



Procedural generation of traffic signs

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PARK

McDonald's

STREET



introduction



How to automatically generate plausible traffic signs at their appropriate location in a virtual urban environment?

problem complexity

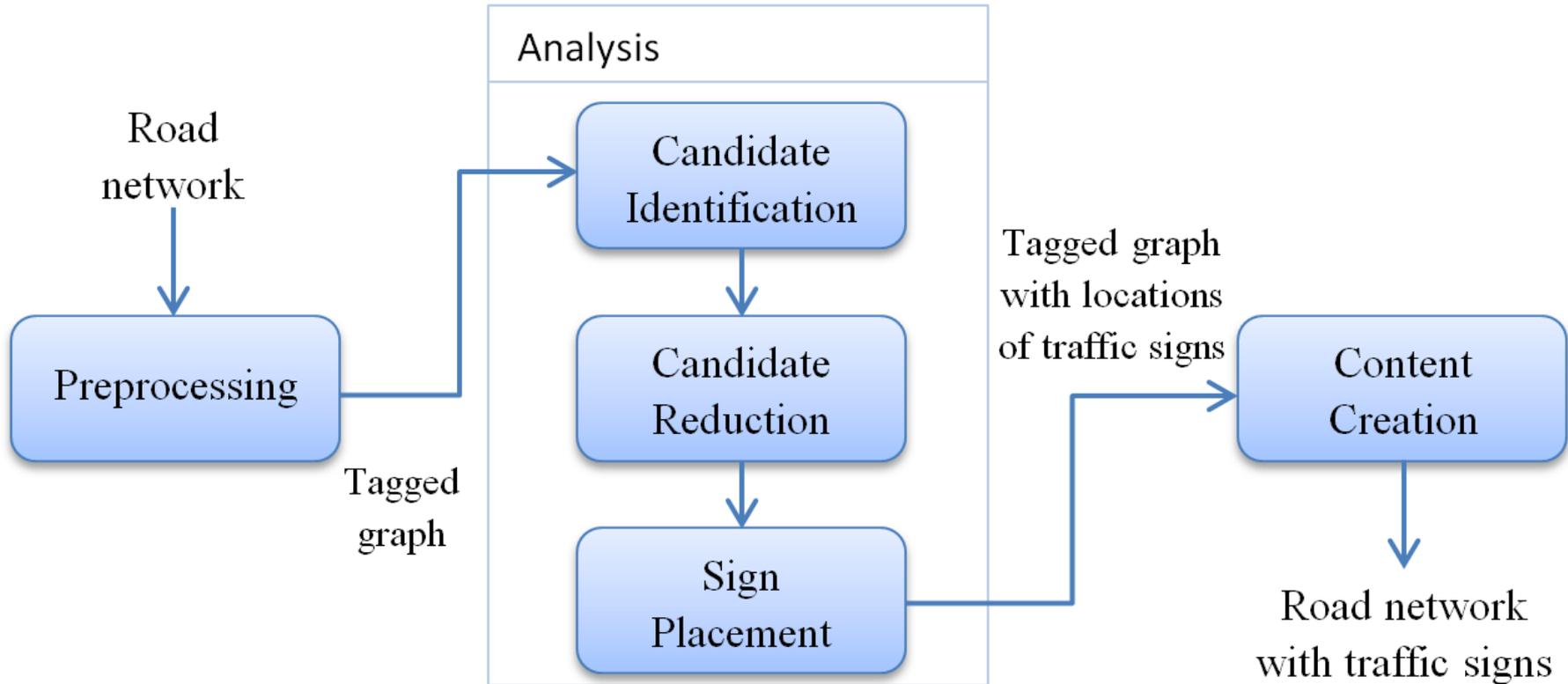


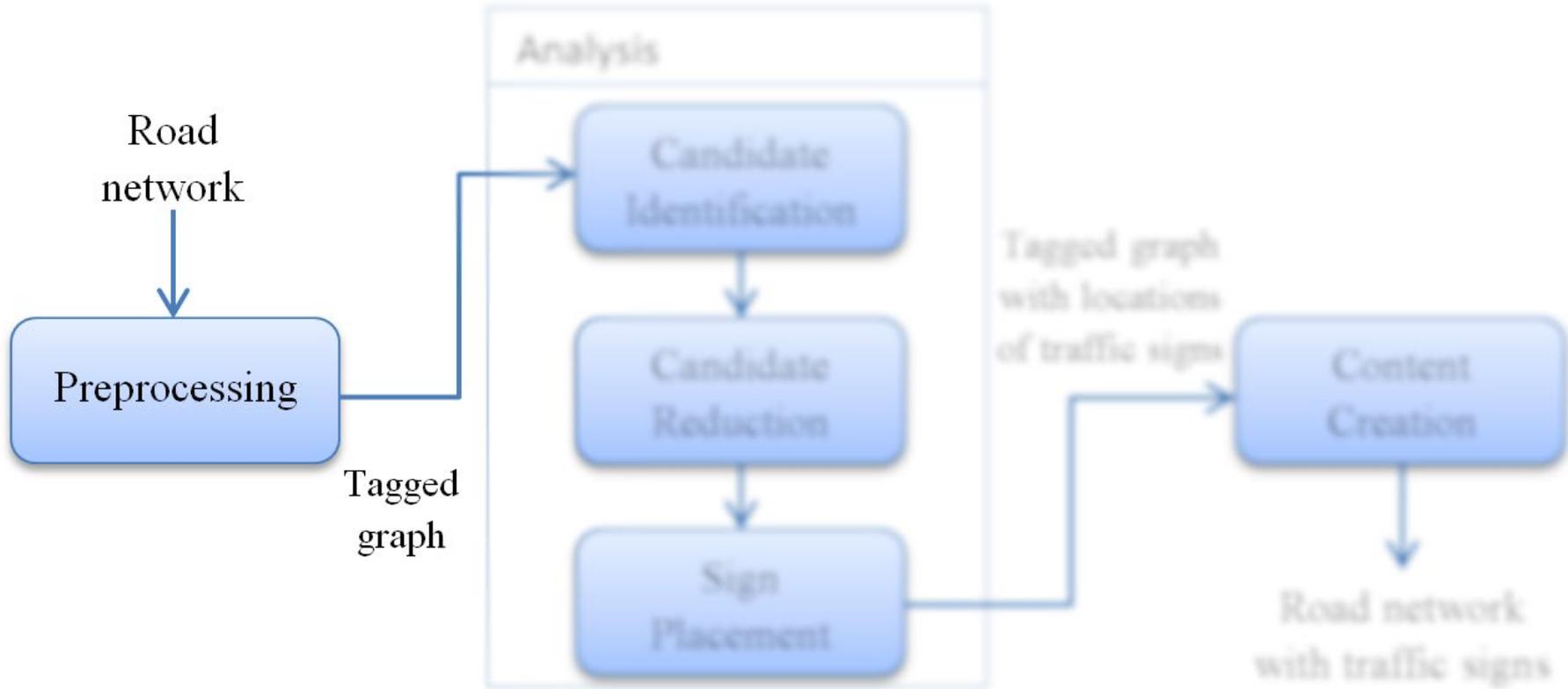
many different aspects:

