

Cooperative traffic light control - Considering cyclists with the aid of V2I

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Knowledge for Tomorrow

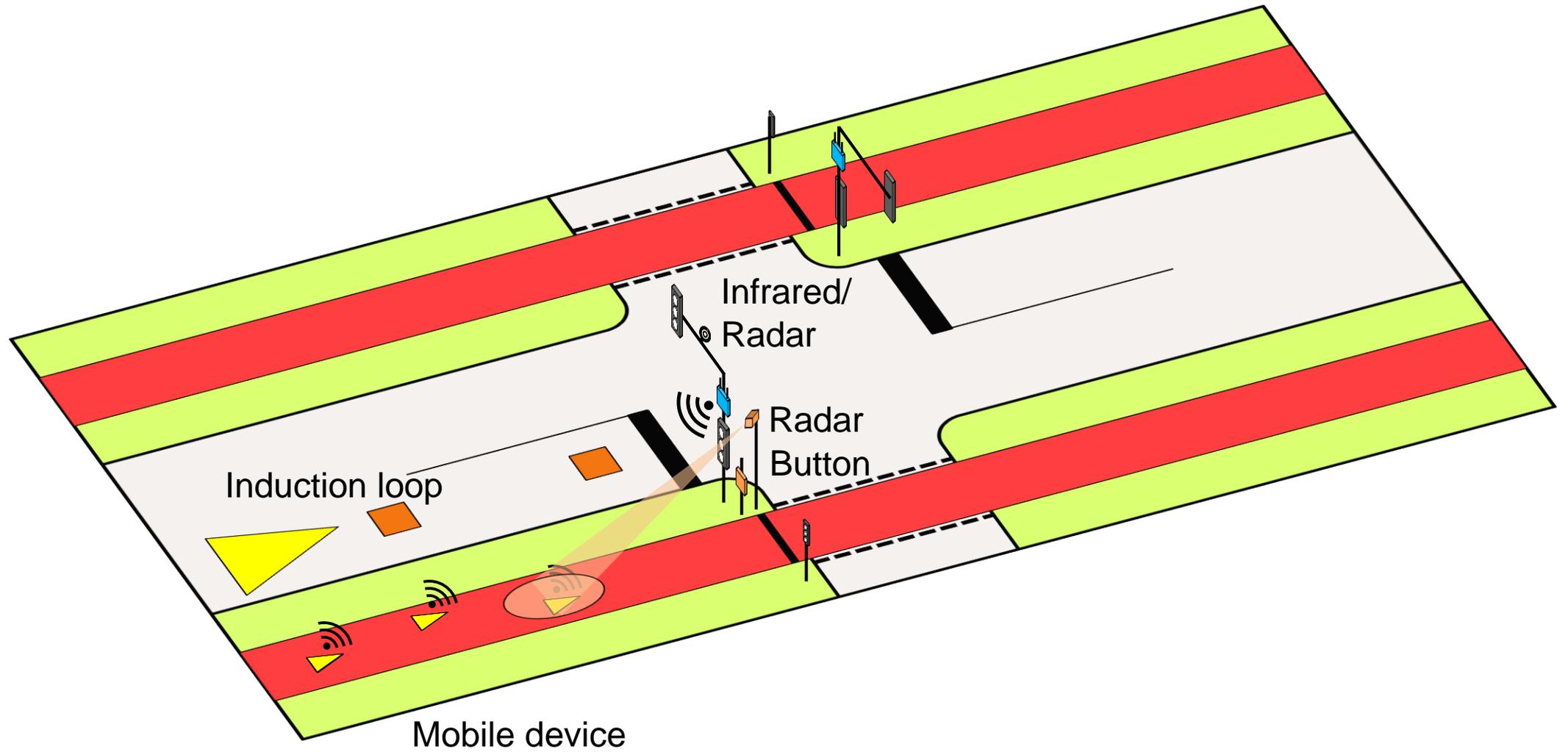


Presentation outline

