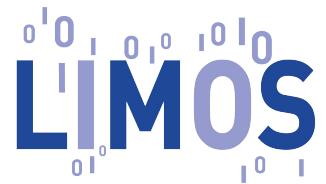


# What are intersections for pedestrian users?

Jean-Marie Favreau, Jérémie Kalsron

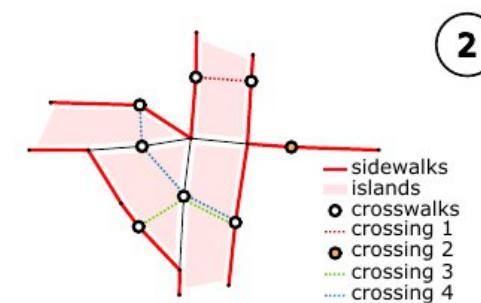
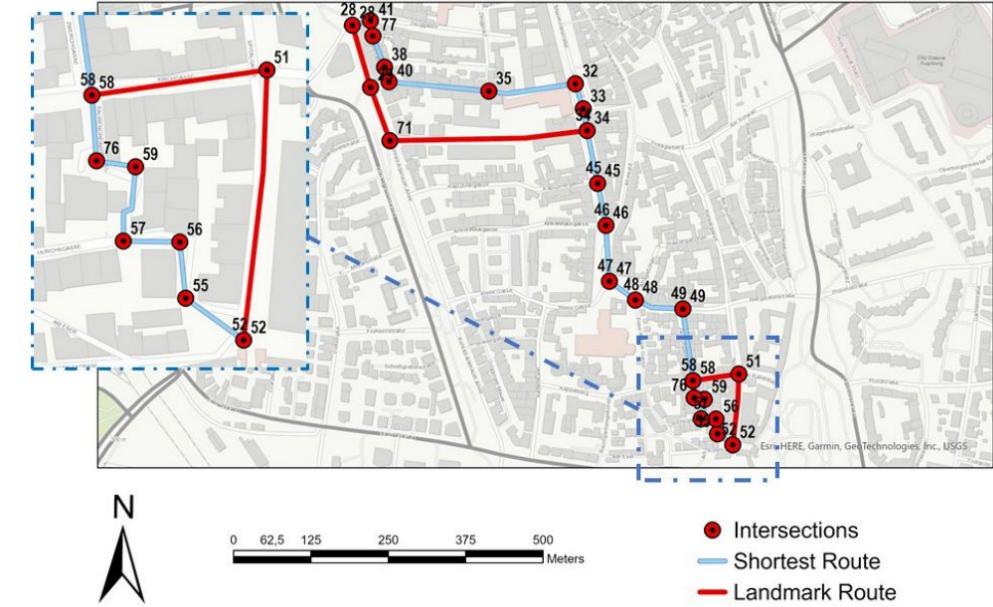
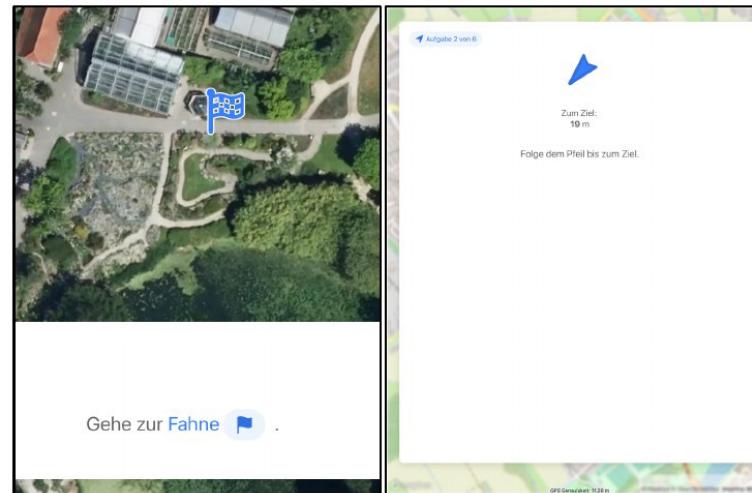
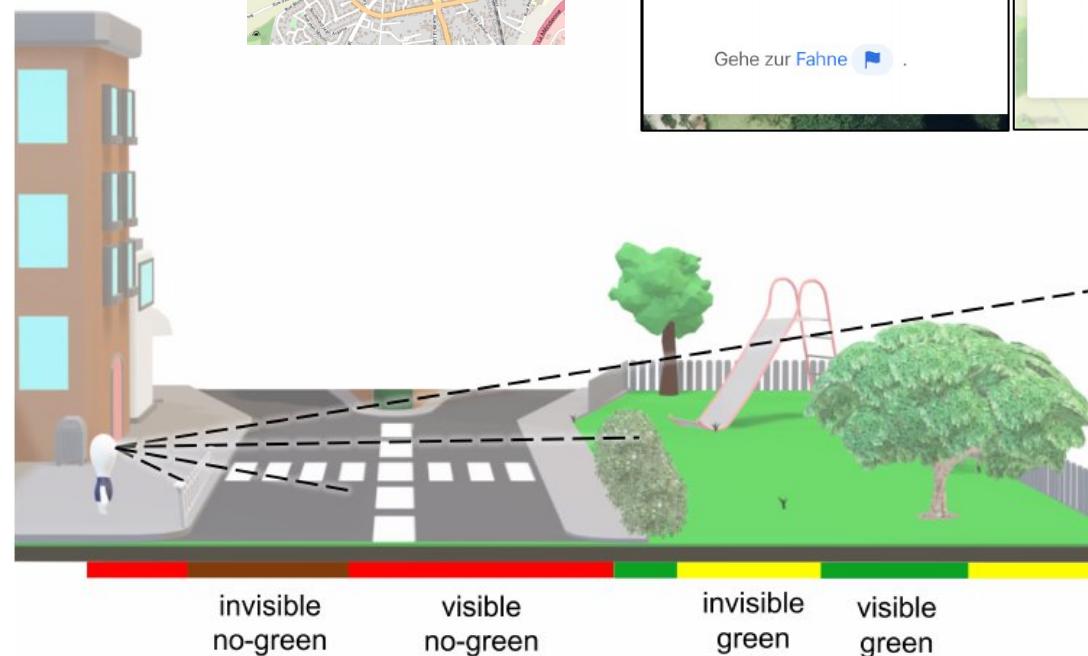
LIMOS, Université Clermont Auvergne, France

 @jm\_favreau



# GIS for cities at pedestrian scale

AGILE 2022, Vilnius

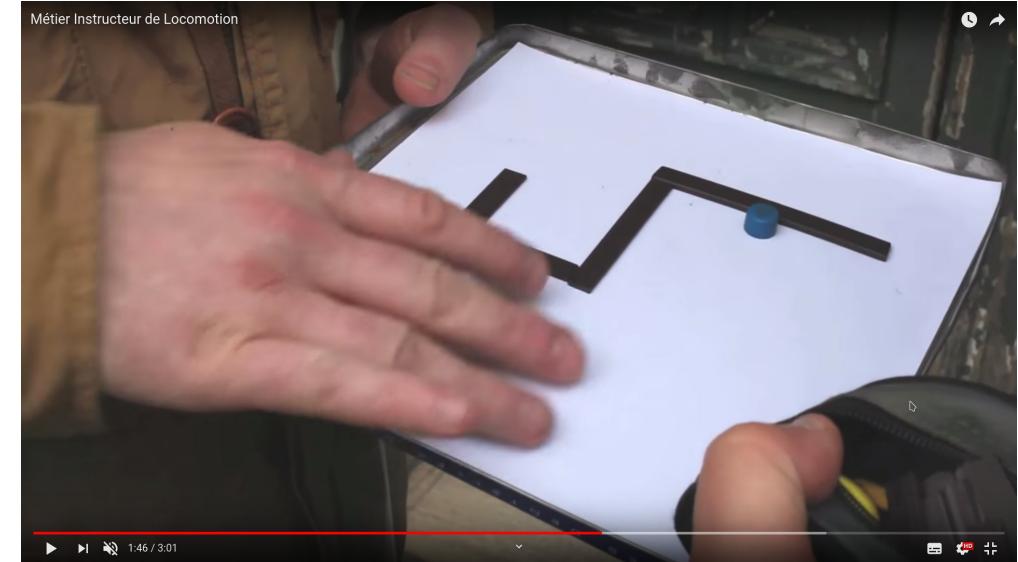


A photograph of a woman in a red jacket walking on a cobblestone street. In the background, there is a large, classical-style building with columns and a green park area with trees. The foreground features a paved walkway.

# Context and motivation

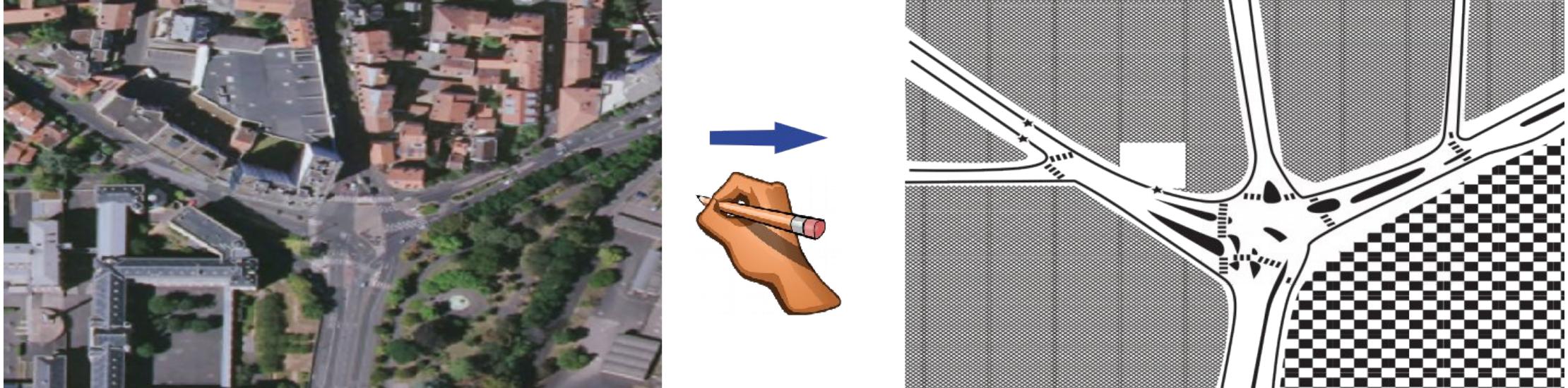
# Mobility and Orientation of visually impaired people

- first challenge: urban **intersections**



source: <https://youtu.be/oyGyfY1LbnM> (AILDV)