- users
- environment
- objects
- rules



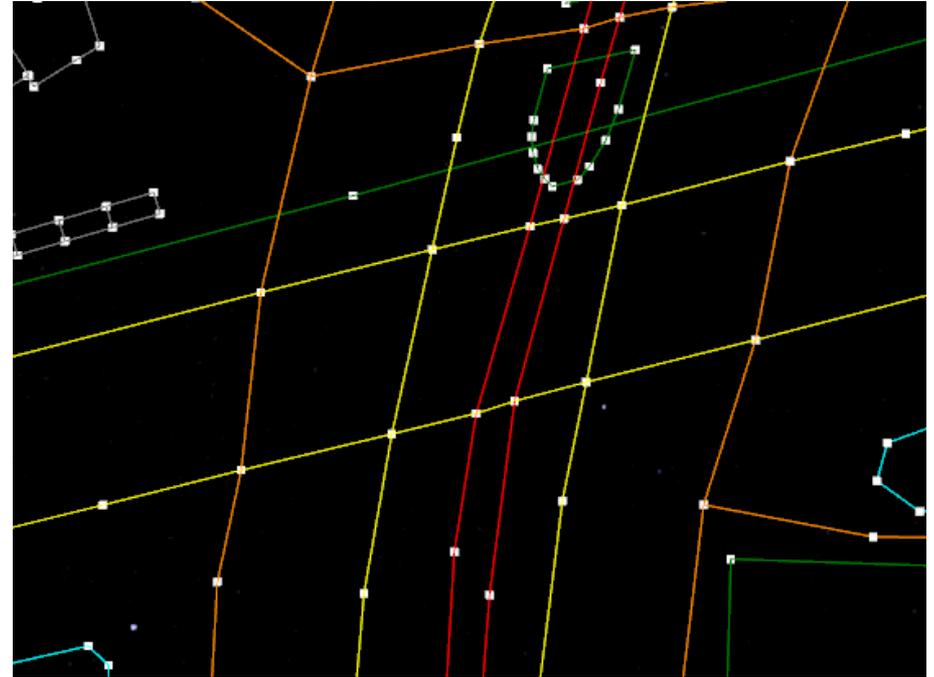
general approach





preprocessing

tagged graph



- node: point in space

- edge: connection between 2 nodes

- edge types: street edge, path, waterway, railway, area
- other attributes: direction, speed, width, number of tracks,...