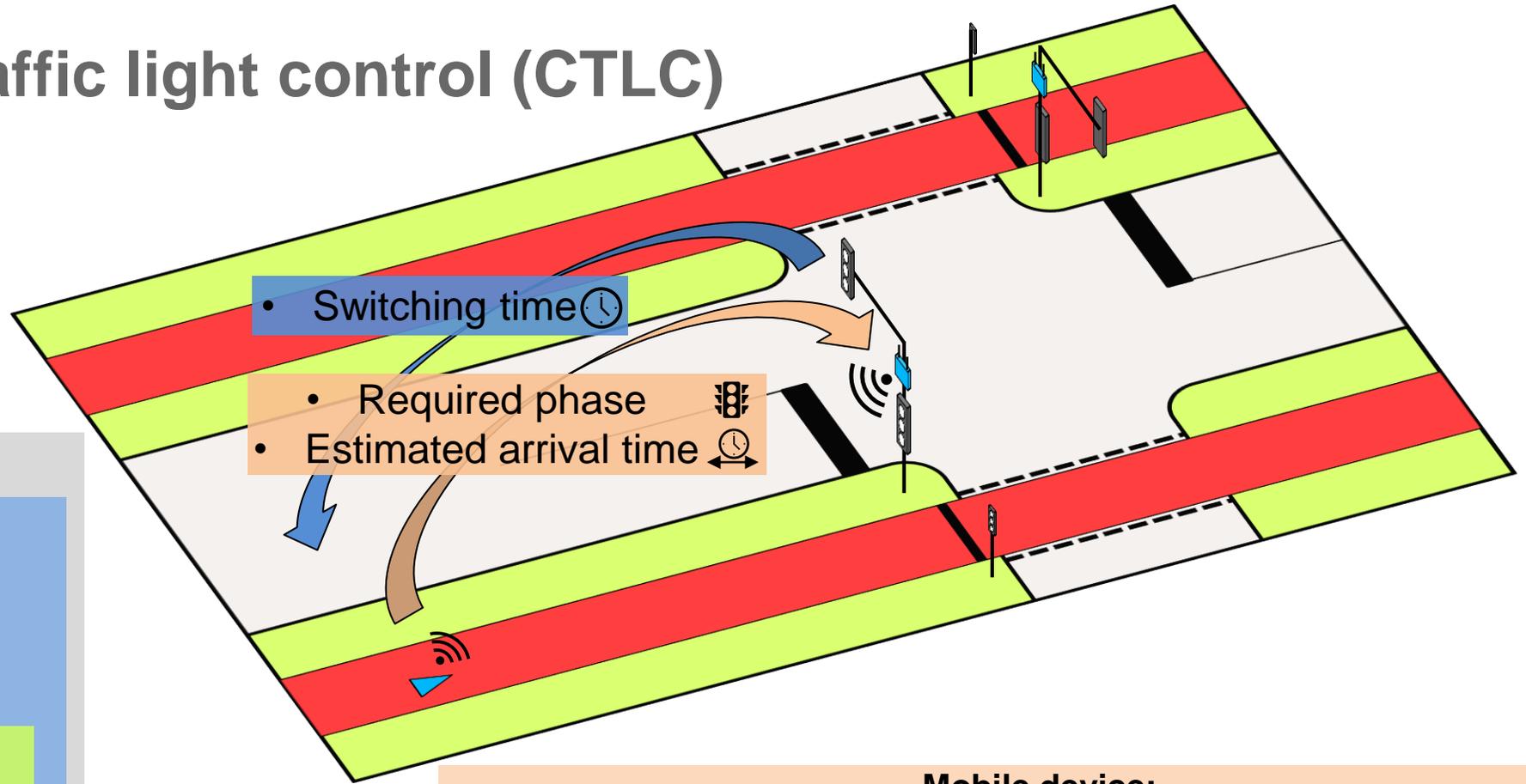
- Motivation
- Cooperative traffic light control (CTLC)
- Examples usage of individual attributes
- CTLC Implementation in SUMO
- Simulation scenario
- Analysis and results



