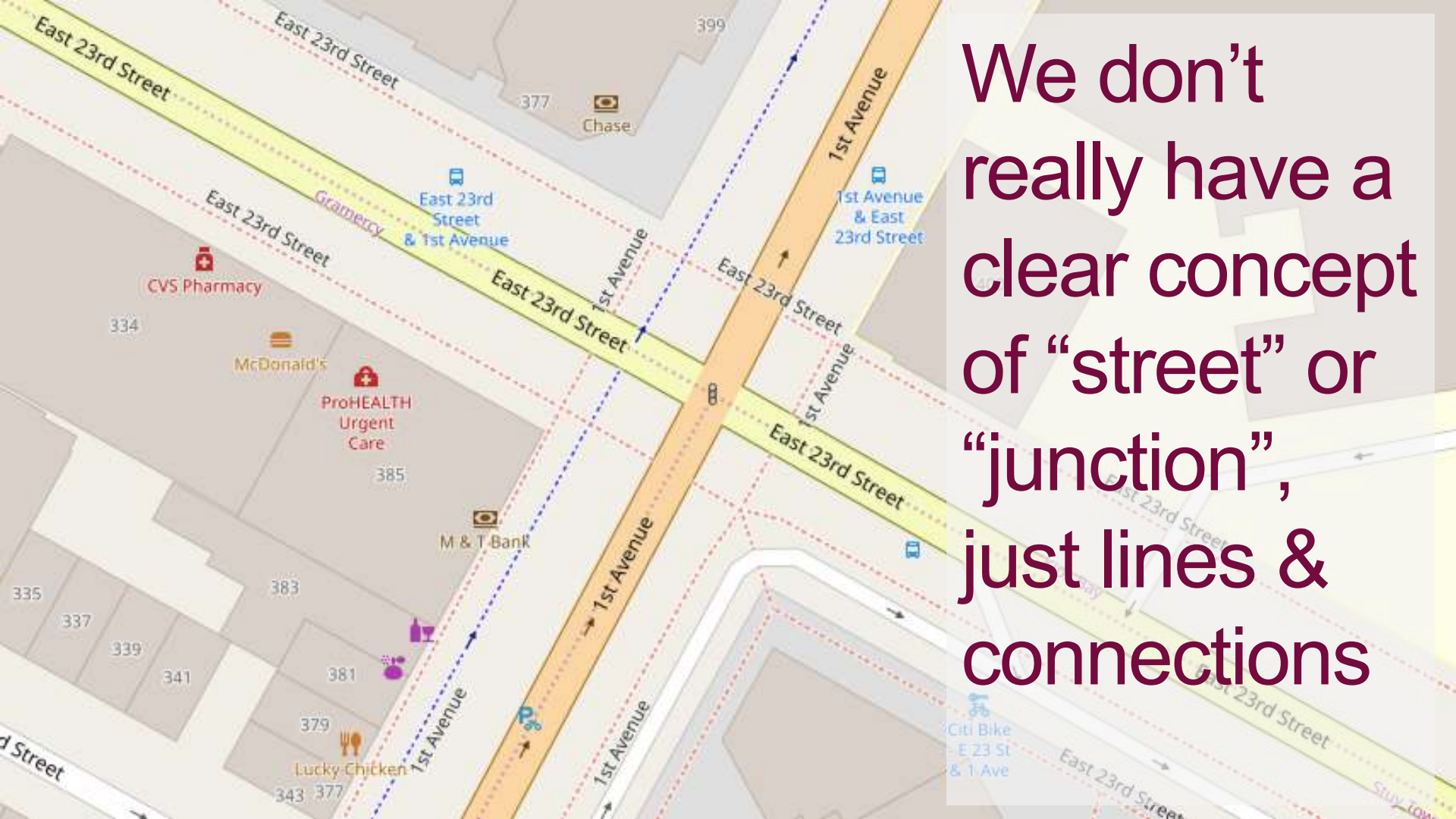
Ugly. What is this?
Should cyclists get “bear left” twice?