# Maps for visually impaired people: current approach



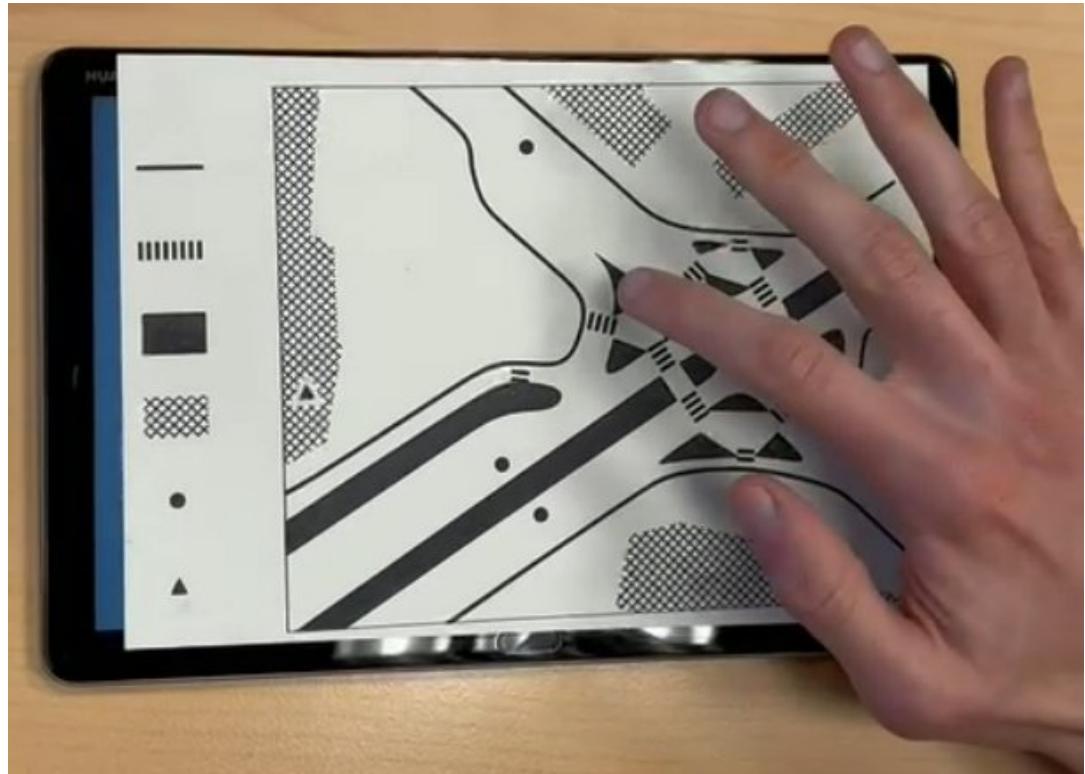
- Handmade maps
- Very few qualified people
- Need of support for appropriation

# ACTIVmap research project



# Assistance to design multimodal maps

- relief map generation
  - generation of textual description



# CrossroadsDescriber - Automatic Textual Description of OpenStreetMap Intersections

Jérémie Kalsron, Jean-Marie Favreau, and Guillaume Touya

AGILE 2022

<https://activmap.limos.fr>



# First question

What are intersections for pedestrian users?

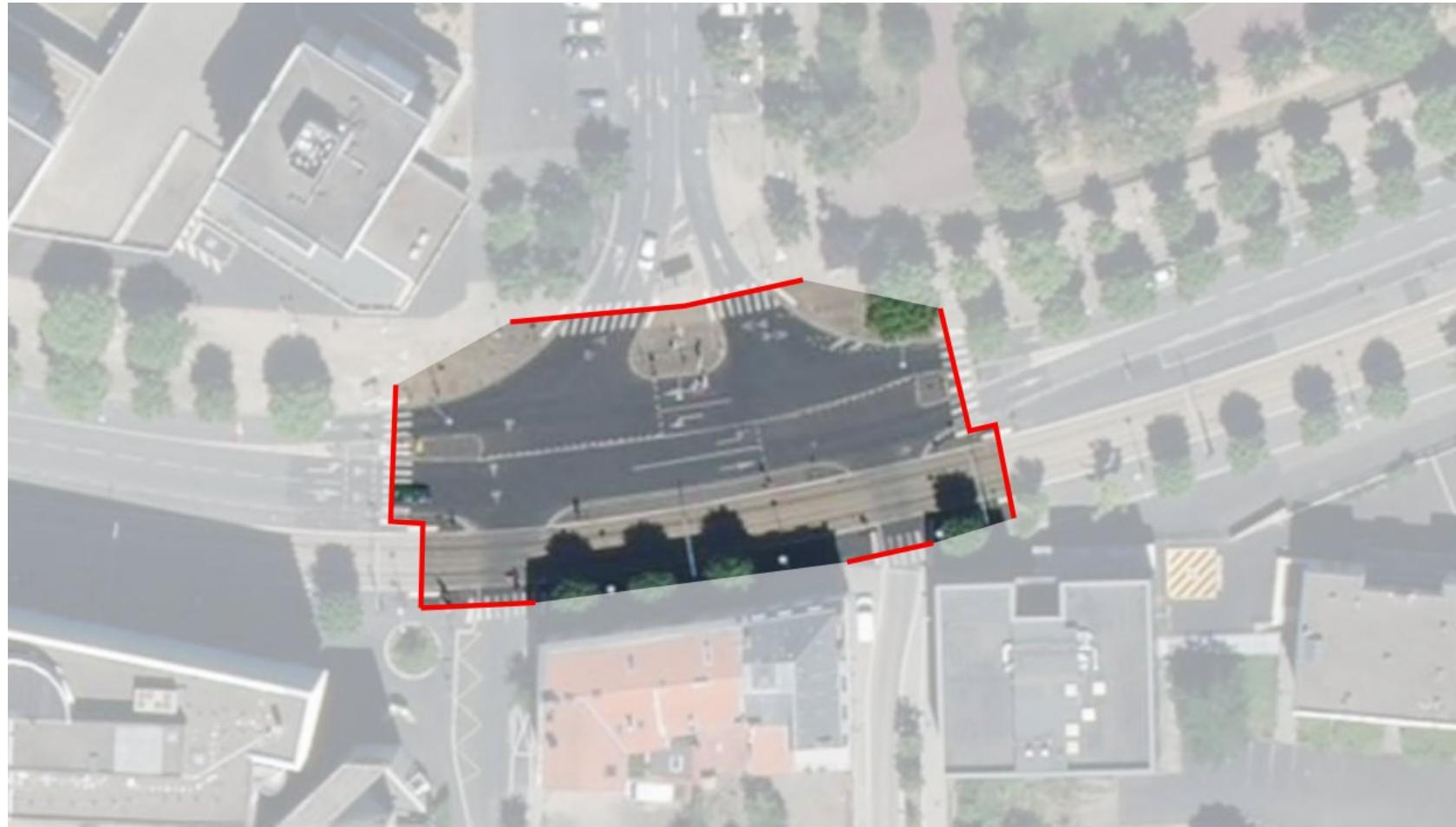
# What are intersections for pedestrian users?