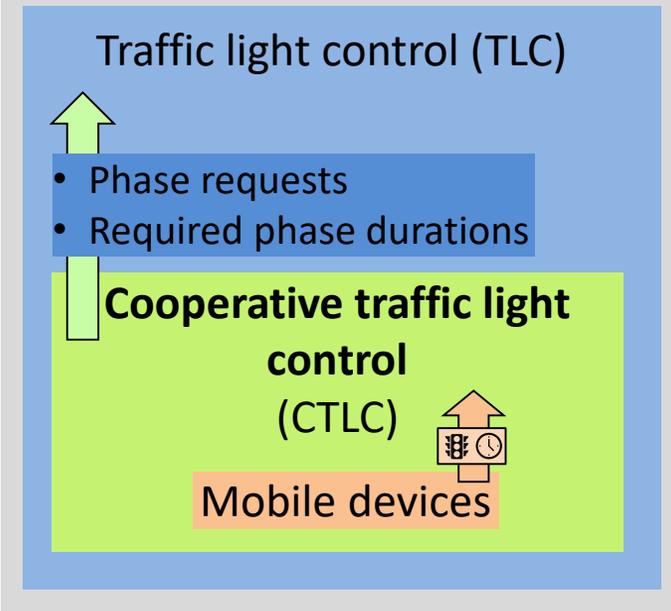
Motivation



Cooperative traffic light control (CTLTC)



System structure:



Mobile device:

Individual attributes

Current attributes

- Position 📍
- Speed 🚗
- Route 🛣️

User behavior

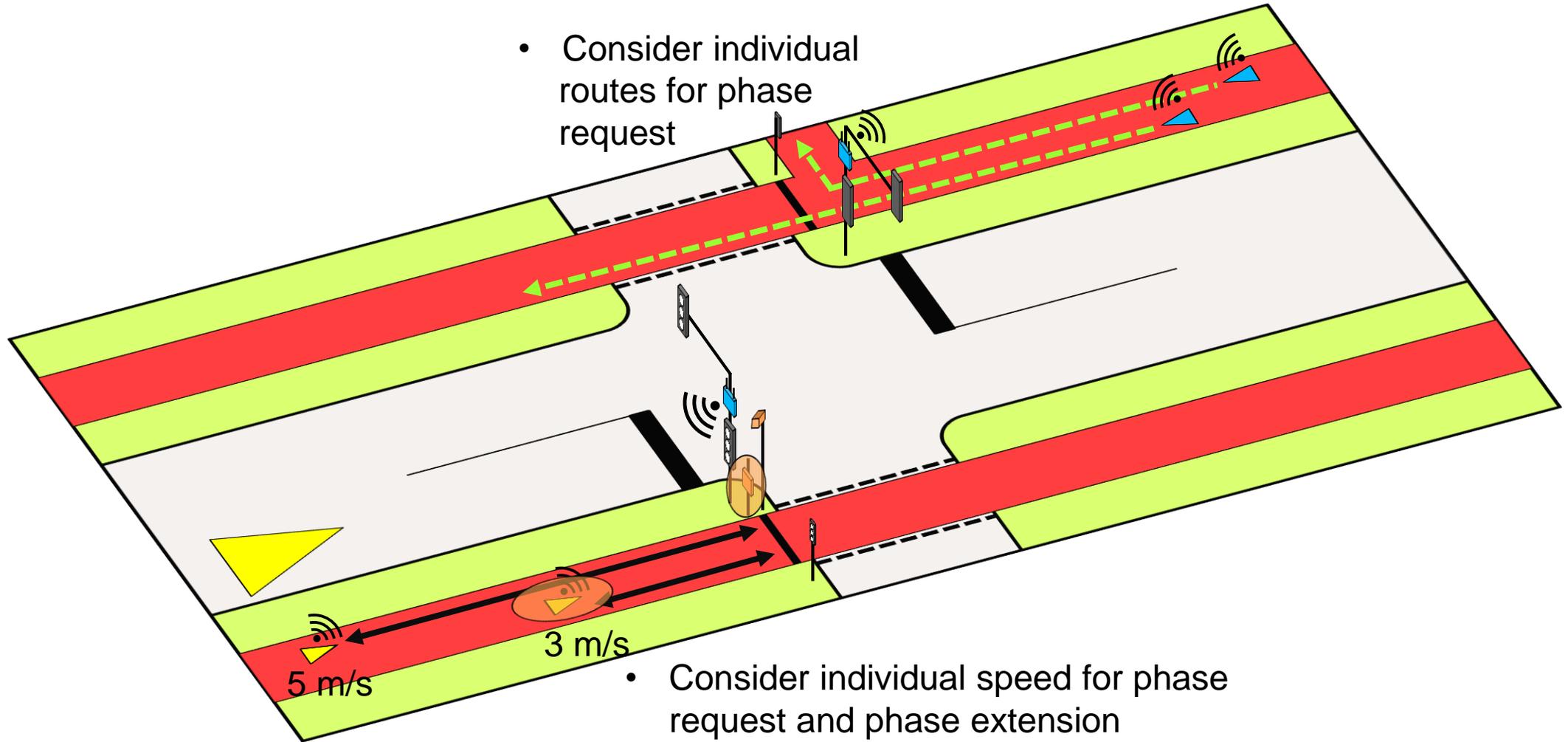
- Usual/max speed 🚗
- Routes history 🛣️
- ... 📊