MANDELA HOUSE
20
ZONE

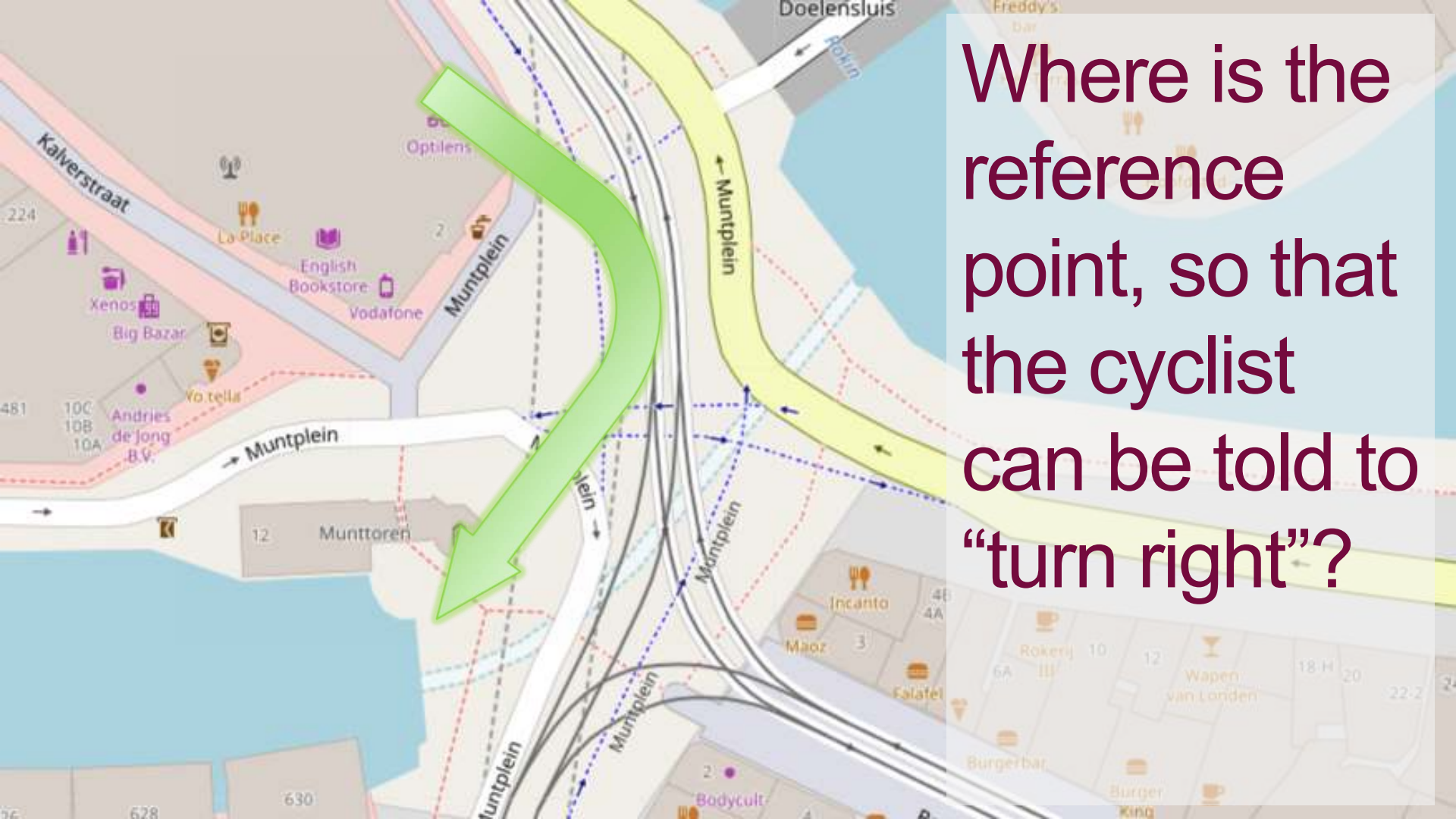
Problem 2: How many 1st Avenues?





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”?
Doelensluis
Amstel
Muntplein
Kalverstraat
Optiens
La Place
English Bookstore
Vodafone
Xenos
Big Bazar
Yo tella
Andries de Jong B.V.
Muntplein
Munttoren
Muntplein
Muntplein
Muntplein
Muntplein
Incanto
Maoz
Falafel
Rokerij
Wapen van Londen
Burgerbar
Burger King
Bodycult
224
481
10C
10B
10A
12
2
3
4B
4A
6A
10
12
18 H
20
22-2
630
628

Problem 3: Pedestrian routing poor

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?

