Network conversion for SUMO integration

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Introduction

Part of project COLOMBO
- Low penetration cooperative communication
- Traffic surveillance algorithms
- Robust traffic control with low information
- Research requires full control:
  - TraCI interface, access to almost everything
  - Open source allows for quick extensions

Why converting?
- Quick network generation
- Updates in one format directly to applied to other
Introduction – Imflow

- Easy import from Vissim, same objects
- Whish list: export to SUMO

What is Imflow?

- Real-time adaptive traffic control system
- Runs on top of existing traffic light controllers
- Aims to improve mobility within the existing infrastructure
- Requires detection to measure traffic conditions
- A communication network
Streets & connectors – nodes & edges (1/3)

- Vissim uses streets (can span multiple intersections)
- Intersections just consist of connectors and streets
- Imflow has the same information in XML format

```
LINK 111 NAME "" LABEL 0.00 0.00
   BEHAVIORTYPE 1 DISPLAYTYPE 1
   LENGTH 12.659 LANES 1 LANE WIDTH 3.50 GRADIENT 0.00000 COST 0.00000
   FROM 2196.640 926.585
   TO 2209.263 925.632
```

- SUMO starts with nodes
- Edges connect between nodes

```xml
<node id="111_start" x="2196.64" y="926.585" />
<node id="111_end" x="2209.263" y="925.632" />
<edge id="111" from="111_start" to="111_end" spreadType="center" />
```
Optional “OVER” fields in Vissim can be added to “shape” of edge
Number of lanes can be copied
Use netconvert from edg.xml and nod.xml to net.xml
Options --offset.disable-normalization, --no-turnarounds and --no-internal links
Conversion still not accurate

Worse problems with two 2-way streets in close proximity:
Intersection areas (1/3)

- Intersection area polygon in Imflow configurator
- All connectors will become internal lanes
- Signal heads at transition from street to connector
- Uncontrolled intersections as small as possible, mostly aesthetic
Intersection areas (2/3)

- Original connector from incoming edge to via lane is removed:
  
  ```xml
  <connection from="1" to="10001" fromLane="0" toLane="0" dir="s" state="M"/>
  ```

- New connection from 1 to 16 via 10001 is added:
  
  ```xml
  <connection dir="l" from="1" fromLane="0" linkIndex="0" state="o" tl="45" to="16" toLane="0" via="10001_0"/>
  ```

- Connector from 10001 to 16 is kept
- Turn direction calculated using heading difference
- XML translation table is made to translate linkIndex to signal group number (previous presentation)

```xml
<intersection id="37">
  <signalgroup id="37000" sumoSGs="7"/>
  <signalgroup id="37001" sumoSGs="19"/>
  ...
  <signalgroup id="37019" sumoSGs="24,12"/>
</intersection>
```
Intersection areas (3/3)

- Drawing the intersection area
- Clockwise ordering
- Endpoints of incoming edges
- Startpoints of outgoing edges
- Resulting area indicated in green
- Right of way rules are cleared (netconvert)
Signal groups and detectors

- Length and location of detectors can simply be copied (E2)
- Signal groups are at the end of an edge
- More complex intersections require 2 junction areas (not yet implemented)
- Pedestrians modelled as small vehicles will improve at 0.21.0
Other network formats

- Aimsun doesn’t have a human readable network file format
- The TEDI part is human readable and describes the geometry
- First converting to Vissim may be an option

- Paramics has a human readable format
- Uses a similar node-edge structure
- Curves described as arc, requires shape segment recalculation
Conclusion

- Direct conversion no manual editing
- Integration with traffic light controller
- Lessons learned applicable to other future convertors

Future work:
- Complex intersections with multiple junctions
- Right of way rules (partial conflicts)
Questions

?