Traffic light information

- Geometries 🗺️
- Phases 🚦
- Transition times ⌚

Examples usage of individual attributes

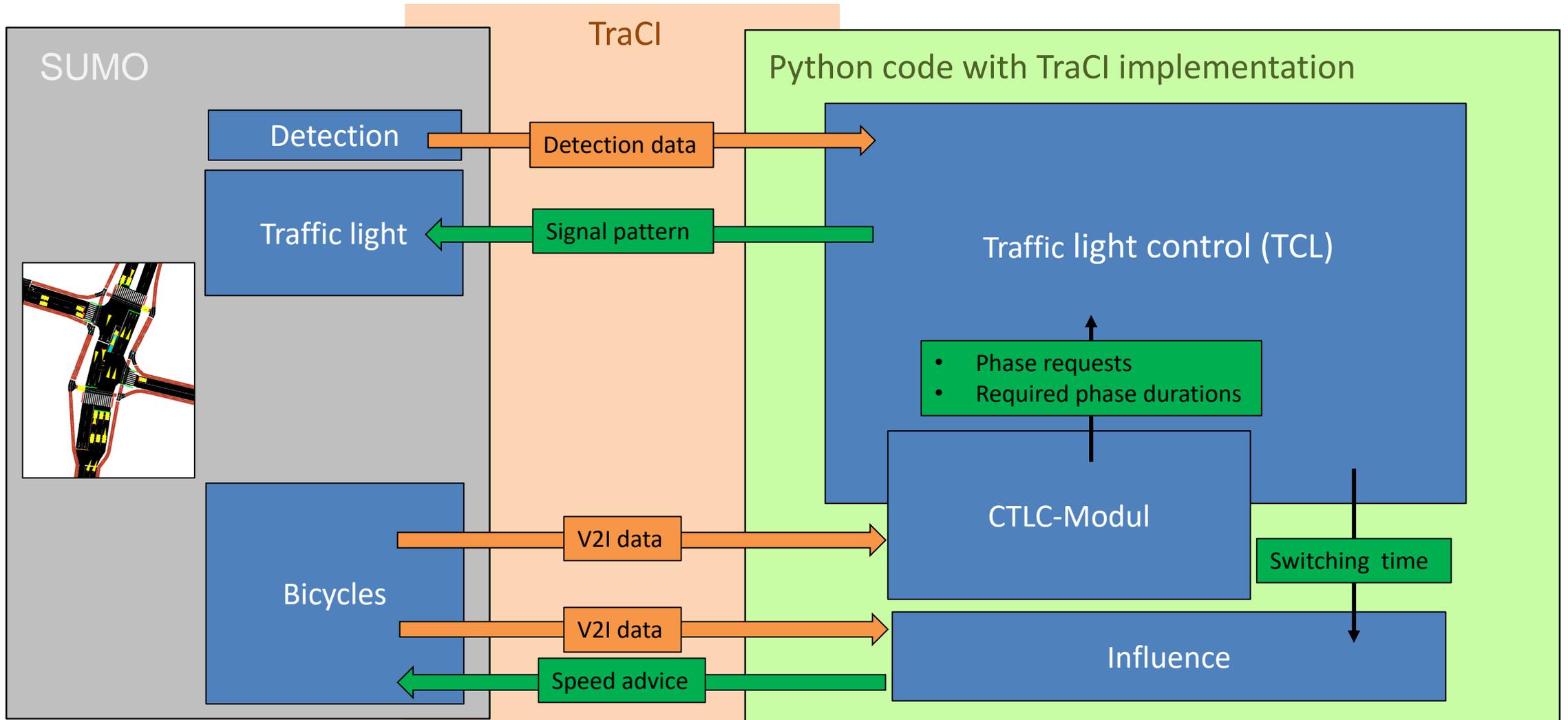
- Consider individual routes for phase request