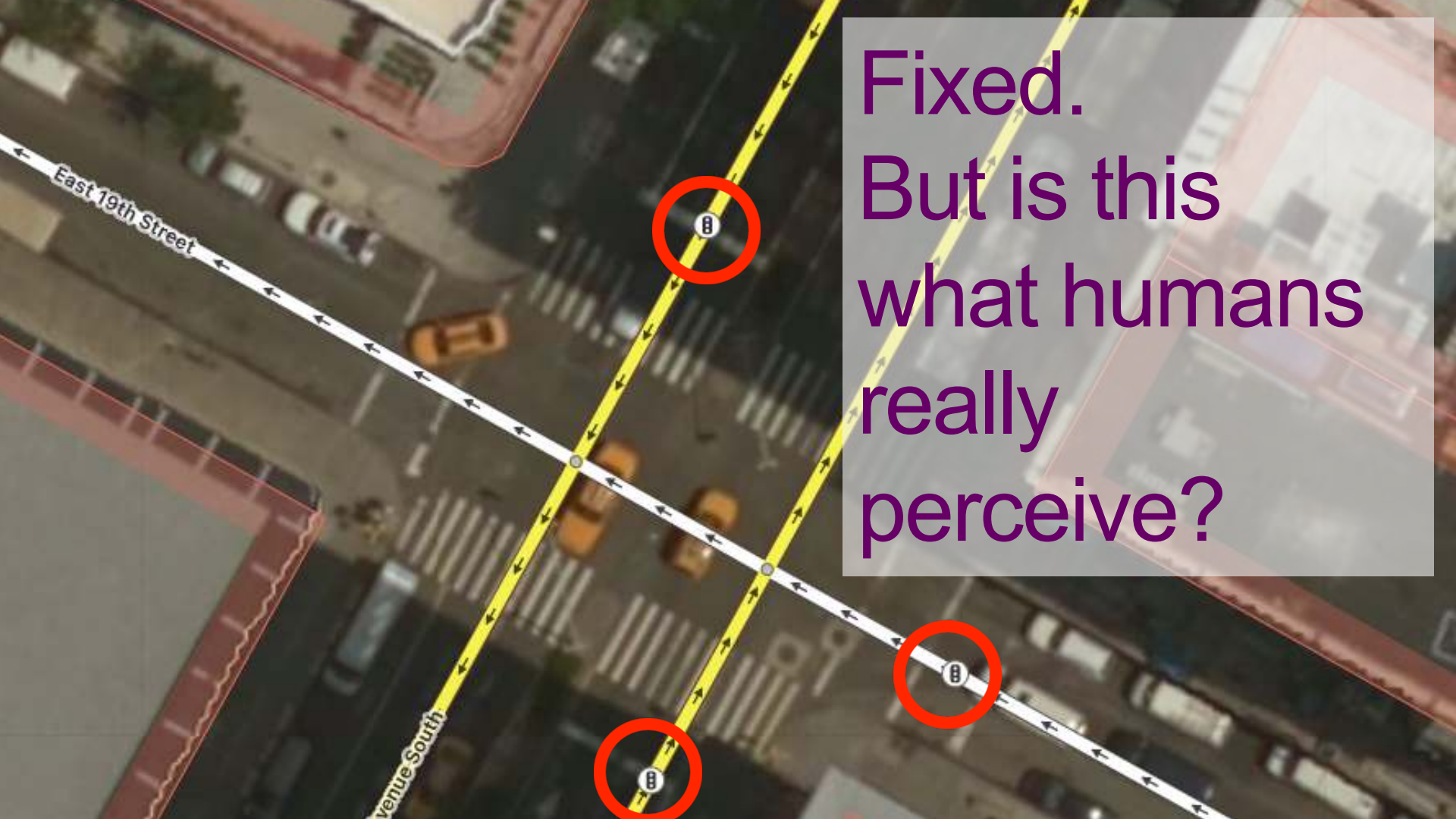
Problem: Junction times unmeasurable

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?
1st Avenue
East 23rd Street
1st Avenue
East 23rd Street
East 23rd Street


East 19th Street
venue South
Fixed.
But is this what humans really perceive?