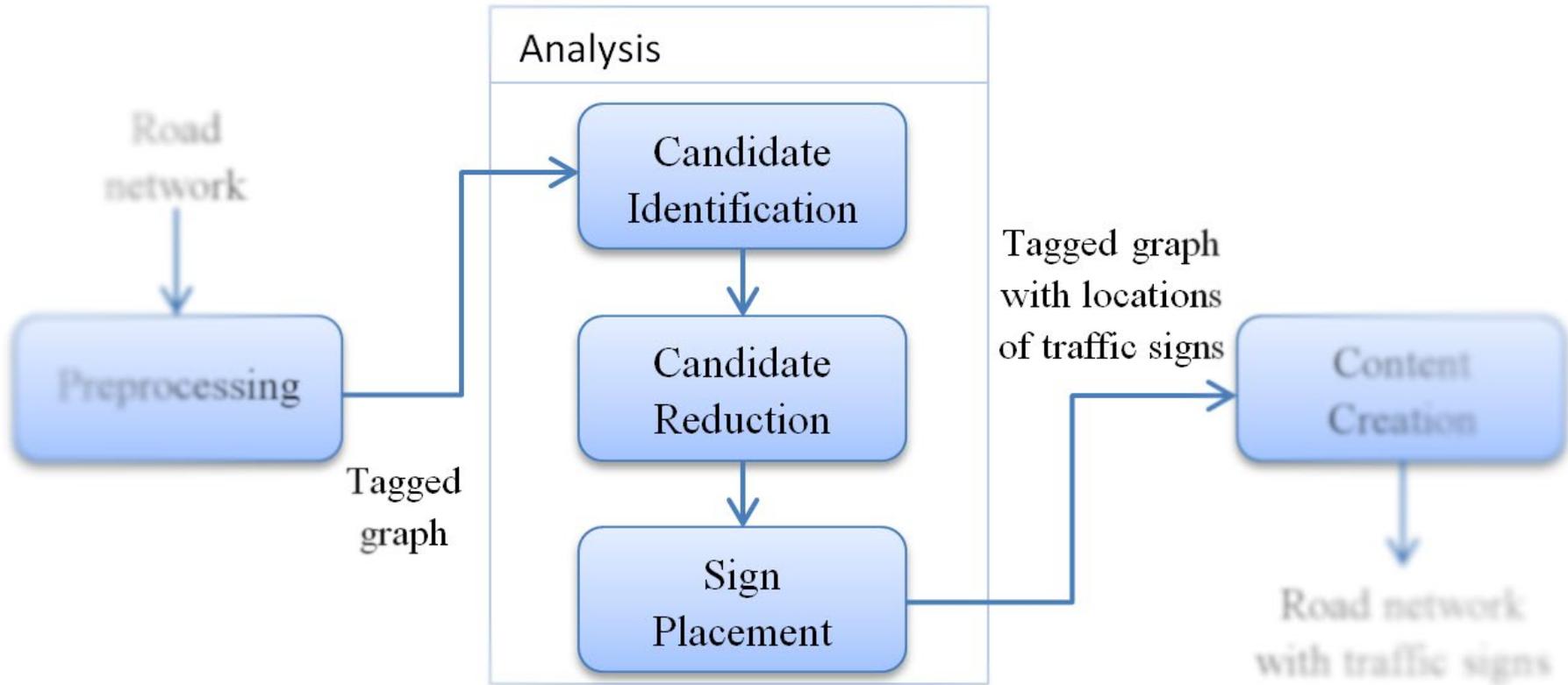


preprocessing

tagged graph

- ways: sequence of consecutive edges
 - line entities
 - area entities

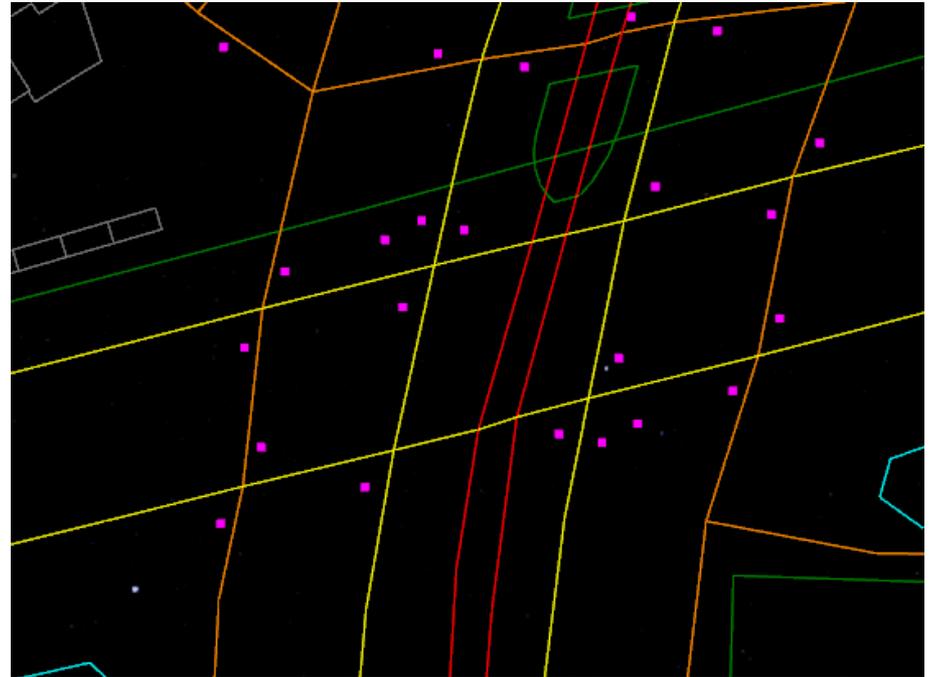
- tags: represent relevant features or characteristics
 - node tags
 - edge tags



analysis



- candidate
- sign tag
- 3 steps:
 - candidate identification
 - candidate reduction
 - sign placement



candidate identification



categories

categorize signs on common characteristics of

- roads
- intersections
- environment





candidate identification

method

traversing graph and analyze

- nodes
- adjacent edges
- ways

candidate found: add **sign tag**

candidate identification

tags and attributes

- tags on:

- nodes
- edges



- comparison of attributes:

- priority
- speed
- road type
- special intersection

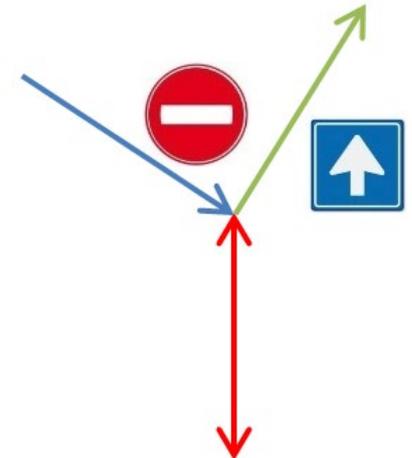
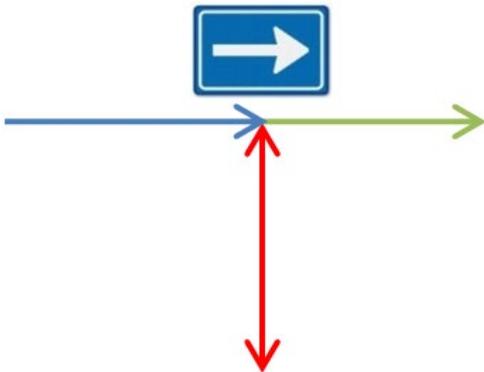


candidate identification



road direction

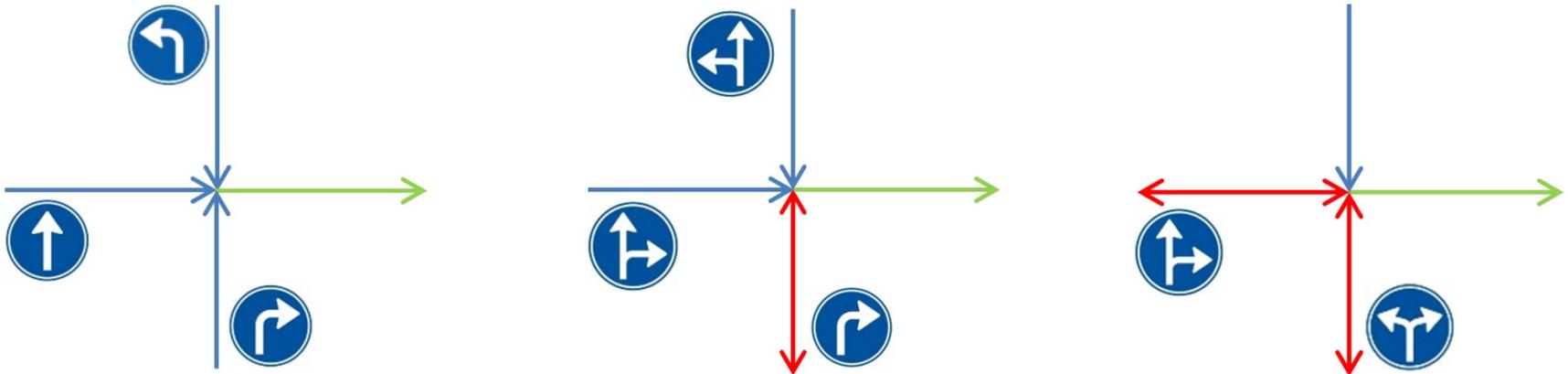
- roundabout
- intersection with 3 roads:
 - T-split, Y-split, other



candidate identification

road direction

- intersection with more than 3 roads:
 - amount of outgoing or two-way roads
 - location relative to each other



candidate identification



ways

sharp curves:

- multiple edges bending the same way
- total angle more than threshold



Points of Interest (PoI):