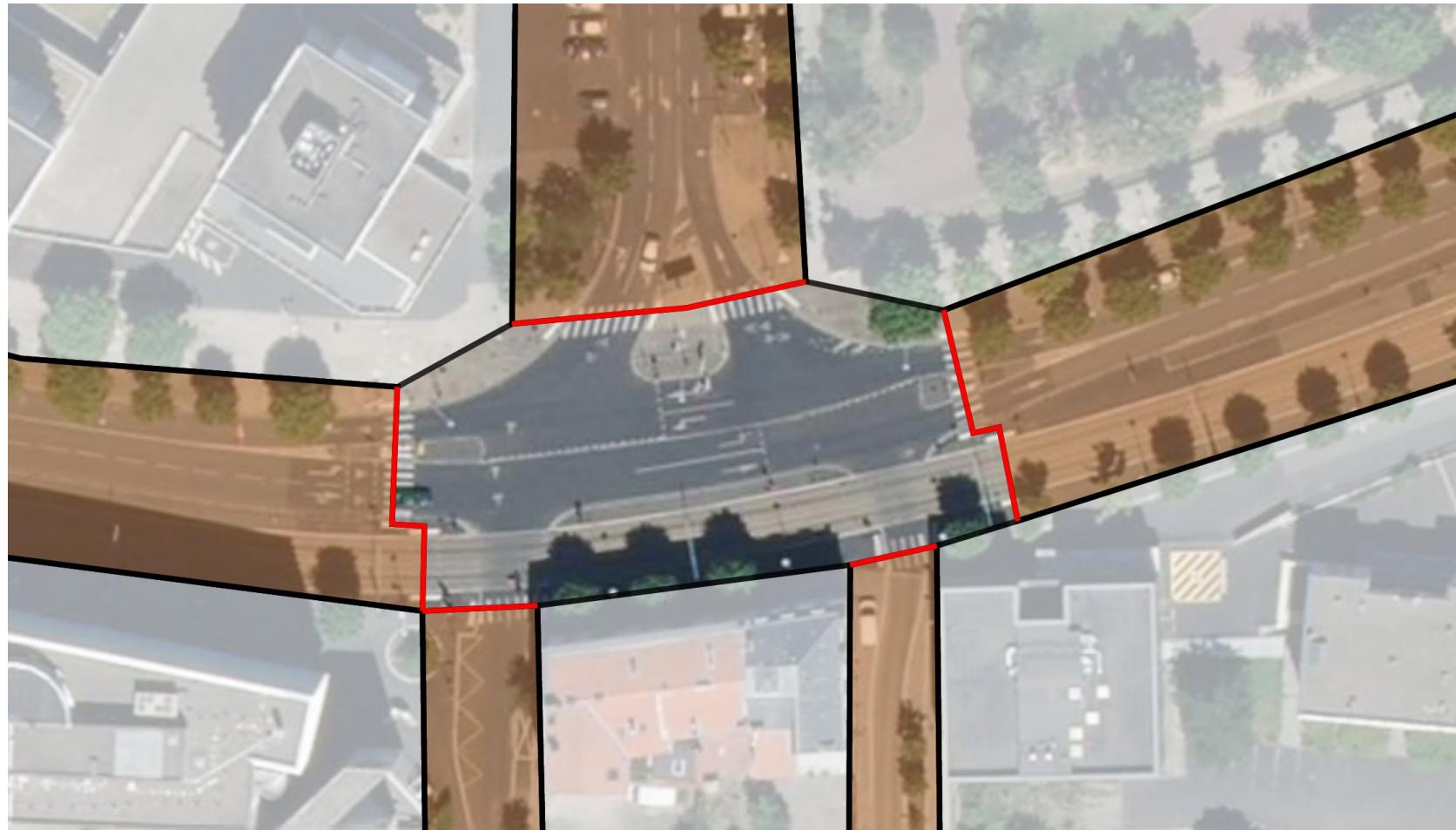
# A region that cannot be crossed



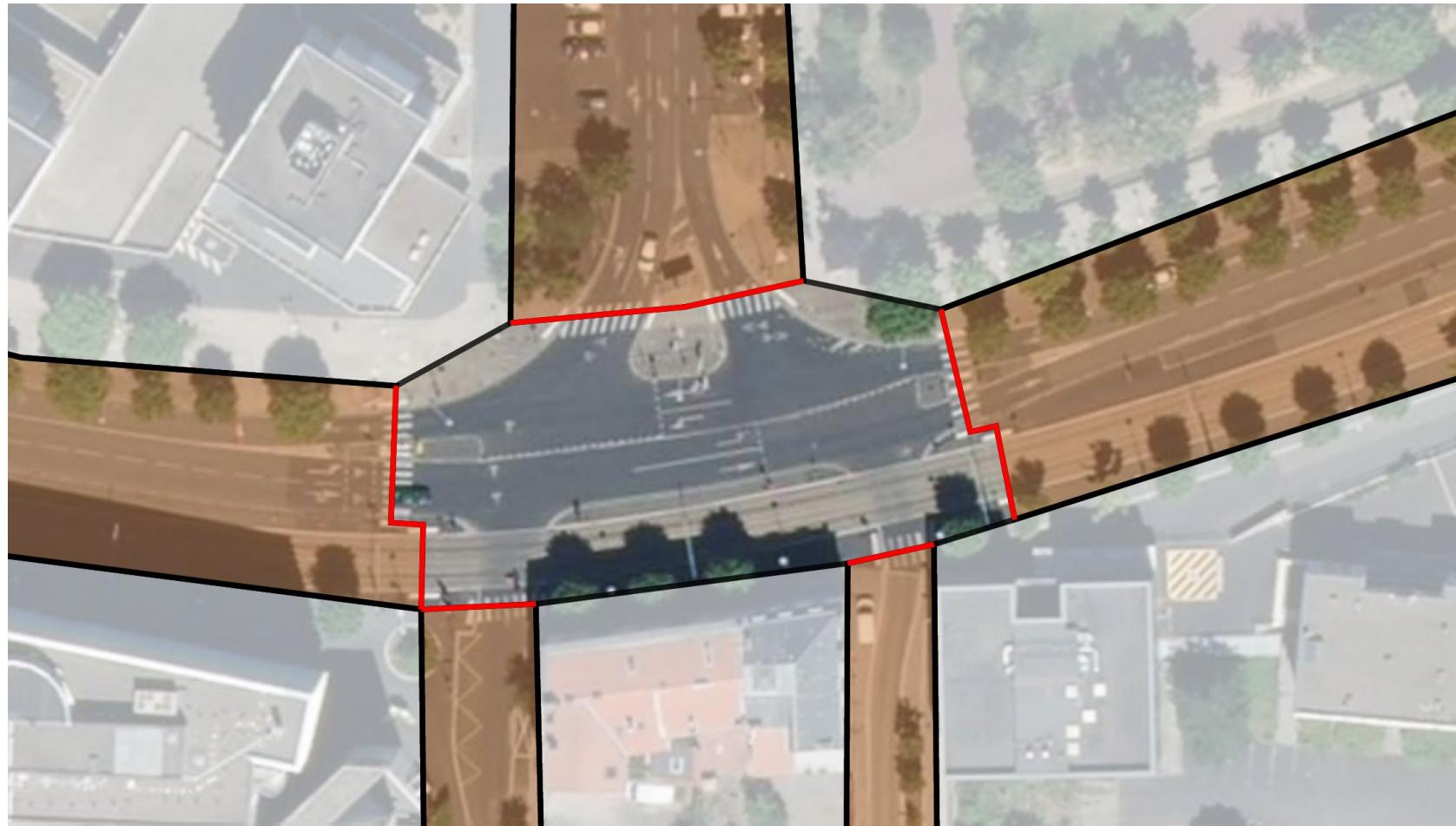
# A region bordered by pedestrian crossings



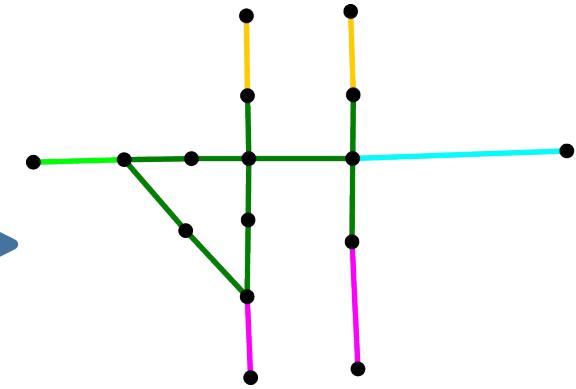
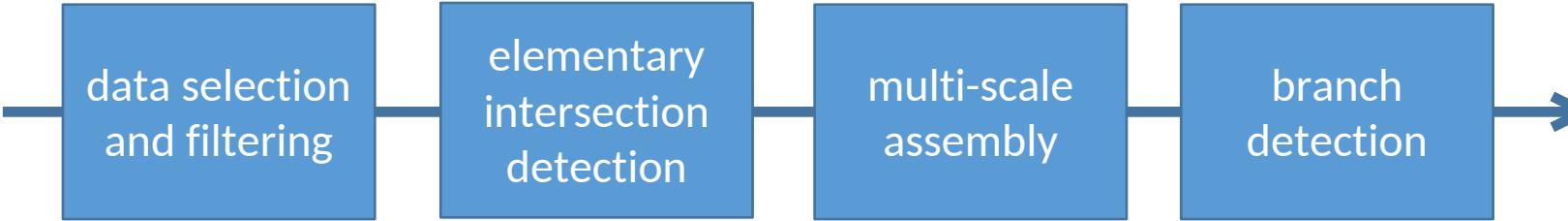
# A region connected to branches



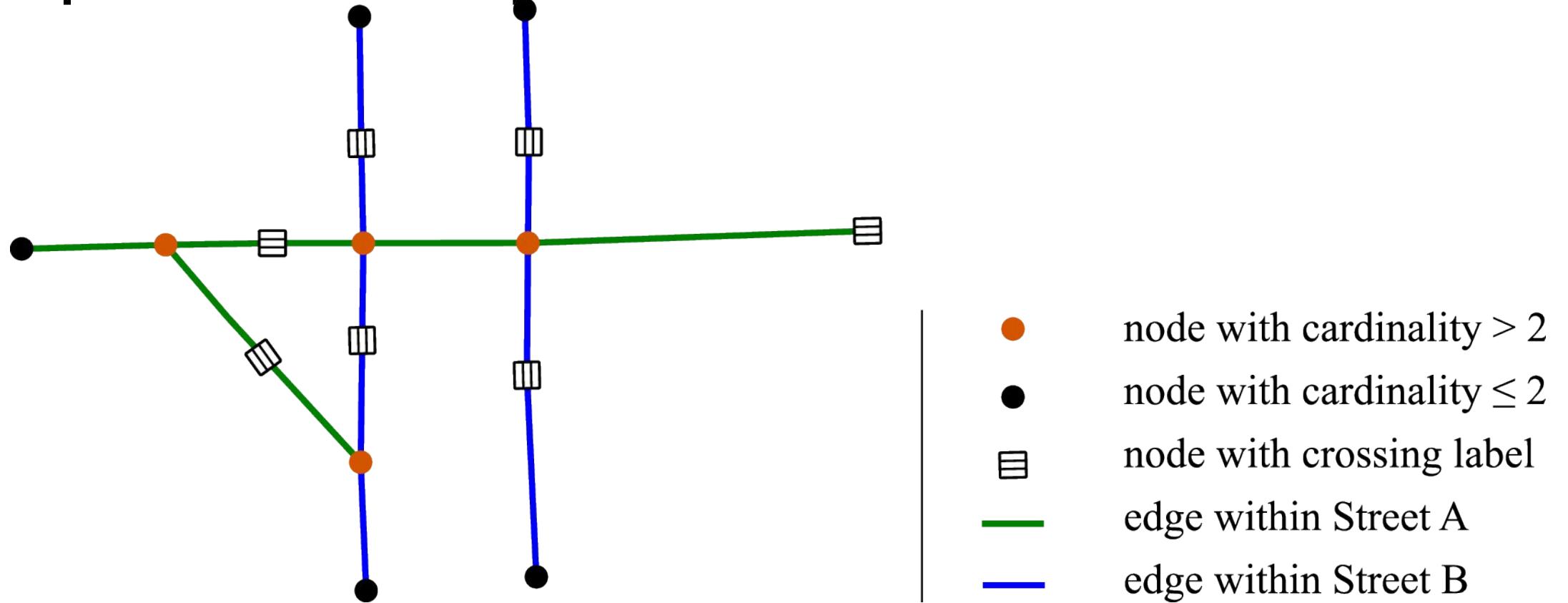
# Our proposal: considering crossings as boundaries



# Overview of the process chain

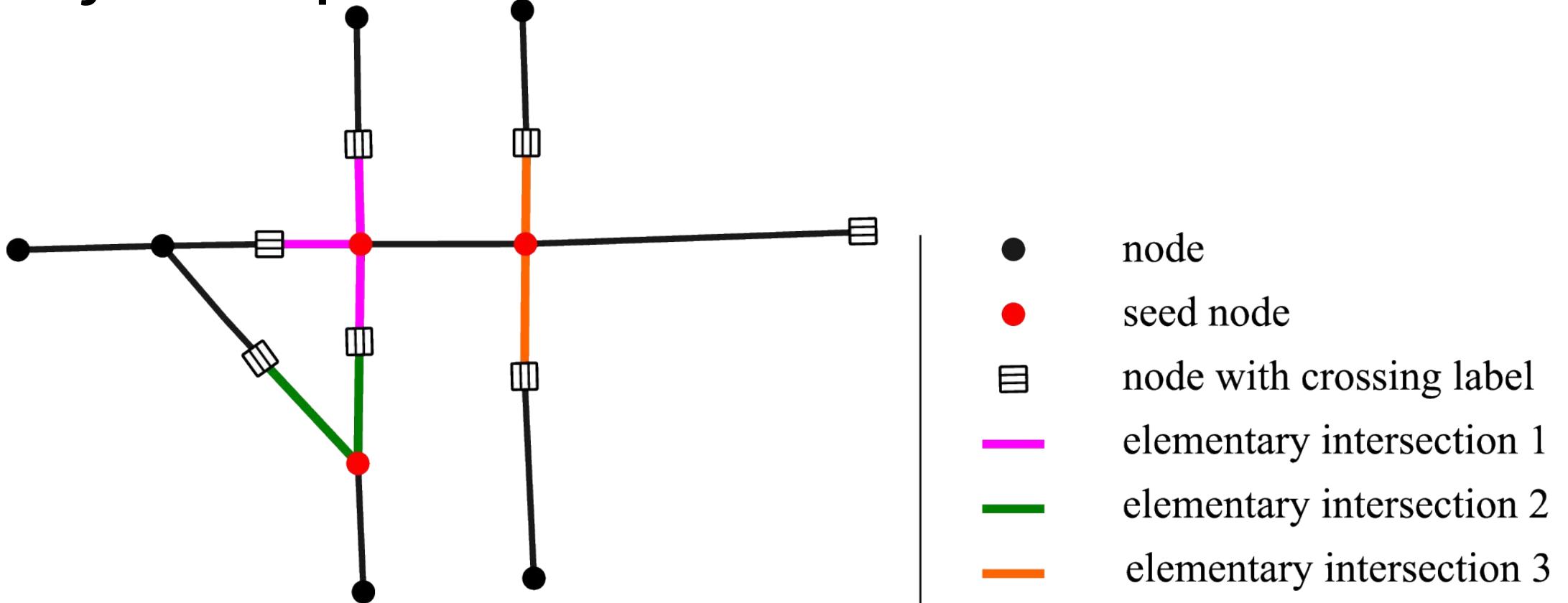


# Semantic and topologic classification from OpenStreetMap



Street names, node cardinality, specific node types (traffic signals, pedestrian crossings)