Problem: No unified “street”
Pedestrian routing - state of the art?
Physical location vs routable?
Ellesmere Road

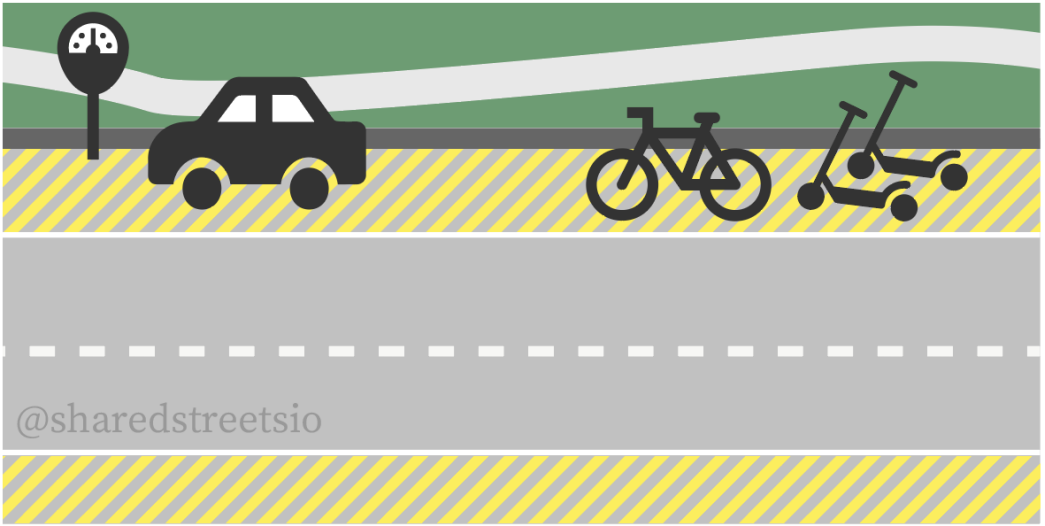
If routable, then shouldn’t it be this?

Pedestrians are the greatest pythagoreans

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

Problem: Kerbside hard to model

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

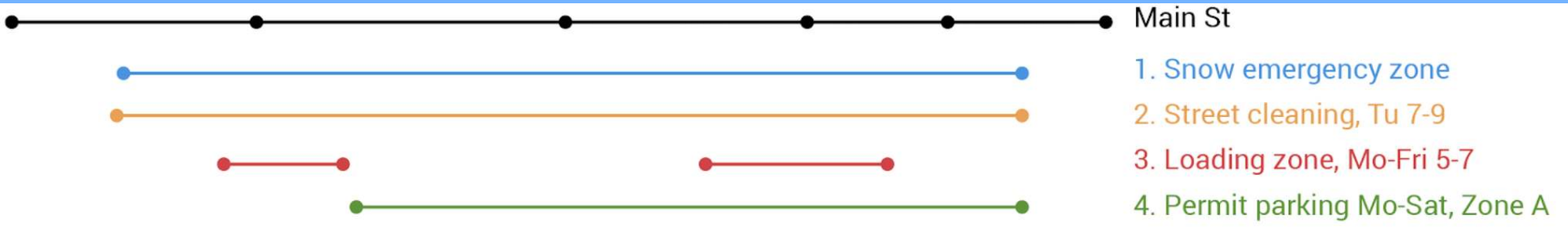


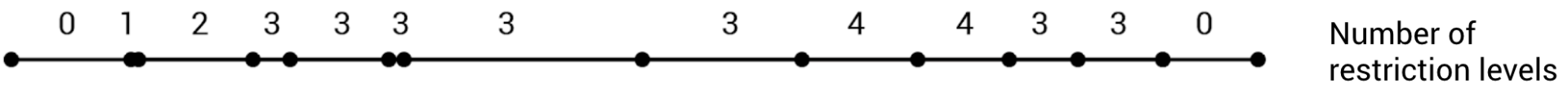
← “Inner curb” (e.g. sidewalk)

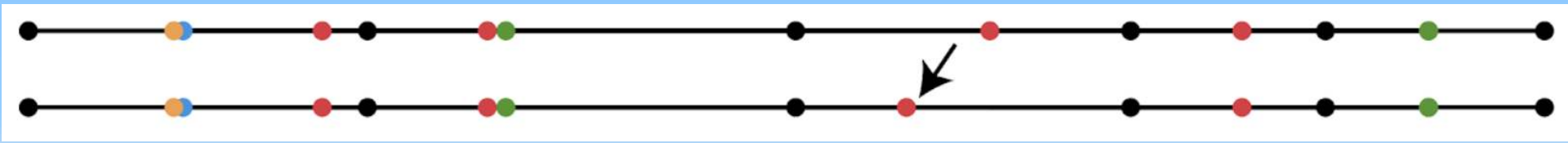
← Actual, physical curb as a barrier

← **Where curb regulations apply (i.e. the outer edge of the street)**

← Street centerline


Main St
1. Snow emergency zone
2. Street cleaning, Tu 7-9
3. Loading zone, Mo-Fri 5-7
4. Permit parking Mo-Sat, Zone A