- e.g. hospital, industrial, park, ...
- use flooding algorithm to identify candidates along main intersections
- criteria:
 - distance from PoI
 - rank of roads

candidate reduction



goal: remove redundant sign tags

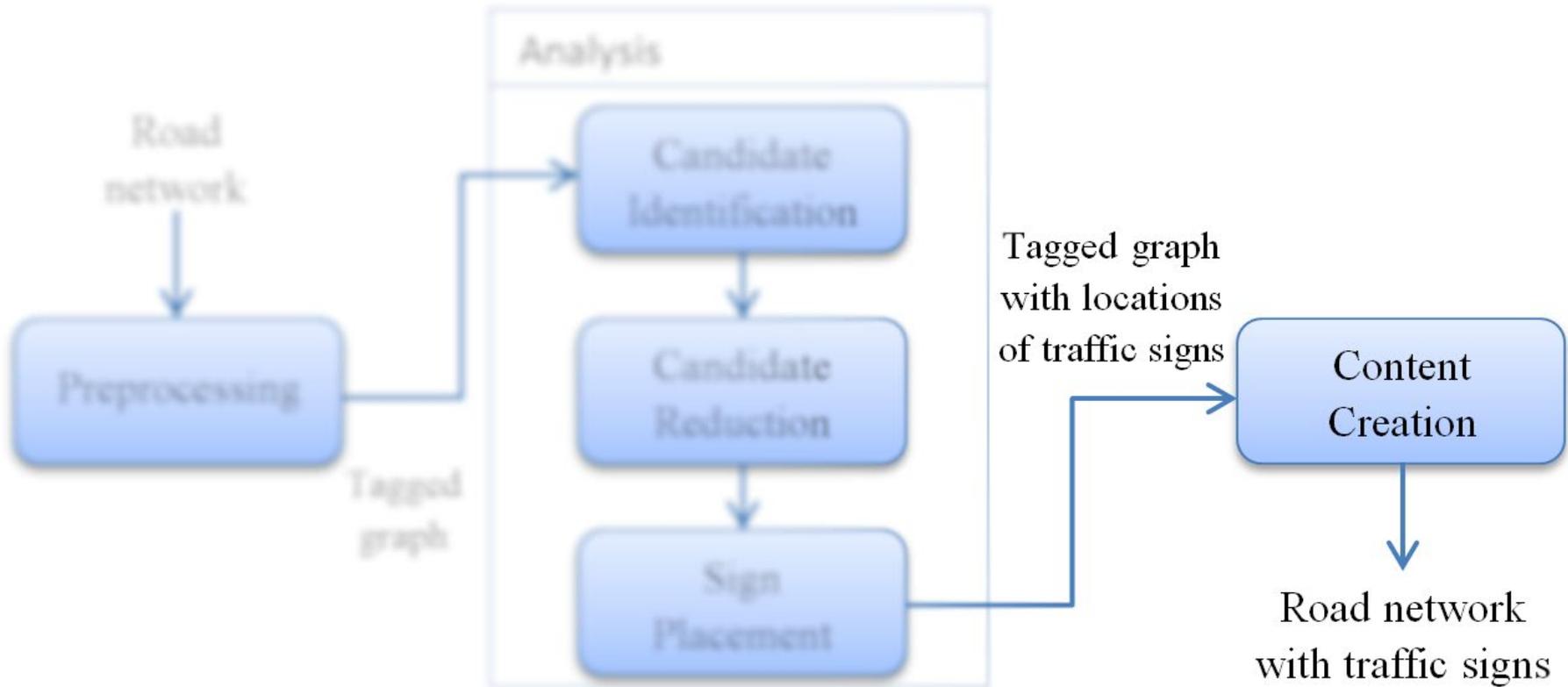
- inclusion cases
- single road cases
- topological cases:
 - roundabouts
 - large intersections



sign placement



- location: before, on, special
- orientation: outwards (out) or towards (in) the intersection
- general cases: *before-out*, *on-out* and *on-in*