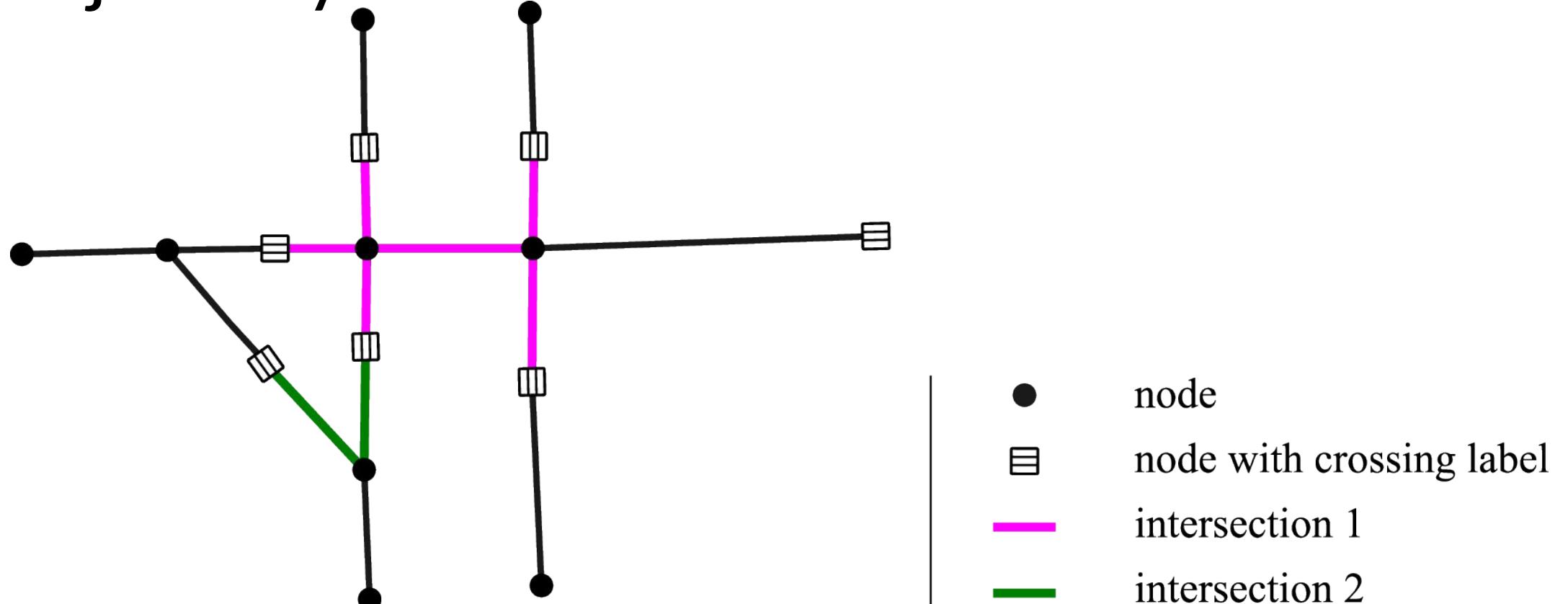
# Elementary intersections: seed nodes and adjacent paths



**Boundary nodes:** crossings, traffic signals

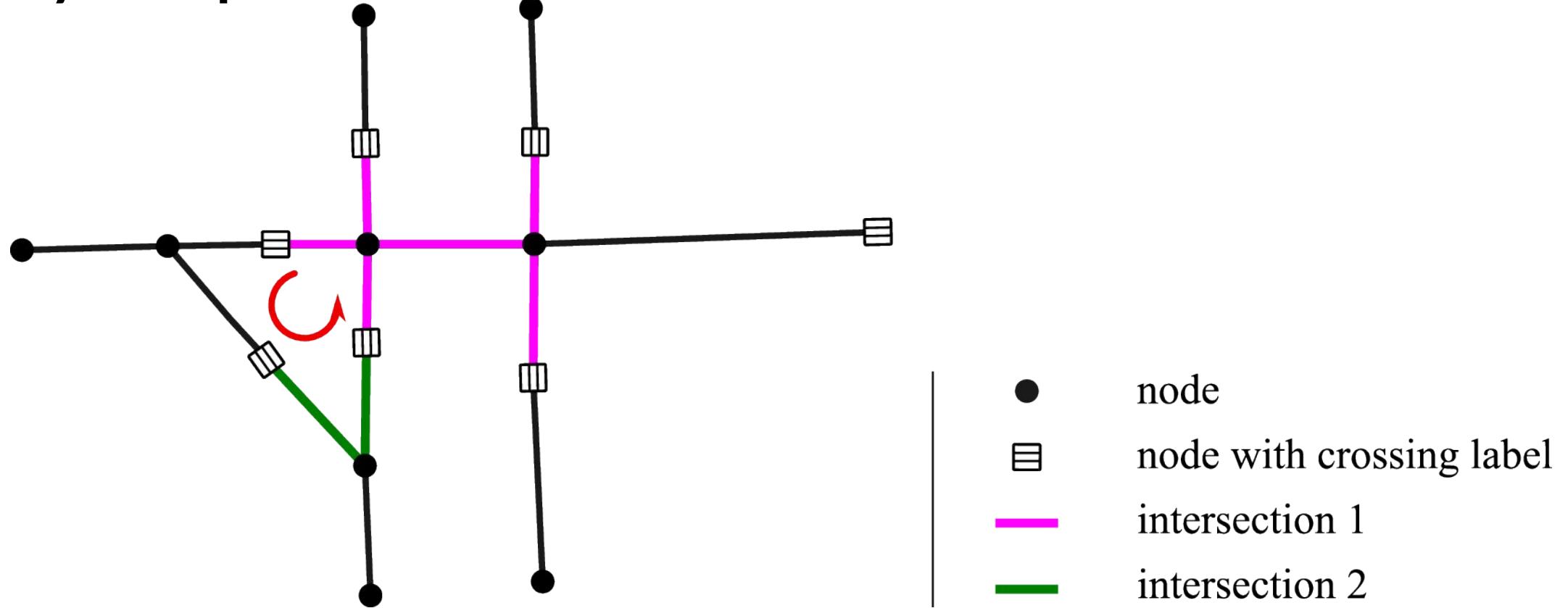
**Threshold distance:**  $C_0 \times$  street's width

# Multi-scale approach: first assembly step by adjacency



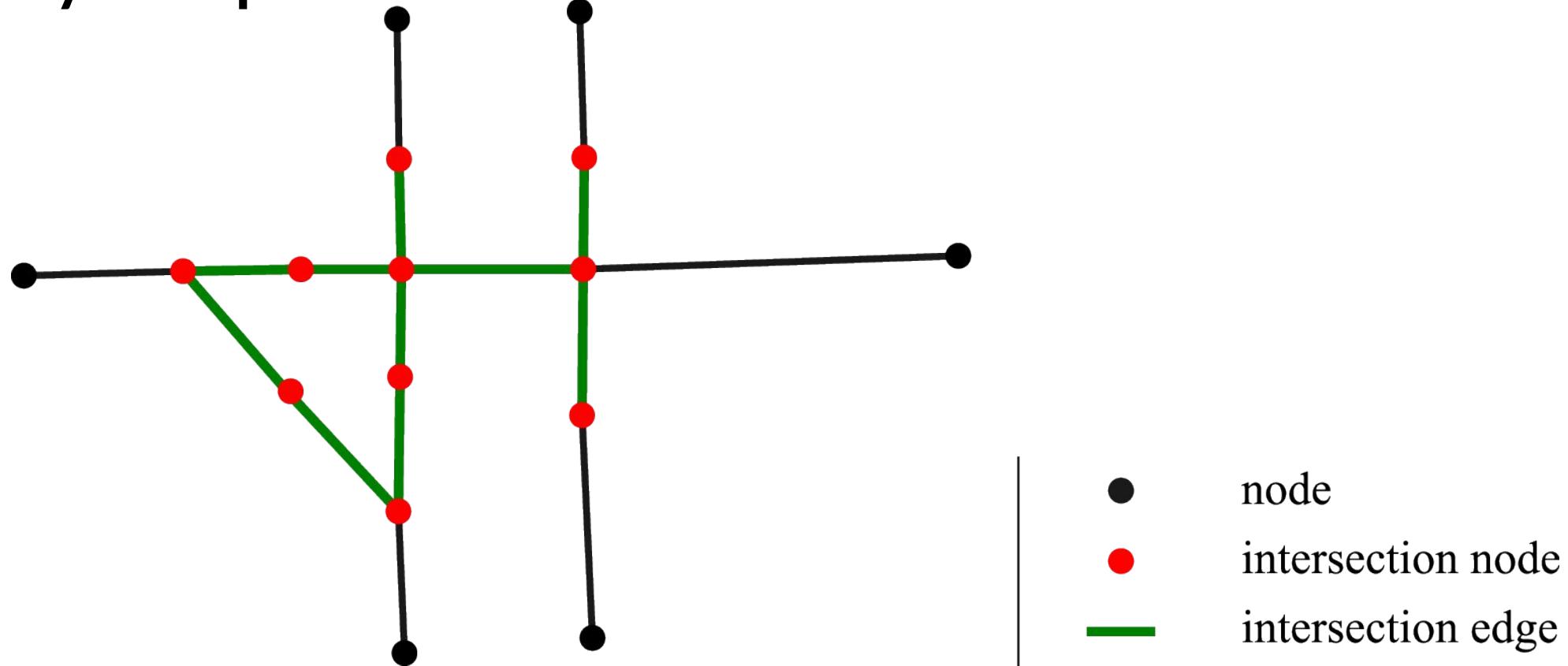
Threshold distance:  $C_1 \times \text{street's width}$