- Consider individual speed for phase request and phase extension

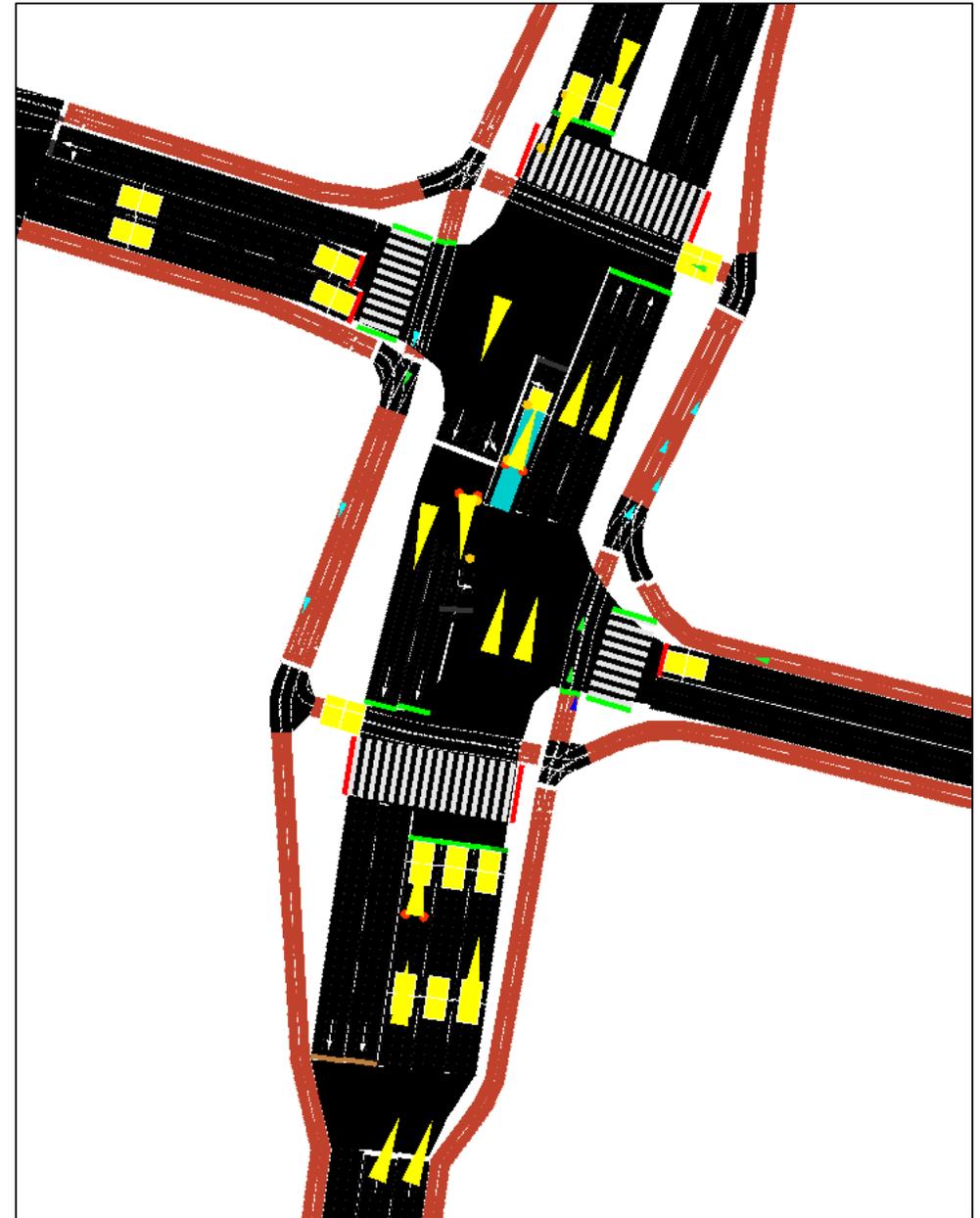


CTLC Implementation in SUMO



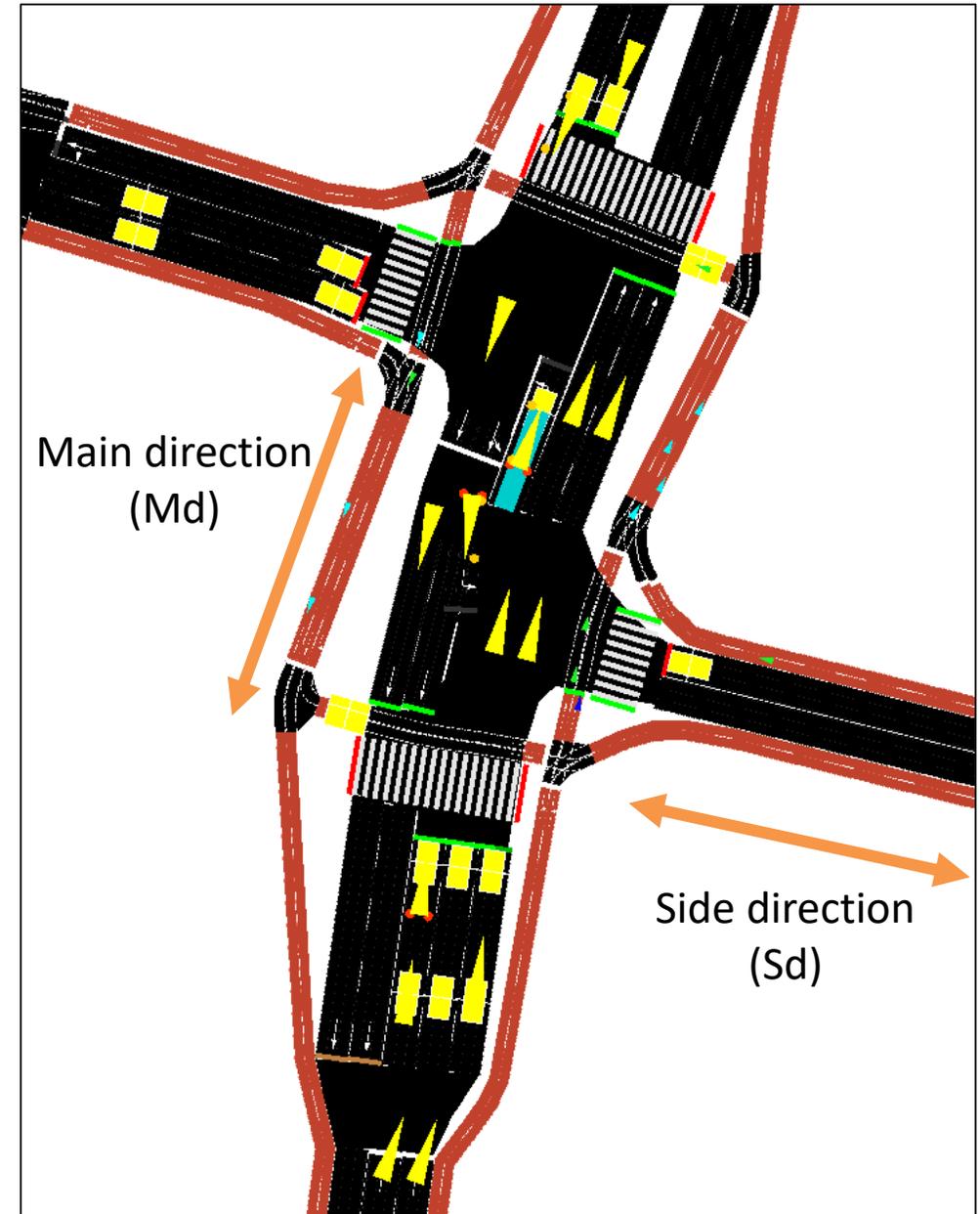
Simulation scenario

- Intersection Tostmannplatz (Braunschweig)
 - Vehicle-actuated traffic light control
- Simulation scenarios for evaluation:
 - Vehicle-actuated traffic light control (TLC)
 - Vehicle-actuated traffic light control + CTLC-Modul (TLC + CTLC)
 - Cyclist (100% V2X capable)



Simulation scenario

Traffic mode	TLC	TLC + CTLC
Motor vehicle Md & Sd	Induction loop <ul style="list-style-type: none"> Phase request Phase extension 	Induction loop <ul style="list-style-type: none"> Phase request Phase extension
Bicycle Md	-	Mobile device - V2X <ul style="list-style-type: none"> Phase request Phase extension
Bicycle Sd	Request button <ul style="list-style-type: none"> Phase request 	Mobile device - V2X <ul style="list-style-type: none"> Phase request Phase extension



