

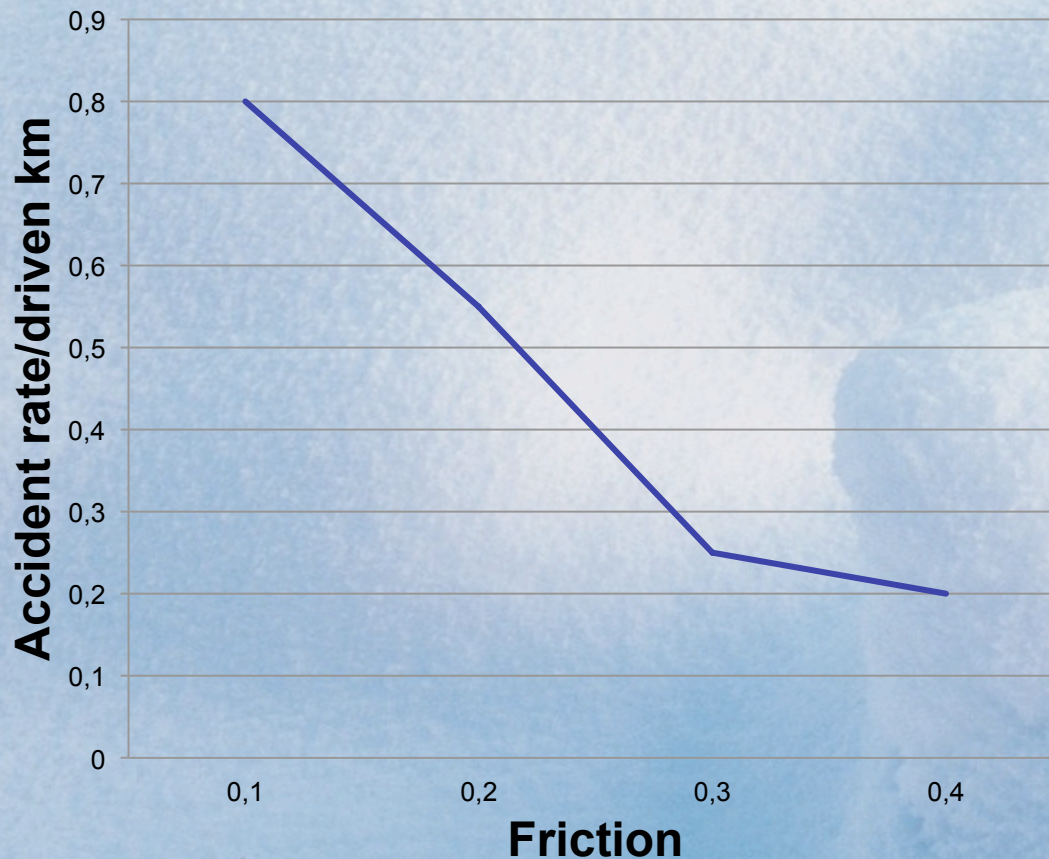
Slippery road detection

-using different methods of polarised light



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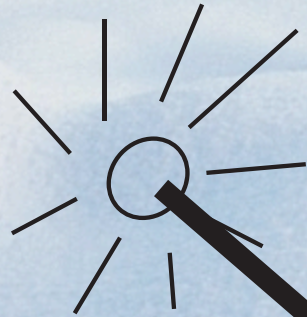
Why do we want to detect slippery road conditions?