# Multi-scale approach: second assembly step by loop detection



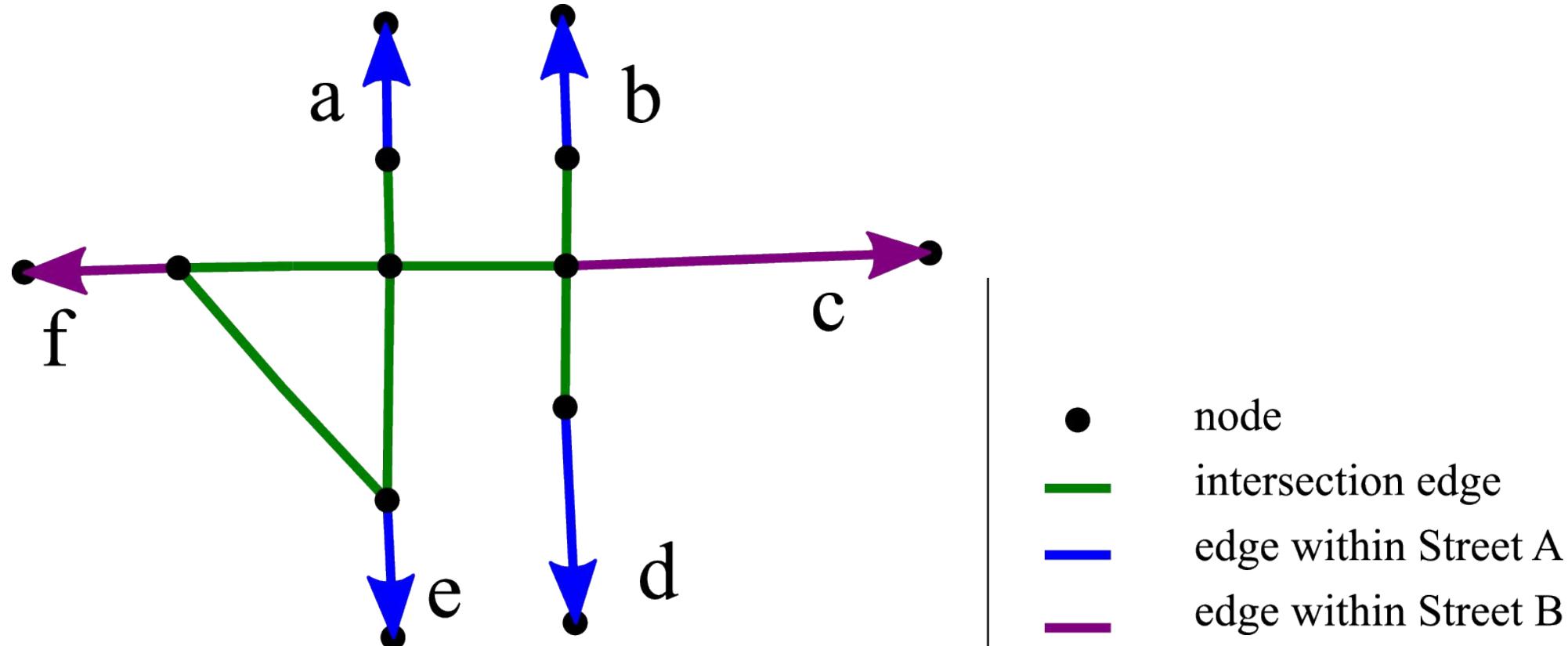
Threshold distance:  $\pi \times C_2 \times \text{street's width}$

