Estimating potential of warning system, which prevents road accidents at pedestrian crossings

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The problem

Estonian National Road Safety Program 2003 - 2015:
- Before implementation (2003): „Vehicle - pedestrian crashes are a very actual problem”
- Final report (2016): „Pedestrian safety remains a burning issue; especially in the big cities”

C-ITS that would warn the vehicles and the road users of potential danger?

The study

Two stages:
1. Traffic conflict study
2. Conflict modeling

Traffic conflicts study

- 10 dangerous crossings in Tallinn, Estonia
- Winter 2017 (pilot) and summer 2018 (study)
- 1512 h of video recorded (~ 2 months)
- 74 vehicle – pedestrian conflicts were selected for analysis
Results

Winter: 283 h, 33 conflicts
Summer: 1229 h, 41 conflicts

No conflicts were observed at two-lane crossings

Three typical conflicts

Type 1

Conflict type 1. What does the driver see?

Conflict type 1. What does the pedestrian see?
The very last chance to warn

Where to locate the warning signal?

The very last chance to act (AEB)

Type 2
Conflict type 2. What does the driver see?

The very last chance to warn

(1)

Where to locate the warning signal?

The very last chance to act (AEB)
Type 3

Vehicle speed = 41.4 km/h
Pedestrian speed = 6.5 km/h

T2 = 0.27 sec

Conflict type 3. What does the driver see?

The very last chance to warn

The very last chance to act (AEB)
How do road users react to danger?

- Distracted
- Speeding
- Impaired
- Drowsy

Pedestrians’ reaction to danger:

- Inattention
- Drowsiness
- Impaired
- Distracted

Running over the road
### Potentially dangerous behavior scenarios

<table>
<thead>
<tr>
<th>#</th>
<th>Driver Behavior</th>
<th>Pedestrian Reaction</th>
<th>Type 1 Status</th>
<th>Type 2 Status</th>
<th>Type 3 Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Does nothing</td>
<td>Accelerates</td>
<td>No collision</td>
<td>Collision</td>
<td>Collision</td>
</tr>
<tr>
<td>2</td>
<td>Accelerates</td>
<td>Does nothing</td>
<td>Collision</td>
<td>No collision</td>
<td>Collision</td>
</tr>
<tr>
<td>3</td>
<td>Accelerates</td>
<td>Accelerates</td>
<td>No collision</td>
<td>Collision</td>
<td>Collision</td>
</tr>
<tr>
<td>4</td>
<td>Turns away</td>
<td>Does nothing</td>
<td>-</td>
<td>No collision</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Turns away</td>
<td>Accelerates</td>
<td>-</td>
<td>Check</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Turns away and accelerates</td>
<td>Does nothing</td>
<td>-</td>
<td>No collision</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>Turns away and accelerates</td>
<td>Accelerates</td>
<td>-</td>
<td>Check</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>Turns away and decelerates</td>
<td>Does nothing</td>
<td>-</td>
<td>Check</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>Turns away and decelerates</td>
<td>Accelerates</td>
<td>-</td>
<td>Check</td>
<td>-</td>
</tr>
</tbody>
</table>

### Why is it important to brake in time?

[Image of a road with a car and a pedestrian]

By braking in time, drivers can prevent collisions and ensure the safety of both drivers and pedestrians.
To sum up

- Warning system has certain potential
- Crossings on multi-lane roads are more dangerous
- Warning the vehicle is potentially more effective
- The best solid solution is to brake and not prevent driver from turning away

Thank you for attention!

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