Wallman C-G and Åström H: Friction measurement methods and the correlation between road friction and traffic safety, VTI meddelande 911A, 2001

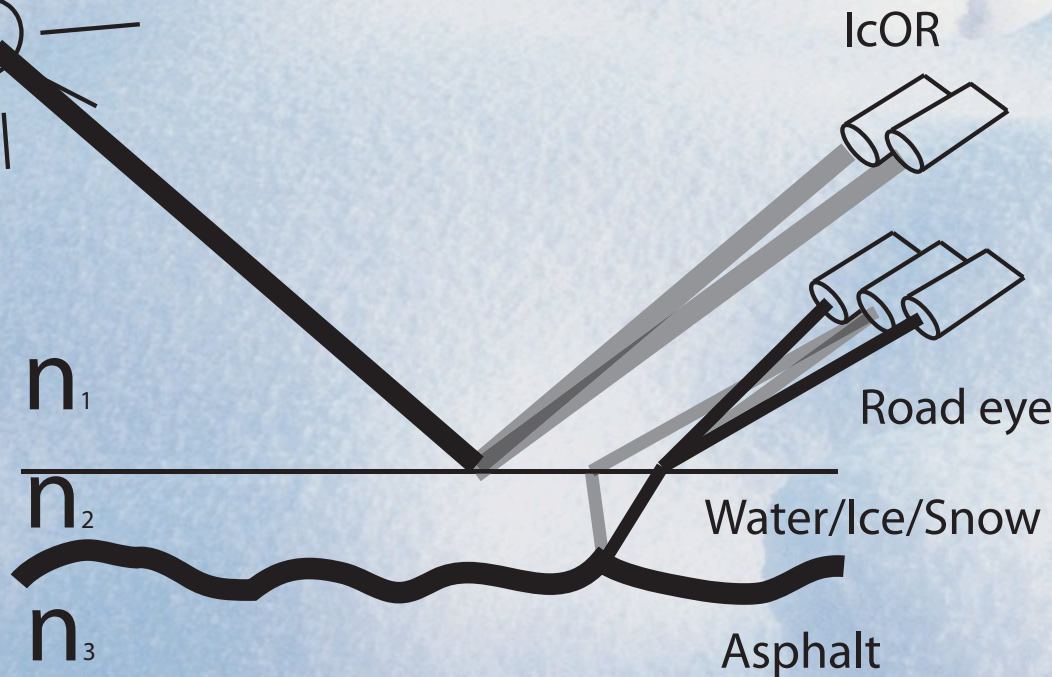
What could be improved knowing the road condition ahead?

- Driver warning
- Systems as the TCS, ABS and ESP could benefit from this information
- ...