# Multi-scale approach: second assembly step by loop detection

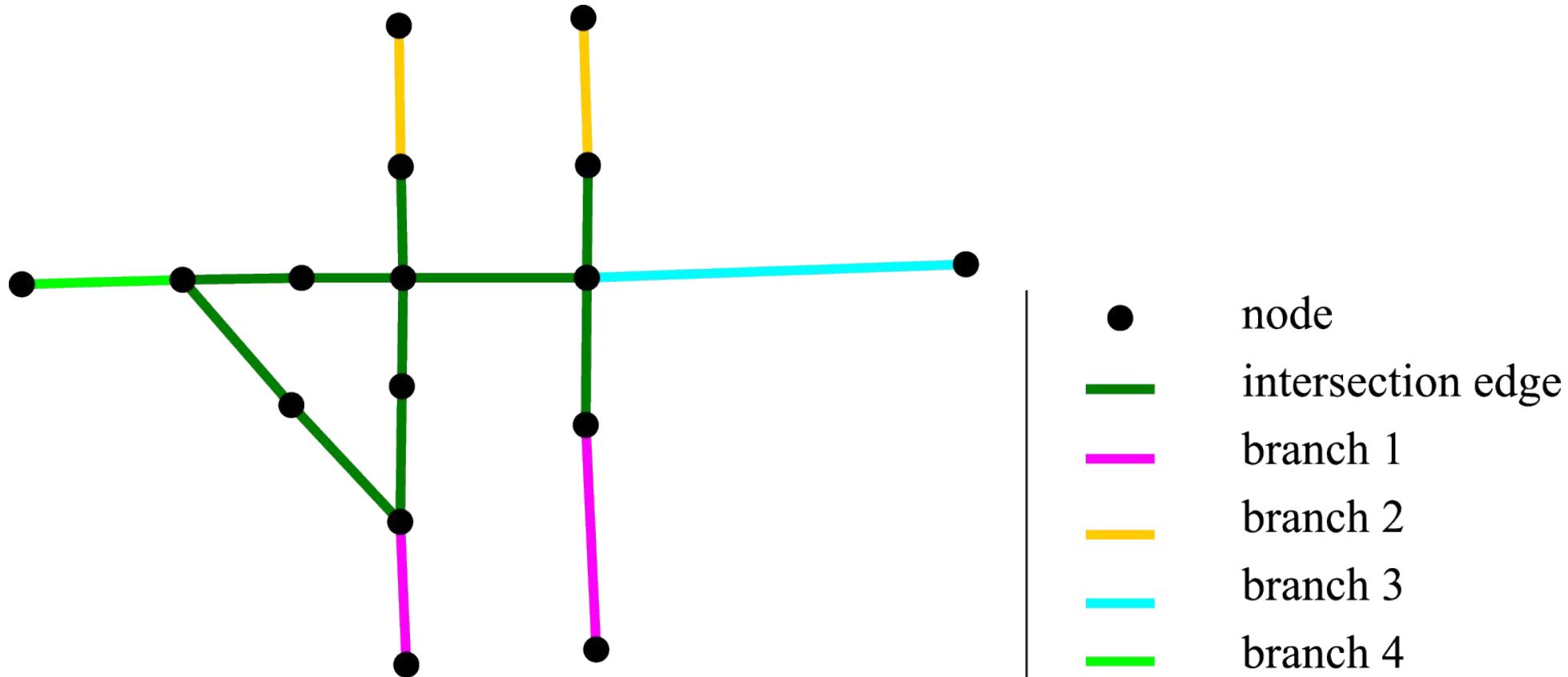


**Threshold distance:**  $\pi \times C_2 \times$  street's width

# Final segmentation: adjacent edges classification



# Final segmentation: identification of branches

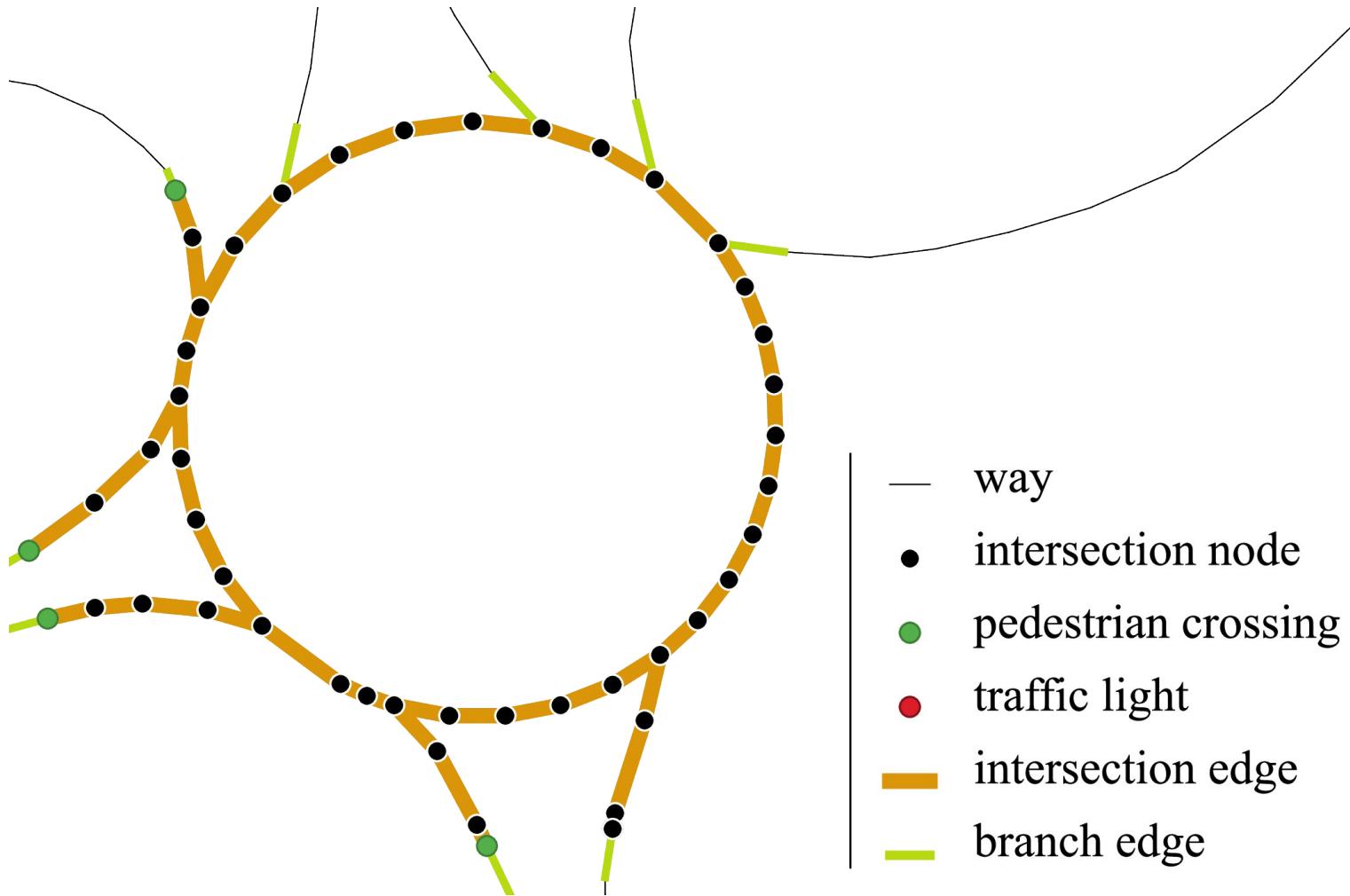


Grouping adjacent edges by name and orientation

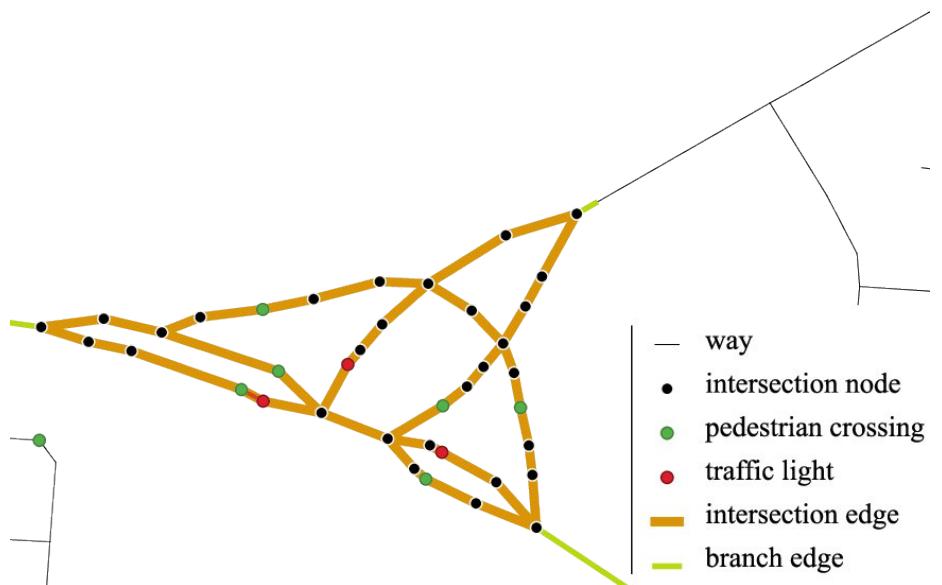
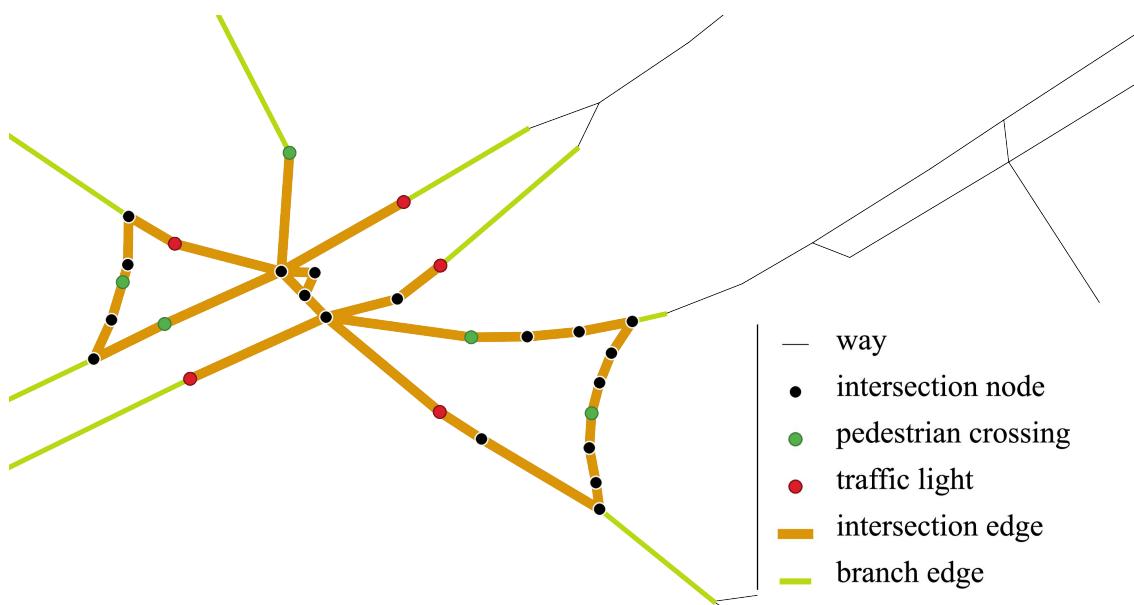
# Some examples

