Cycle journey planning, for cyclists, by cyclists

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.
Cycle journey planning, for cyclists, by cyclists

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
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?
<table>
<thead>
<tr>
<th>Tag</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>highway</td>
<td>primary</td>
</tr>
<tr>
<td>cycleway</td>
<td>track</td>
</tr>
</tbody>
</table>

0. Original method c. 2008
1. Separate paths approach
In reality you can cross the road.

No-one actually cycles like this:
## Bicycle page on wiki – begins OK…

### 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.

<table>
<thead>
<tr>
<th>Ref</th>
<th>Context</th>
<th>Photo</th>
<th>OSM</th>
<th>Description</th>
</tr>
</thead>
</table>
| L1a |        | ![Image](image1) | ![Image](image2) | Cycle lanes on left and right sides of the road.  
Way A: `highway=s[1] + cycleway=lane` (recommended)  
or  
or  
Way A: `highway=s[1] + cycleway:both=lane` |
| L1b |        | ![Image](image3) | ![Image](image4) | Bidirectional cycle lane on right side of the road.  
or  
Way A: `highway=s[1] + cycleway=lane` (not recommended, as this cant be distinguished from normal lanes) |
| L2  |        | ![Image](image5) | ![Image](image6) | Oneway cycle lane on right side of the road only.  
Way A: `Highway=s[1] + cycleway:right=lane`  
(nb: bikes can use the normal highway on the left side) |

### Cycle lanes in oneway motor car roads

<table>
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</table>
| M1  |        | ![Image](image7) | ![Image](image8) | Cycle lanes on left and right sides of the oneway road.  
Way A: `highway=s[1] + oneway=yes + cycleway=lane + oneway:bicycle=no` (recommended)  
or  
Way A: `highway=s[1] + oneway=yes + cycleway:left=opposite_lane + cycleway:right=lane` |
| M2a |        | ![Image](image9) | ![Image](image10) | Oneway cycle lane on right side and same direction of the oneway road.  
Way A: `highway=s[1] + oneway=yes + cycleway:right=lane` |

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If you have any further questions or need more information, feel free to ask! 😊
Cycle lanes and bus/taxi lanes

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<tbody>
<tr>
<td>B1</td>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td>Cycle lanes on left and right sides of the road with a bus/taxi only lane. Proposal (no consensus): <strong>Way A</strong>: $\text{highway}=\ast + \text{lanes}=3 + \text{lanes:forward}=2 + \text{access}:\text{lanes}=\text{no}</td>
<td>\text{yes}</td>
</tr>
<tr>
<td>B2</td>
<td><img src="image3.png" alt="Image" /></td>
<td><img src="image4.png" alt="Image" /></td>
<td>Cycle lanes on left and right sides of the road after a bus/taxi only lane in right side. Proposal (no consensus): <strong>Way A</strong>: $\text{highway}=\ast + \text{lanes}=3 + \text{lanes:forward}=2 + \text{access}:\text{lanes}=\text{no}</td>
<td>\text{yes}</td>
</tr>
<tr>
<td>B3</td>
<td><img src="image5.png" alt="Image" /></td>
<td><img src="image6.png" alt="Image" /></td>
<td>Cycle lane on left side of the road and a shared cycle lane with a bus/taxi lane in right side. Proposal (no consensus): <strong>Way A</strong>: $\text{highway}=\ast + \text{busway:right}=\text{right} + \text{cycleway:left}=\text{lane} + \text{cycleway:Right}=\text{share_busway}$. or <strong>Proposed_features/shared_lane</strong></td>
<td></td>
</tr>
<tr>
<td>B4</td>
<td><img src="image7.png" alt="Image" /></td>
<td><img src="image8.png" alt="Image" /></td>
<td>Cycle track shared with a bus/taxi track in right side of the road. Proposal (no consensus): <strong>Way A</strong>: $\text{highway}=\text{service} + \text{service}=\text{bus} + \text{oneway}=\text{yes} + \text{cycleway:right}=\text{share_busway}$. <strong>Way B</strong>: assuming for bicycle and buses there is an obligation to use <strong>Way A</strong> in forward directions (of way A): $\text{highway}=\ast + \text{oneway}=\text{bus}=\text{yes} + \text{oneway}=\text{bicycle}=\text{yes}$. assuming bicycles may use <strong>Way B</strong> in both directions: $\text{highway}=\ast$</td>
<td></td>
</tr>
<tr>
<td>B5</td>
<td><img src="image9.png" alt="Image" /></td>
<td><img src="image10.png" alt="Image" /></td>
<td>Cycle lane shared with a bus/taxi lane on right side of the road (in some countries only).</td>
<td></td>
</tr>
</tbody>
</table>

... ends up with more and 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
bicycle:lanes=no|designated|designated|yes|yes|
designated|no
bus:lanes=no|no|no|yes|yes|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|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?
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
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?
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

@sharedstreetsio
1. Snow emergency zone
2. Street cleaning, Tu 7-9
3. Loading zone, Mo-Fri 5-7
4. Permit parking Mo-Sat, Zone A
Concept of a “Street” (two here)
Tesselation
Pedestrian areas with de-facto routes
Concept of “Junction”

Surrounds all relevant features, unifying them
Martin Lucas-Smith

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Twitter: @cyclestreets
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PS London Cycling Infrastructure Database
https://wiki.openstreetmap.org/wiki/TfL_Cycling_Infrastructure_Database