IcOR -VTT

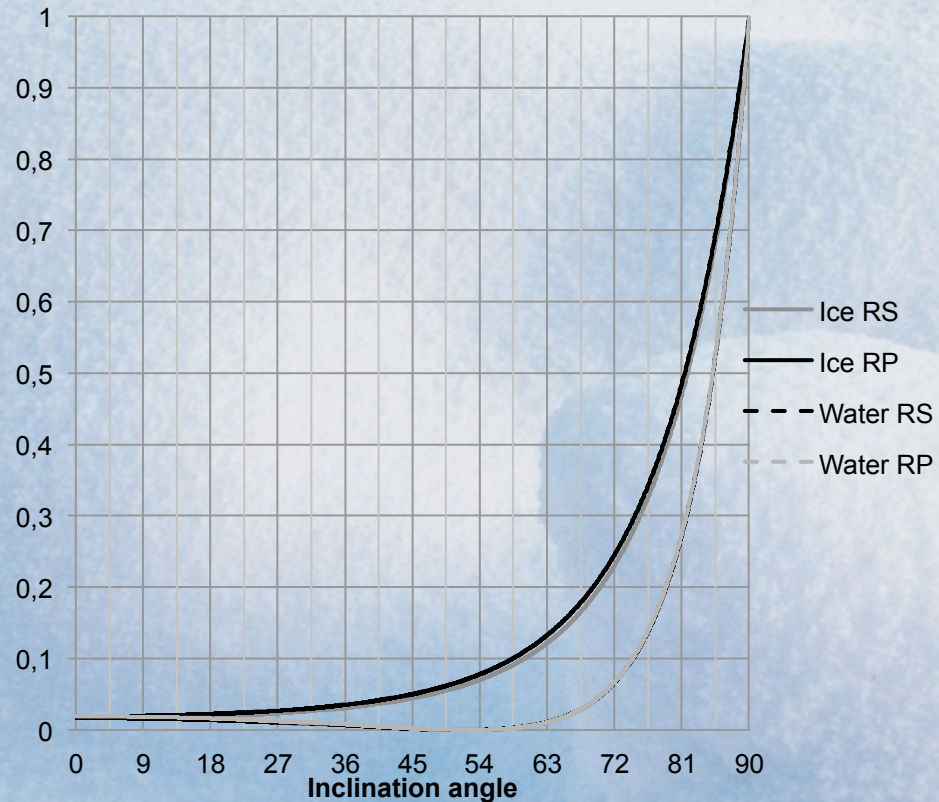
Road eye -Optical Sensors



Two systems for preview detection of slippery road conditions, both exploring the polarization of light

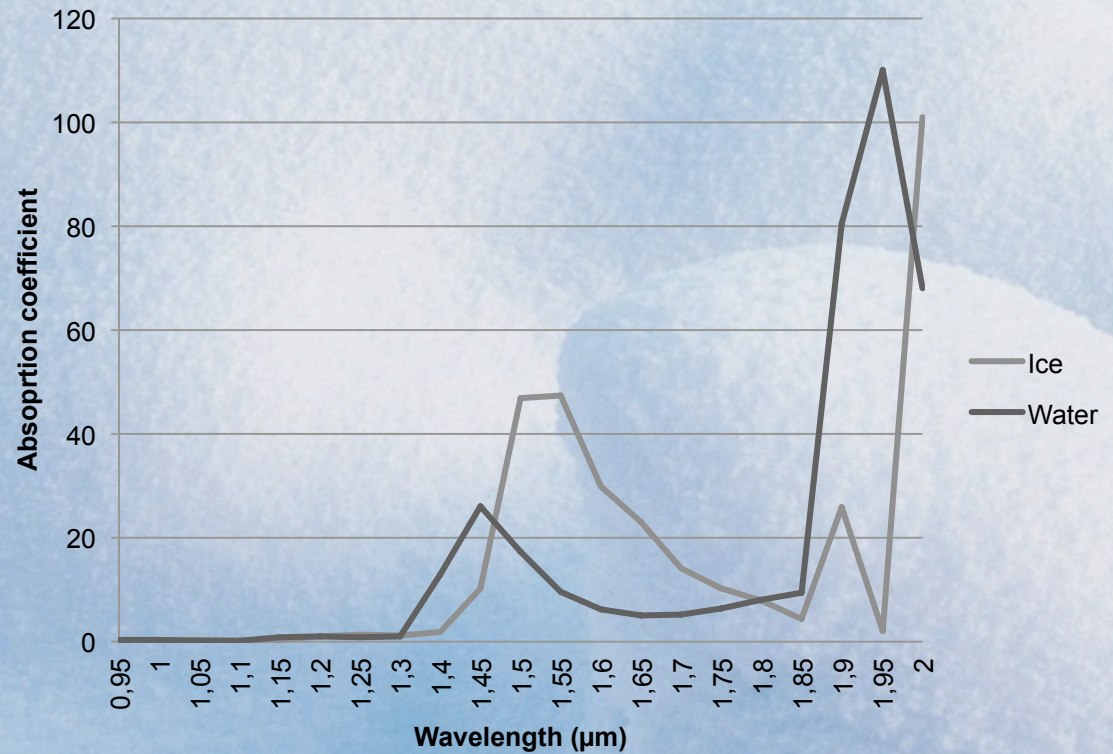
Physical properties explored by the two sensors:

- Polarisation



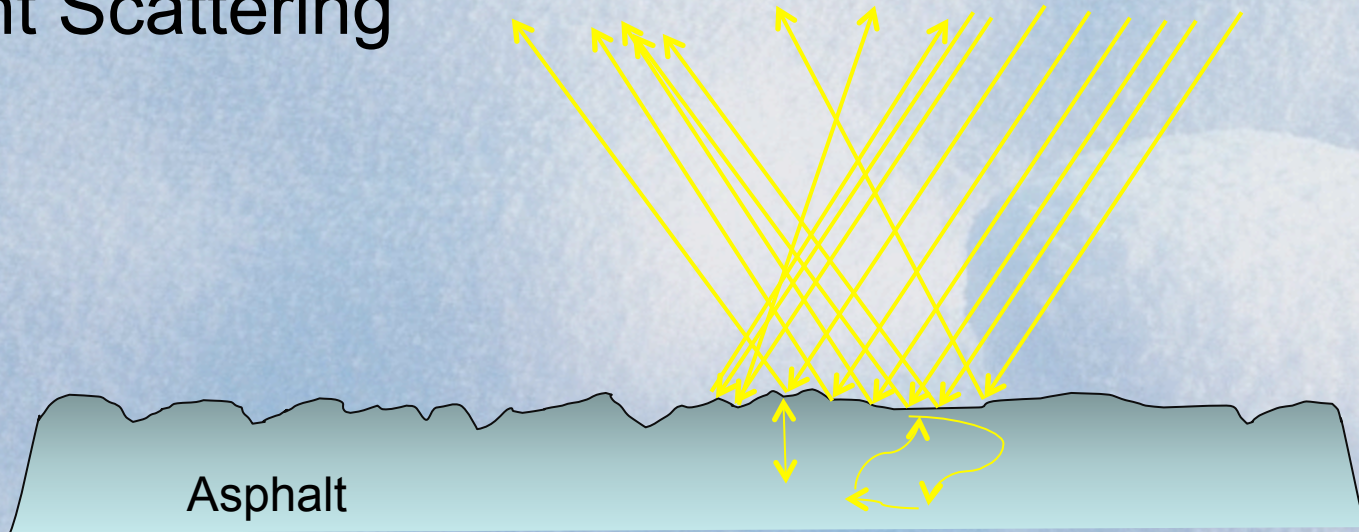
Physical properties explored by the two sensors:

- Polarisation
- Absorption



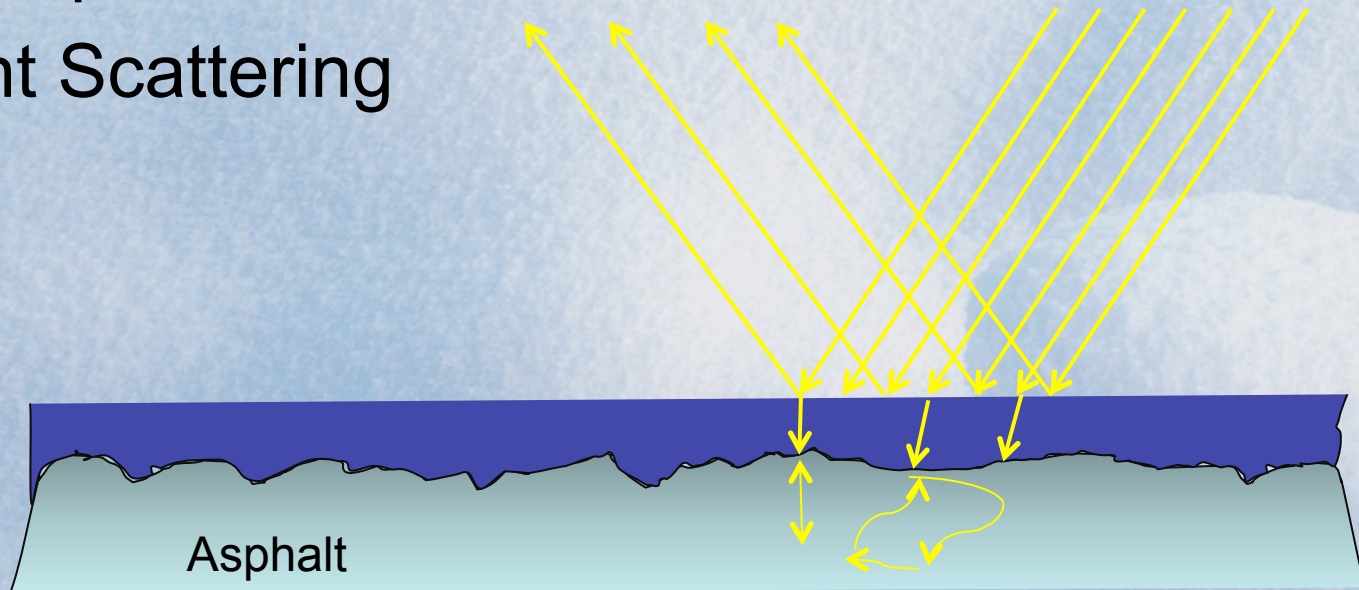
Physical properties explored by the two sensors:

- Polarisation
- Absorption
- Light Scattering

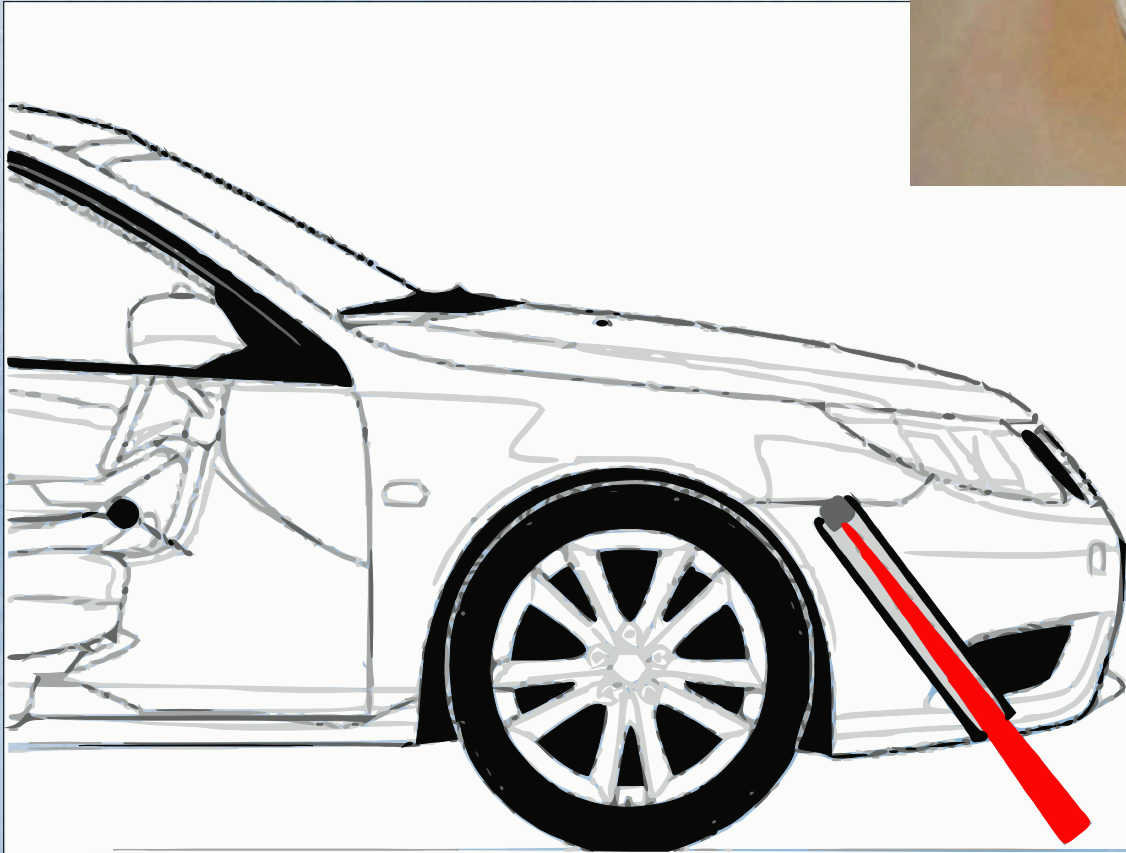


Physical properties explored by the two sensors:

- Polarisation
- Absorption
- Light Scattering

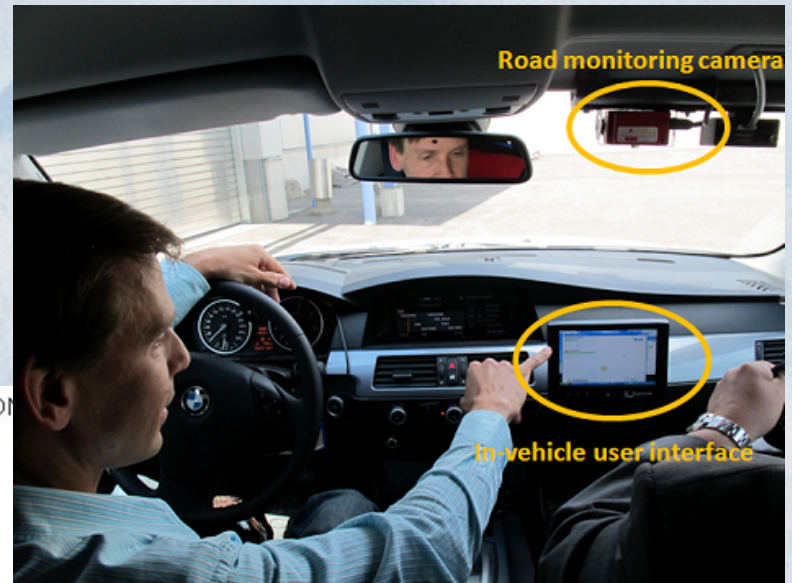


Road eye



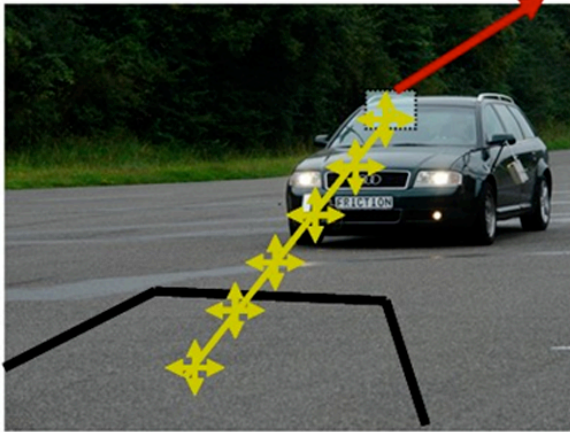
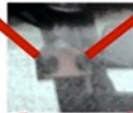
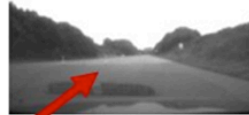
- 3 laser diodes of different NIR wavelengths
- Photo diode as a detector that samples with 20 Hz

IcOR



HORIZONTAL POLARISATION

VERTICAL POLARISATION



GRAININESS: 0,879



GRAININESS: 0,905

- Polarising filters in front of the optics
- Camera pair to capture polarisations synchronously
- Texture analysis to detect road graininess