Default values:  $C_0=2$ ,  $C_1=2$ ,  $C_2=4$

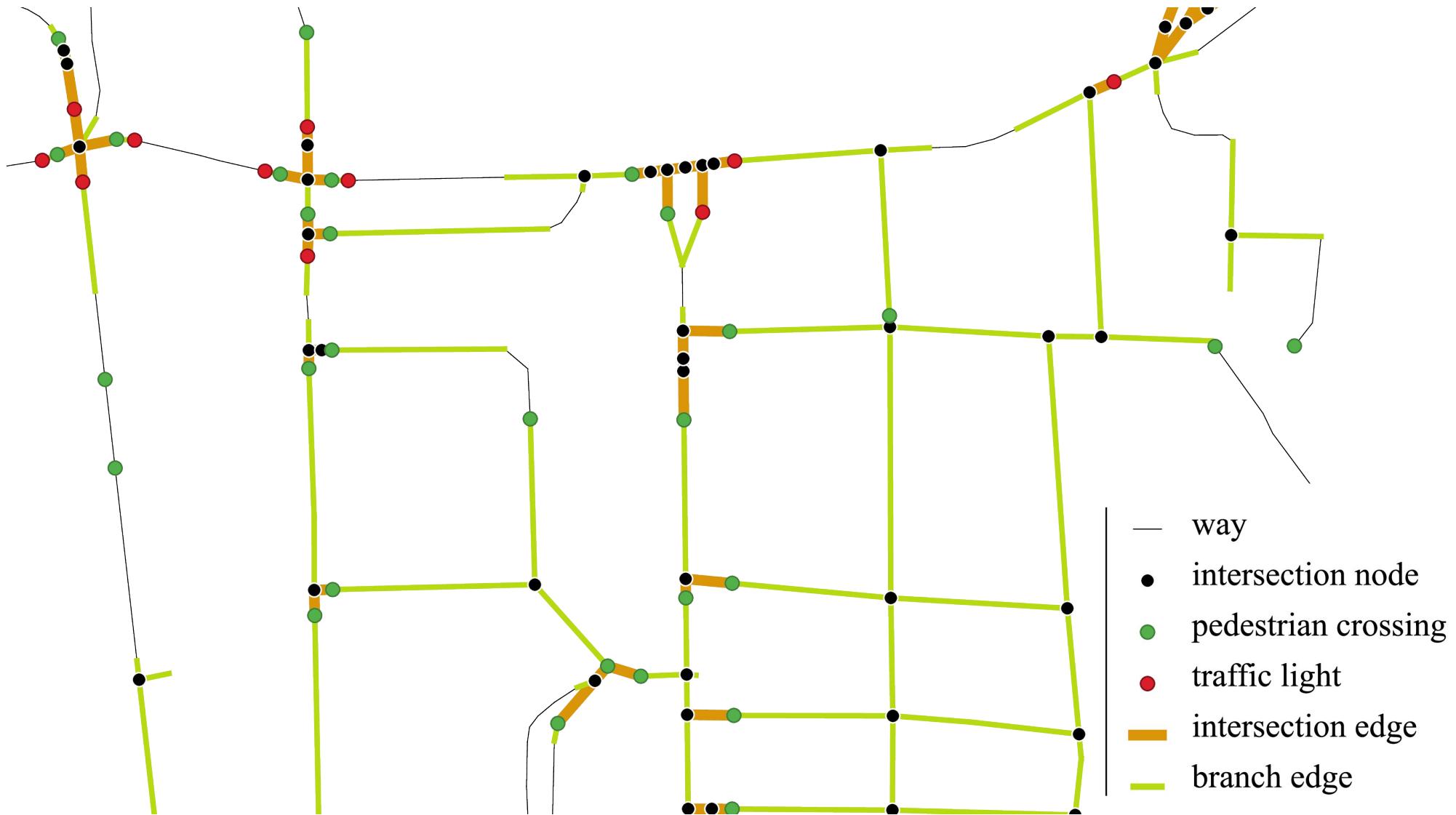
# Roundabout



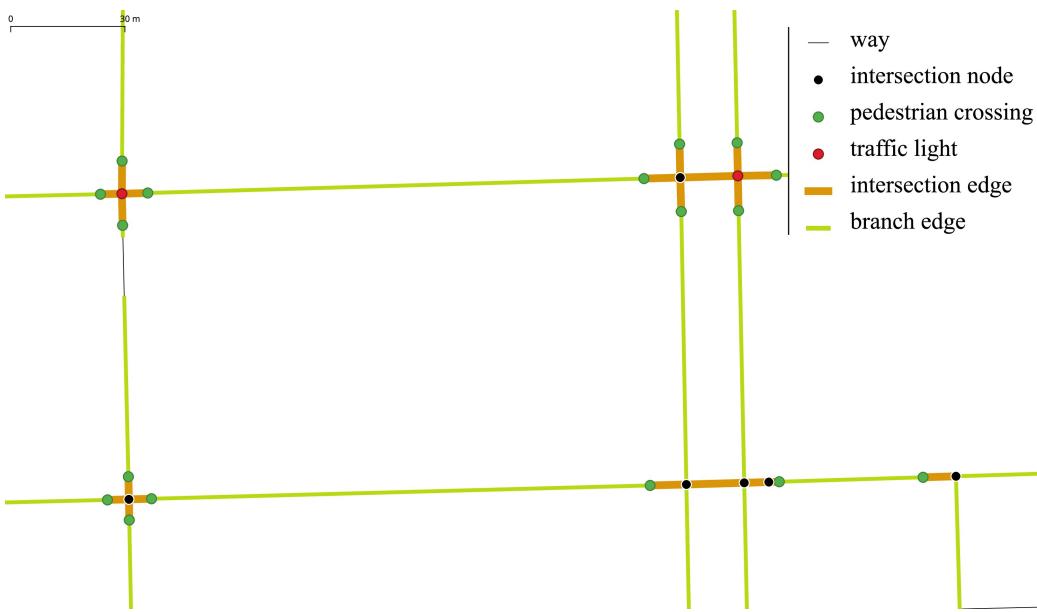
# Complex intersections



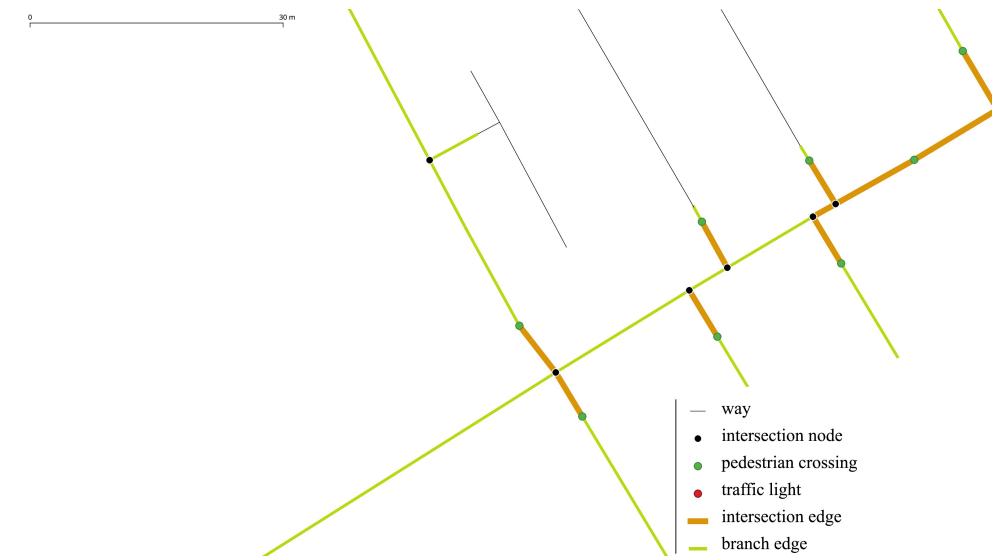
# Neighborhood



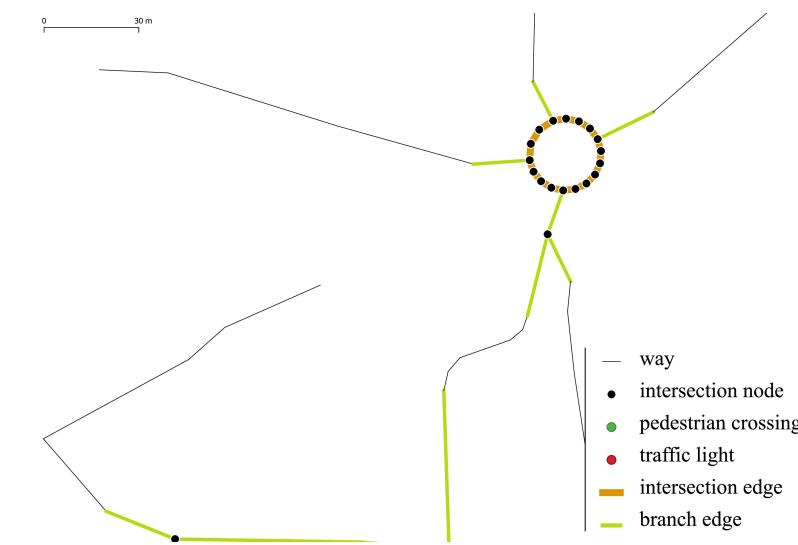
# Worldwide examples



New York (USA)

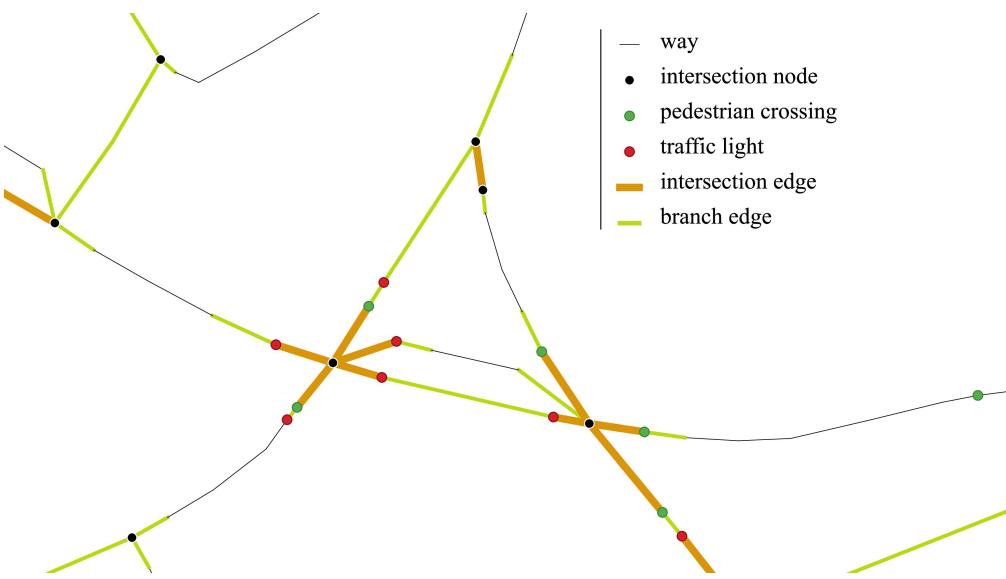


Conakry (Guinea)

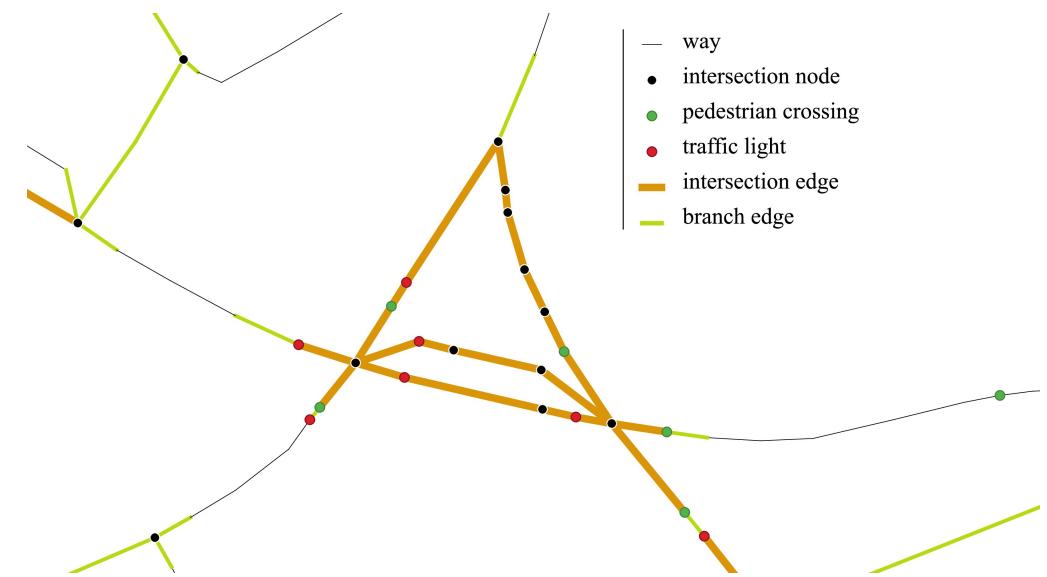


Champeix (France)

