A comparison of different surrogate safety measures for traffic conflicts involving VRUs

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Objectives

Many SSMs have been proposed and applied in (scientific) research.

But how do they relate to each other?

1. Which aspects influence the calculation of the SSMs?
2. Are the measures identifying the same (severe) events?
3. Are there (significant) correlations?

Focus on events involving VRUs
- Other evasive manoeuver capabilities
Available datasets at Transportation Research Institute (IMOBI) of Hasselt University

- Channelized Right-Turn Lanes (CRTL)
  - 4 locations
- Signalized Intersections
  - 4 locations
- Non-Signalized intersections
  - 2 locations

In total 1141 conflict situations
Methods
## Surrogate safety Measures

<table>
<thead>
<tr>
<th>Collision course</th>
<th>Transition</th>
<th>Crossing course</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Collision course diagram" /></td>
<td><strong>T2-value</strong>&lt;br&gt;<strong>T2min</strong>&lt;br&gt;<strong>Extended Delta-V (EdV)</strong>&lt;br&gt;<strong>EdV4</strong>&lt;br&gt;<strong>EdV8</strong></td>
<td><img src="image" alt="Crossing course diagram" /></td>
</tr>
<tr>
<td><strong>Time-to-Collision (TTC)</strong>&lt;br&gt;<strong>Severity Level</strong>&lt;br&gt;<strong>TTCmin</strong></td>
<td><img src="image" alt="Transition diagram" /></td>
<td><strong>Post-Encroachment-Time (PET)</strong></td>
</tr>
</tbody>
</table>
Results: Range

Severity Level

TTCmin

T2min

PET

EdV4

UHASSELT
Result: Correlation
Result: Correlation

<table>
<thead>
<tr>
<th>SeverityLevel</th>
<th>TTCmin</th>
<th>T2min</th>
<th>PET</th>
<th>EdV4</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.74</td>
<td>-0.5</td>
<td>0.58</td>
<td>0.01</td>
<td>0.1</td>
</tr>
<tr>
<td>-0.6</td>
<td>0.58</td>
<td></td>
<td>0.52</td>
<td>0.1</td>
</tr>
<tr>
<td>-0.01</td>
<td>0.06</td>
<td>0.52</td>
<td></td>
<td>0.1</td>
</tr>
<tr>
<td>0.1</td>
<td>0.1</td>
<td>0.02</td>
<td>-0.08</td>
<td></td>
</tr>
</tbody>
</table>

The correlation values are represented with different colors and shapes, indicating the strength and direction of the correlation between variables.
Severity assessment

All conflicts (overlap)

Serious conflicts (overlap)
Frequencies (2)

Frequencies Severe conflicts [%]

- All
- VRU 1
- MV 1
- PED
- CYC
- ->
- <-
- CRTL
- SI
- USI
- ^
- >
- <

- SL
- TTCmin
- T2min
- PET
- Edv4
- Edv8
First insights

Calculation of SSMs during the interaction process:

- Do we need to determine when a certain measure can be calculated?

Clear differences in selecting of events observable
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