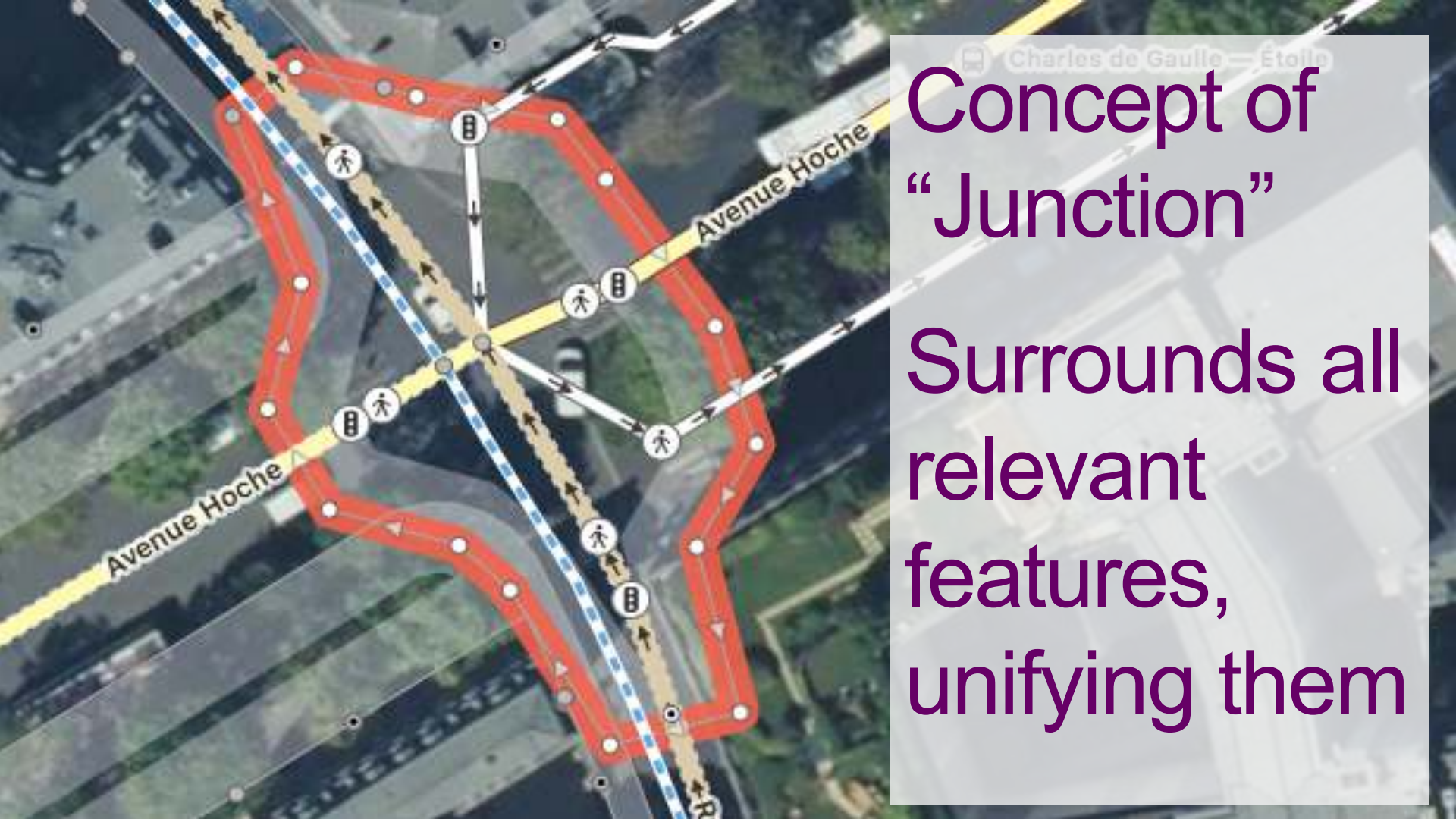

0 1 2 3 3 3 3 3 4 4 3 3 0
Number of restriction levels



Concept of a “Street” (two here)

Tesselation

Pedestrian areas with de-facto routes



Concept of “Junction”

Surrounds all relevant features, unifying them

Imgae: David Earl

Martin Lucas-Smith

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PS London Cycling Infrastructure Database

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