content creation



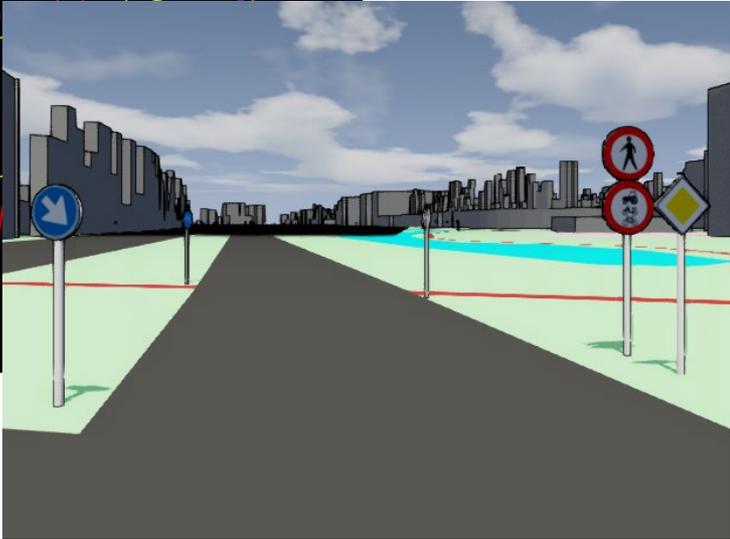
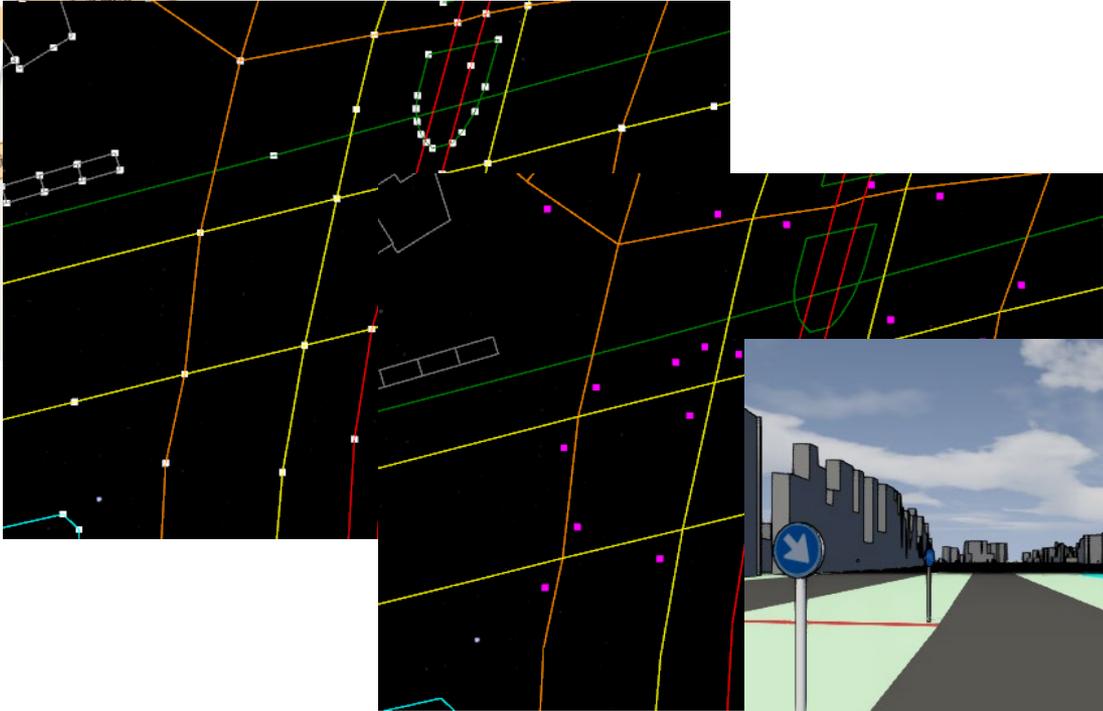
determine traffic sign aspects:

- shape
- texture
- size
- height

posts: merging of traffic signs



results



results



conclusions



- novel general step-by-step approach to automatically generate plausible traffic signs
- tagged graph representation a variety of characteristics as well as the topological structure
- local and global procedural solution
- validated with real-world regions



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