Measurements

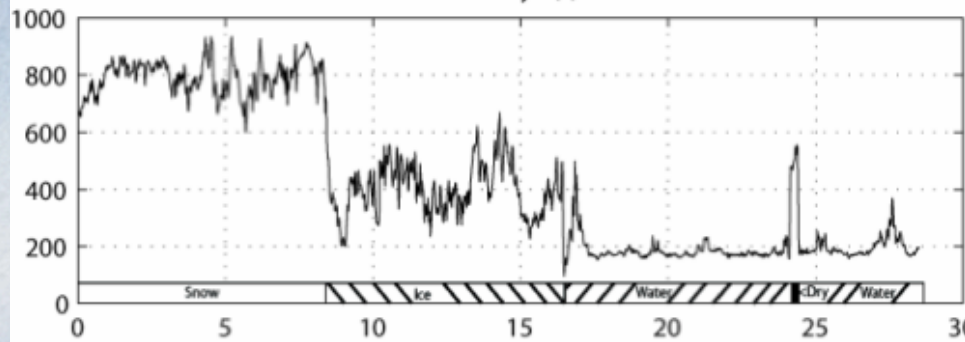


Test track in Arjeplog
Consisting of:

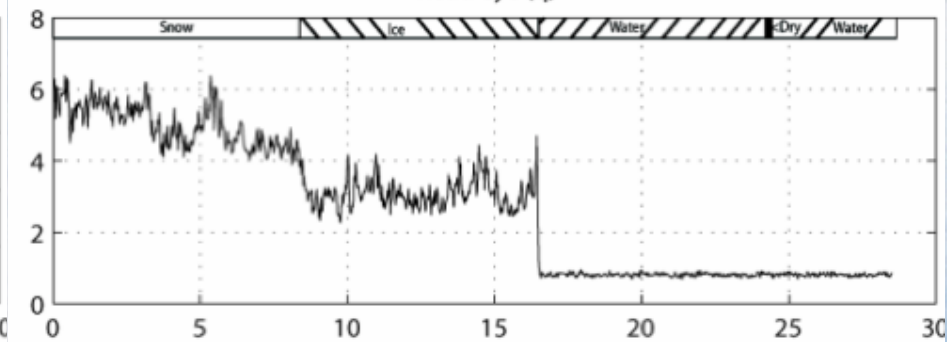
- Dry asphalt
- Wet asphalt
- Ice
- Snow

Results

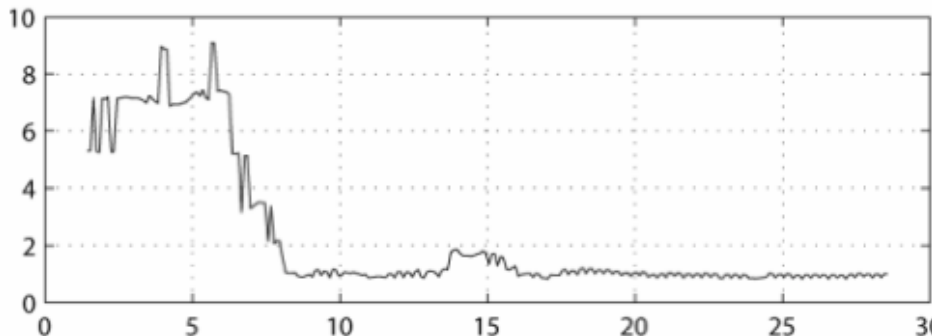
Road eye (s)



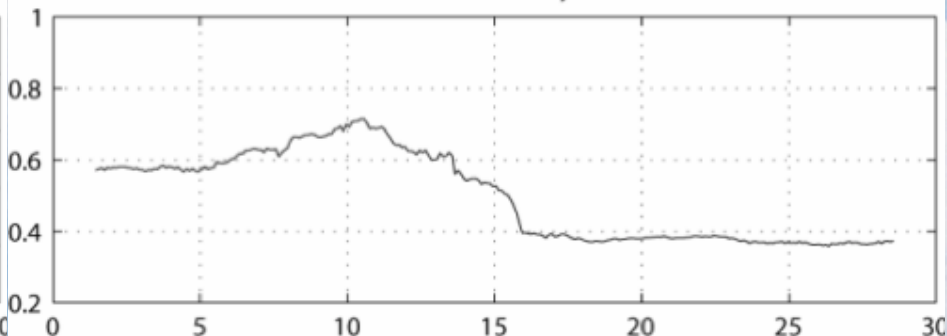
Road eye (q)