Analysis and results

Traffic mode	Average waiting time	Average stop number	Average delay																		
Bicycle	<table border="1"> <tr><th>Control</th><th>Average waiting time [s]</th></tr> <tr><td>TLC</td><td>16</td></tr> <tr><td>TLC + CTLC</td><td>6</td></tr> </table>	Control	Average waiting time [s]	TLC	16	TLC + CTLC	6	<table border="1"> <tr><th>Control</th><th>Average stop number [n]</th></tr> <tr><td>TLC</td><td>0,59</td></tr> <tr><td>TLC + CTLC</td><td>0,38</td></tr> </table>	Control	Average stop number [n]	TLC	0,59	TLC + CTLC	0,38	<table border="1"> <tr><th>Control</th><th>Average delay [s]</th></tr> <tr><td>TLC</td><td>18</td></tr> <tr><td>TLC + CTLC</td><td>19</td></tr> </table>	Control	Average delay [s]	TLC	18	TLC + CTLC	19
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TLC	16																				
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TLC	0,59																				
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TLC + CTLC	19																				
Motorized traffic	<table border="1"> <tr><th>Control</th><th>Average waiting time [s]</th></tr> <tr><td>TLC</td><td>27</td></tr> <tr><td>TLC + CTLC</td><td>25</td></tr> </table>	Control	Average waiting time [s]	TLC	27	TLC + CTLC	25	<table border="1"> <tr><th>Control</th><th>Average stop number [n]</th></tr> <tr><td>TLC</td><td>1,13</td></tr> <tr><td>TLC + CTLC</td><td>1,06</td></tr> </table>	Control	Average stop number [n]	TLC	1,13	TLC + CTLC	1,06	<table border="1"> <tr><th>Control</th><th>Average delay [s]</th></tr> <tr><td>TLC</td><td>36</td></tr> <tr><td>TLC + CTLC</td><td>34</td></tr> </table>	Control	Average delay [s]	TLC	36	TLC + CTLC	34
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Thank you for your
attention!

