Experimental service for high-resolution slipperiness risk forecasts in Finland

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Background

- Weather forecasting models have improved considerably, and now it is possible to develop forecasts and warnings for road stretches with 10 km spatial resolution.
- Finnish Road Administration and Foreca Ltd developed a road condition pilot service in February-April 2007 for Main road 8 between Turku and Pori.
- 140 km long road was divided into 11 stretches.
- Road is coastal and known to have rapid changes in road conditions.
• Users were very fond of the service made with Flash/xml-techniques. Lots of information but shown in a clear way.
Road condition warnings

- Colour codes tell if a warning is issued for a certain 2 hour period

- Rain freezing on cold road surface
- Slipperiness due to snow fall
- Wet road surface is freezing
- Risk for hoar frost

SIRWEC 2008, 14-16 May, Prague
Weather during the pilot

• End of winter 2007 was mostly mild with two periods of cold weather in February
Forecast statistics

<table>
<thead>
<tr>
<th>Road stretch from south to north</th>
<th>Av. air temp</th>
<th>Av. road temp</th>
<th>Hoar frost</th>
<th>Snow fall</th>
<th>Road freezing</th>
<th>Hoar frost</th>
<th>Snow fall</th>
<th>Road freezing</th>
<th>Freezing rain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ºC</td>
<td>ºC</td>
<td>kpl</td>
<td>kpl</td>
<td>kpl</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>1 Turku-Raisio</td>
<td>-0.54</td>
<td>0.71</td>
<td>418</td>
<td>444</td>
<td>197</td>
<td>3</td>
<td>7.08 %</td>
<td>7.52 %</td>
<td>3.34 %</td>
</tr>
<tr>
<td>2 Raisio-Masku</td>
<td>-0.54</td>
<td>0.54</td>
<td>419</td>
<td>457</td>
<td>191</td>
<td>0</td>
<td>7.10 %</td>
<td>7.74 %</td>
<td>3.24 %</td>
</tr>
<tr>
<td>3 Masku-Kaitarainen</td>
<td>-0.53</td>
<td>0.61</td>
<td>397</td>
<td>453</td>
<td>168</td>
<td>0</td>
<td>6.72 %</td>
<td>7.67 %</td>
<td>2.85 %</td>
</tr>
<tr>
<td>4 Kaitarainen-Mynämäki</td>
<td>-0.49</td>
<td>0.8</td>
<td>370</td>
<td>467</td>
<td>181</td>
<td>0</td>
<td>6.27 %</td>
<td>7.91 %</td>
<td>3.07 %</td>
</tr>
<tr>
<td>5 Mynämäki-Nästi</td>
<td>-0.53</td>
<td>0.74</td>
<td>515</td>
<td>511</td>
<td>288</td>
<td>9</td>
<td>8.72 %</td>
<td>8.66 %</td>
<td>4.88 %</td>
</tr>
<tr>
<td>6 Nästi-Laitila</td>
<td>-0.67</td>
<td>0.99</td>
<td>416</td>
<td>462</td>
<td>231</td>
<td>2</td>
<td>7.05 %</td>
<td>7.83 %</td>
<td>3.91 %</td>
</tr>
<tr>
<td>7 Laitila-Ihode</td>
<td>-0.75</td>
<td>1.29</td>
<td>326</td>
<td>437</td>
<td>188</td>
<td>0</td>
<td>5.52 %</td>
<td>7.40 %</td>
<td>3.18 %</td>
</tr>
<tr>
<td>8 Ihode-Rauma</td>
<td>-0.78</td>
<td>1.17</td>
<td>382</td>
<td>361</td>
<td>191</td>
<td>0</td>
<td>6.47 %</td>
<td>6.11 %</td>
<td>3.24 %</td>
</tr>
<tr>
<td>9 Rauma-Eurajoki</td>
<td>-0.94</td>
<td>1.01</td>
<td>273</td>
<td>384</td>
<td>198</td>
<td>0</td>
<td>4.62 %</td>
<td>6.50 %</td>
<td>3.35 %</td>
</tr>
<tr>
<td>10 Eurajoki-Luvia</td>
<td>-1.06</td>
<td>0.61</td>
<td>468</td>
<td>433</td>
<td>279</td>
<td>0</td>
<td>7.93 %</td>
<td>7.33 %</td>
<td>4.73 %</td>
</tr>
<tr>
<td>11 Luvia-Pori</td>
<td>-1.16</td>
<td>0.12</td>
<td>610</td>
<td>438</td>
<td>336</td>
<td>0</td>
<td>10.33 %</td>
<td>7.42 %</td>
<td>5.69 %</td>
</tr>
<tr>
<td>Total</td>
<td>-0.73</td>
<td>0.78</td>
<td>4594</td>
<td>4847</td>
<td>2448</td>
<td>14</td>
<td>7.07 %</td>
<td>7.46 %</td>
<td>3.77 %</td>
</tr>
</tbody>
</table>

- Statistics show that there is variability between road stretches
- About 7% of warnings were generated due to hoar frost of snow fall
- Freezing road or rain were very unfrequent
• Mean temperature gets logically colder towards North
• Road surfaces are warmest along the road stretch Laitila-Ihode
Road condition warnings

- Warnings for hoar frost increase towards Pori (north)
- Lots of warnings also along Mynämäki-Nästi stretch
Frozen road or rain

- Case 17th February, 2007. Red area: Service predicted well area of freezing rain

- Cases with freezing rain are rare. Fortunately, as they are most dangerous to road transport. Model predicted well the two cases during pilot tests
Conventional web service

- Six-hourly road weather forecast on FinnRA’s web service. The main roads are coloured green, yellow or red depending on the risk level due to road conditions.
Comparing the risk warnings

- Pilot and conventional warnings compared. Red columns on the left show all Pilot warnings combined. Columns on the right show the conventional road condition warning with three severity levels.
Conclusions

- Road condition pilot functioned technically well
- Users liked the looks and the user interface of the service
- Model resolution was good enough for 10 km road stretches
- Warnings were justified in most cases, but sometimes the variability from one hour to next was disturbing
- Warning generation limits should be developed to avoid unnecessary warnings when risk for slipperiness is low
- Warnings should include measure of the intensity of risks