# Influence of the parameters



$C_2=4$

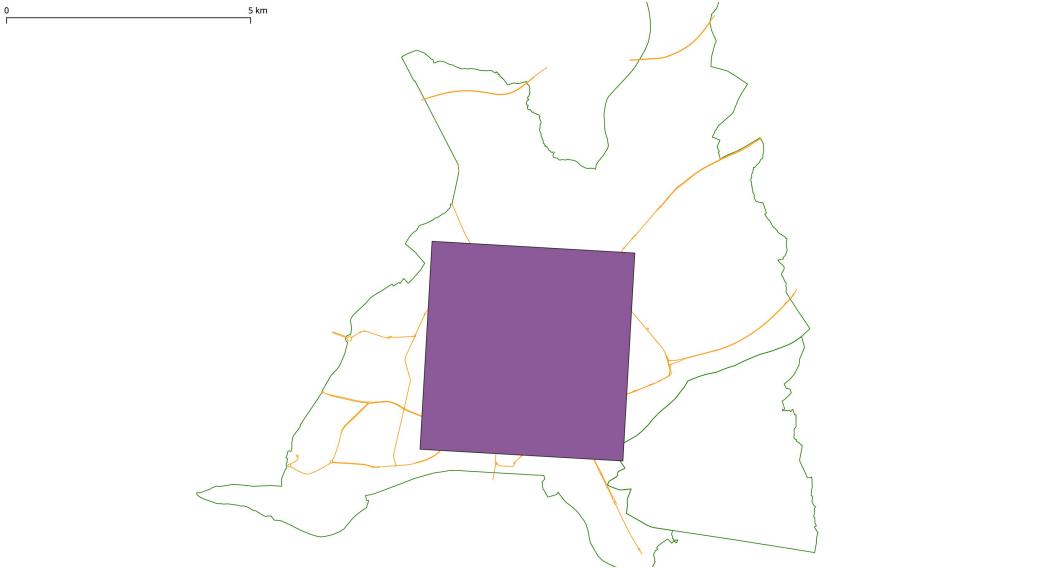


$C_2=5$

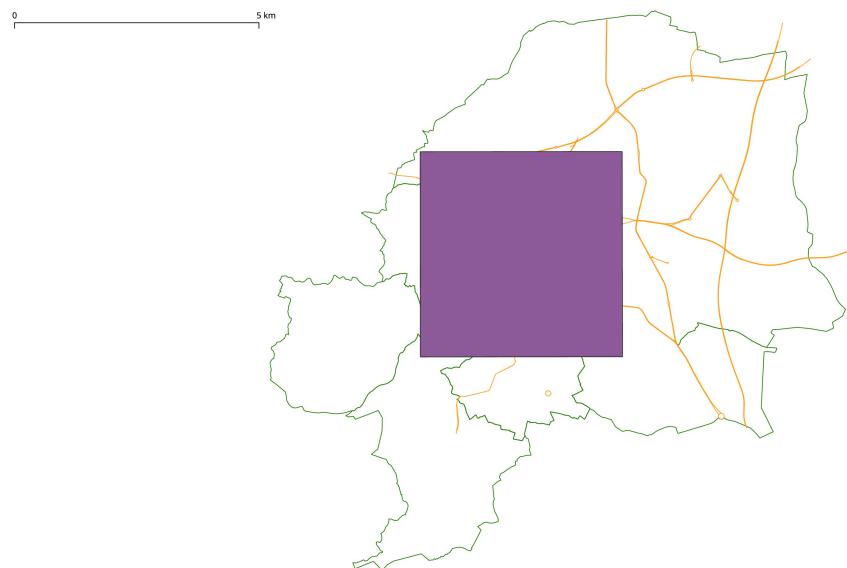
# Statistical evaluation

# Region selection

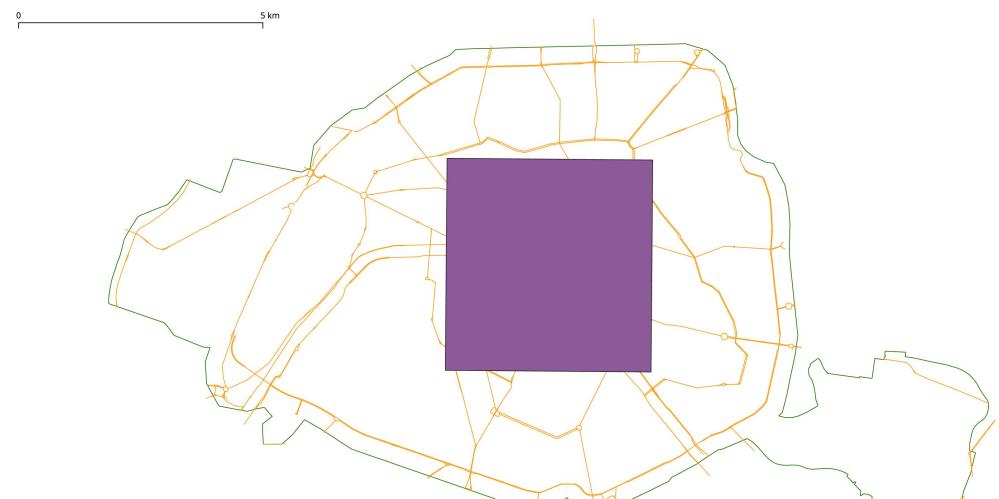
in a 4km square



Nantes (650,081 inhabitants in the urban area)



Clermont-Ferrand (268,696 inhabitants in the urban area)



Paris (10,785,092 inhabitants in the urban area)

# Randomized evaluation

100 crossroads within each city

**Crossroad segmentation quality evaluation**

By answering the following questions, you will evaluate the quality of a junction detection and segmentation algorithm in [OpenStreetMap](#), and participate in the [XXX project](#). This tool is part of the [main evaluation toolkit](#).

Crossroad #299 [osm](#) [gmaps](#) [streetview](#)

Existing crossroad  
yes

Crossroad scale  
correct

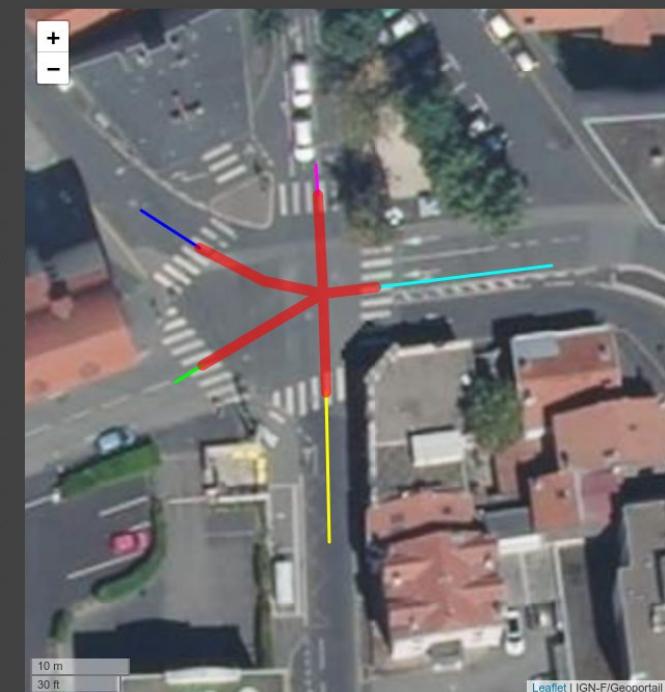
Number of branches  
correct

Branches configuration  
correct

Edge position  
correct

Completeness  
correct

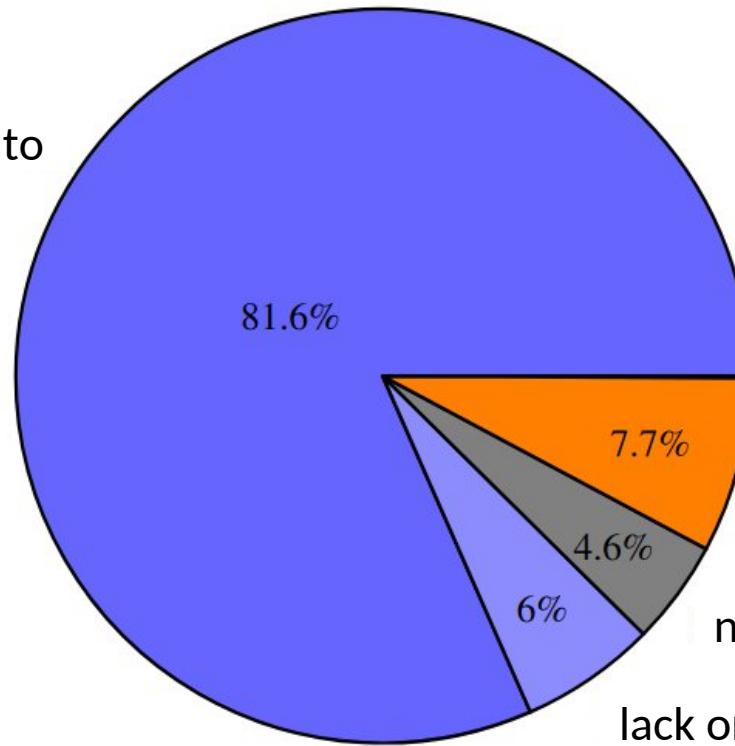
Comments



Download evaluations (101 / 2045) Previous Next

# Evaluation result

Segmentation corresponding to the orthophotography



## Crossroad segmentation quality evaluation browser

Browse the result of a quality evaluation process on a series of junction detection and segmentations algorithm. in [OpenStreetMap](#), and participate in the [XXX project](#). This tool is part of the [main evaluation toolkit](#).

All crossroads (1957)   Evaluated crossroads (100)   Only correct crossroads (88)   Only incorrect crossroads (12)

Evaluated crossroads [osm](#)

ID	Existing crossroad	Crossroad scale	Number of branches	Branches configuration	Edge position	Completeness	Comments	#comp
6	-	-	-	-	-	-	-	1
17	-	-	-	-	-	-	-	1
25	no	-	-	-	-	-	-	1
60	-	-	-	-	-	-	-	1
83	-	-	-	-	too close	-	-	2

require local adjustment of parameters

not supported regions

lack or inaccuracy in OpenStreetMap

# Conclusion and perspectives

# Conclusion

- An algorithm to **segment intersections using topology, geometry and semantic**
- Focusing on **pedestrian scale**
- Intuitive parameters to drive results



# How to reproduce this work

The screenshot shows a GitHub repository page for `jmtrivial/crossroads-segmentation`. The repository has 183 commits, 3 branches, and 2 tags. The README.md file contains the following content:

```
crossroads segmentation

Crossroads segmentation is a python tool that produces automatic segmentations of data from OpenStreetMap.

Installation
```

**Licence:** GPLv3

**Source code:** <https://github.com/jmtrivial/crossroads-segmentation>

**Installation:** pip install crossroads-segmentation

**Dependancies:** OSMnx (incl. NetworkX)

# Perspectives

## Next steps:

- consider **specific configurations**: squares, pedestrian streets
  - improve width estimation of the lanes
  - use this segmentation for:
    - intersection description for visually impaired people
    - pedestrian routing services
    - micro-traffic simulation tools
    - ...

# CrossroadsDescriber - Automatic Textual Description of OpenStreetMap Intersections

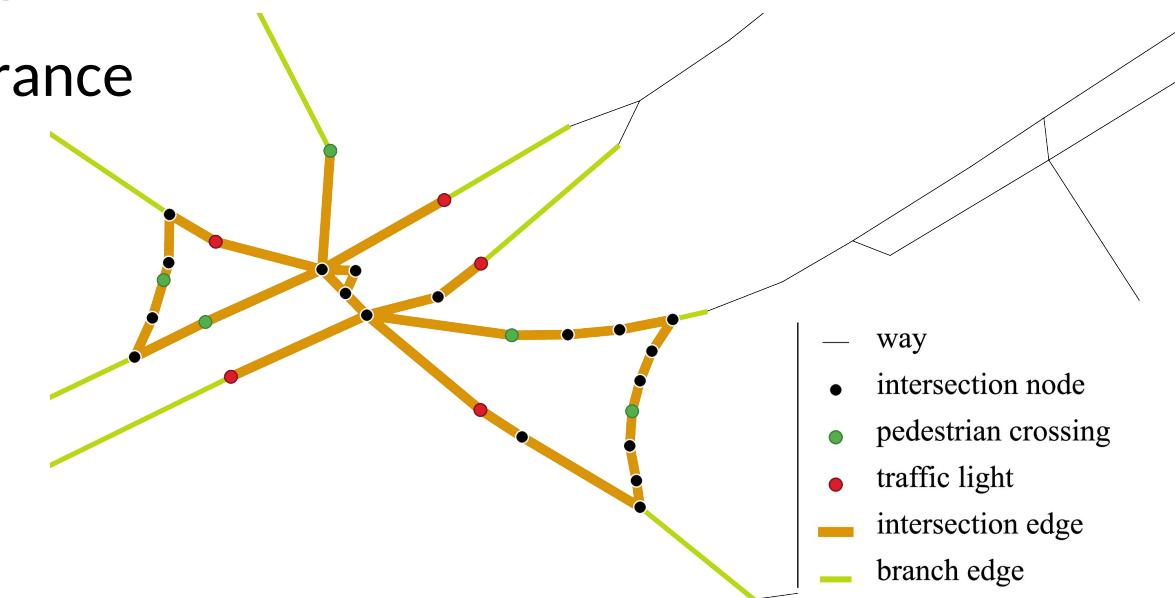
Jérémie Kalsron, Jean-Marie Favreau, and Guillaume  
Touya

## AGILE 2022

# What are intersections for pedestrian users?

Jean-Marie Favreau, Jérémie Kalsron

LIMOS, Université Clermont Auvergne, France



# Width estimation of the lanes

Primary lane: 3 m

Service lane: 2,25 m

other lanes: 2,75 m

cycleway: 1 m

## Attributes

cycleway:right	lane
cycleway:right:lane	advisory
highway	secondary
lanes	2
lit	yes
maxspeed	30
name	Boulevard Léon Malfreyt
oneway	yes
sidewalk	both
surface	asphalt