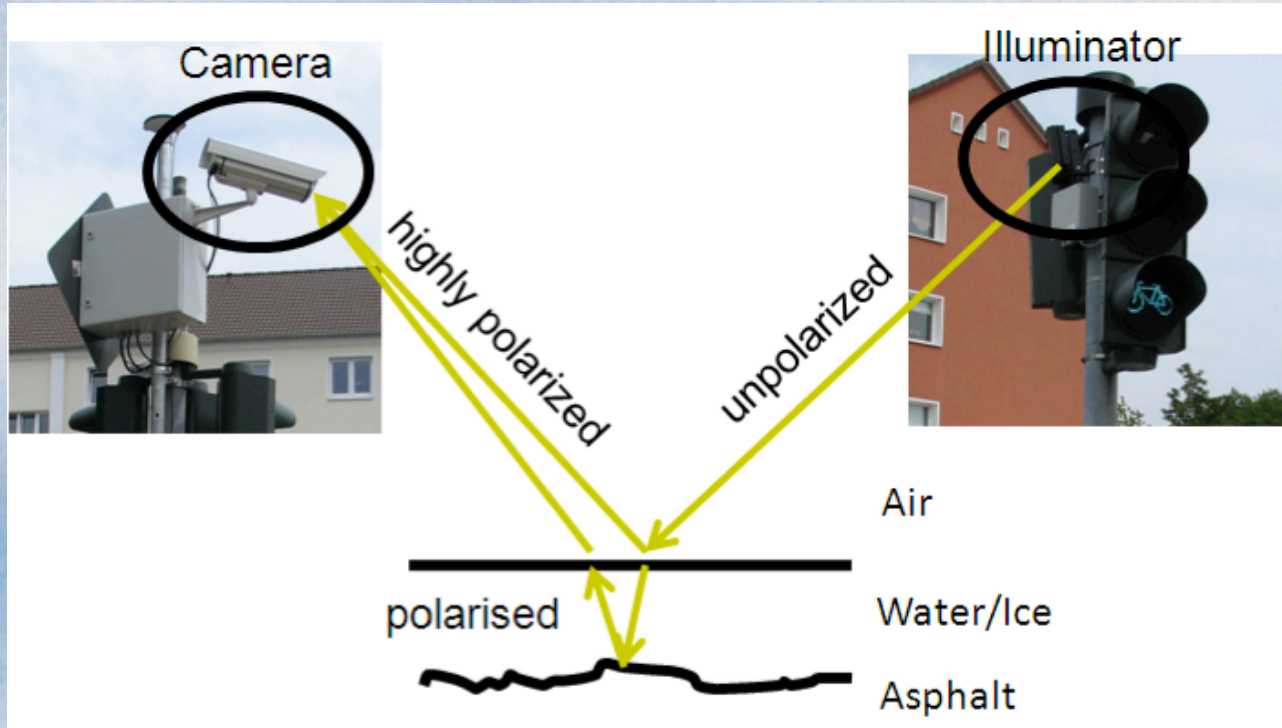
IcOR Polarisation difference



IcOR Granularity



Intersection surveillance



- Tests performed in Wolfsburg in the INTERSAFE-2-EU project
- Same principle as in the on-board camera system
- Relatively low price equipment for infrastructure side friction detection (< 3 k€)

Road Surface Information System



Classifications:

Yellow = Snow

Red = Ice

Blue = Wet Asphalt

Black = Dry Asphalt

Thank you
for the attention

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