ERPUG

vti

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Macro and Micro Texture Performance of Cement Concrete Pavement Surfaces

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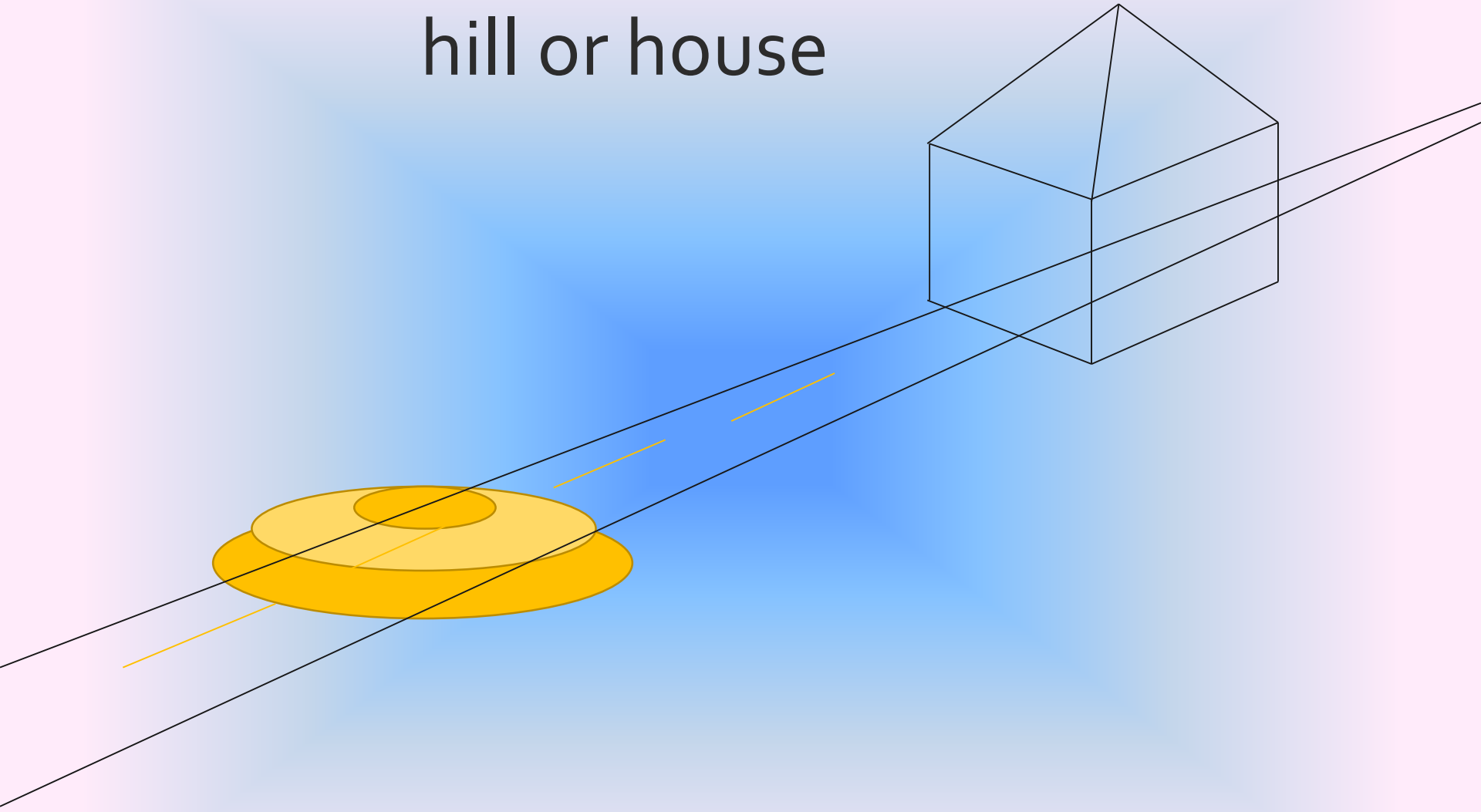
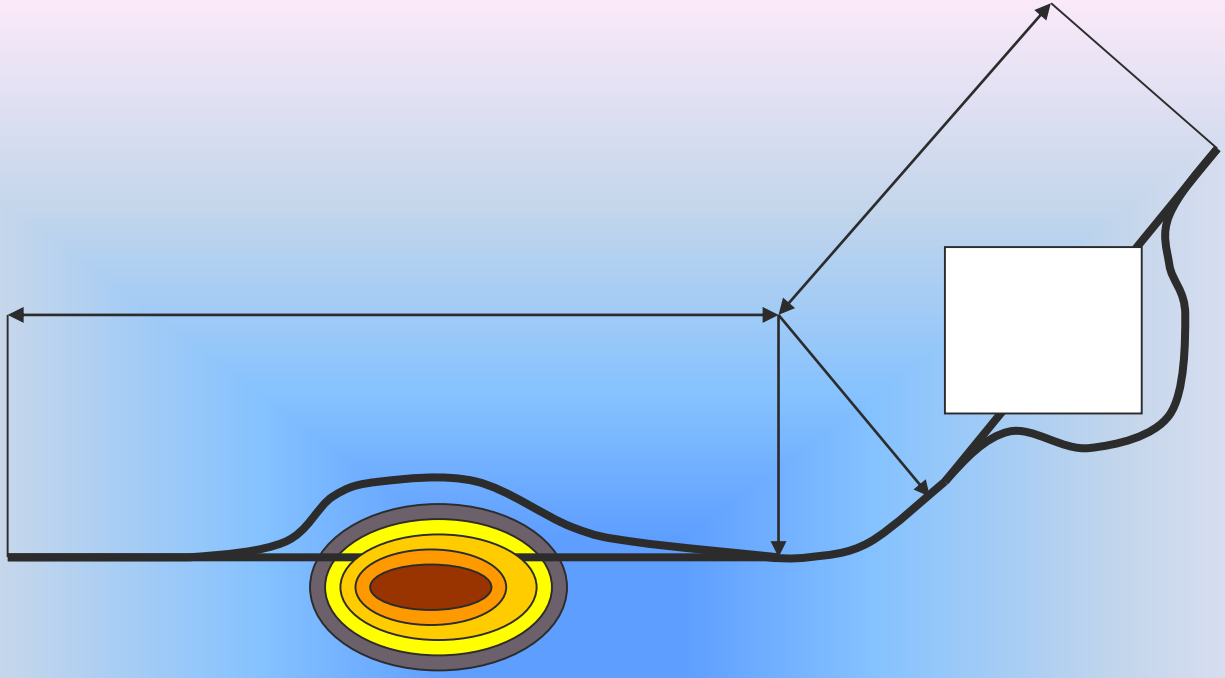
ROAD DESIGN

hill or house





The high-capacity transit roads have
less curves with smaller radius
and more straight sections than local roads have,
where even geometric constraints
can significantly affect final alignment.

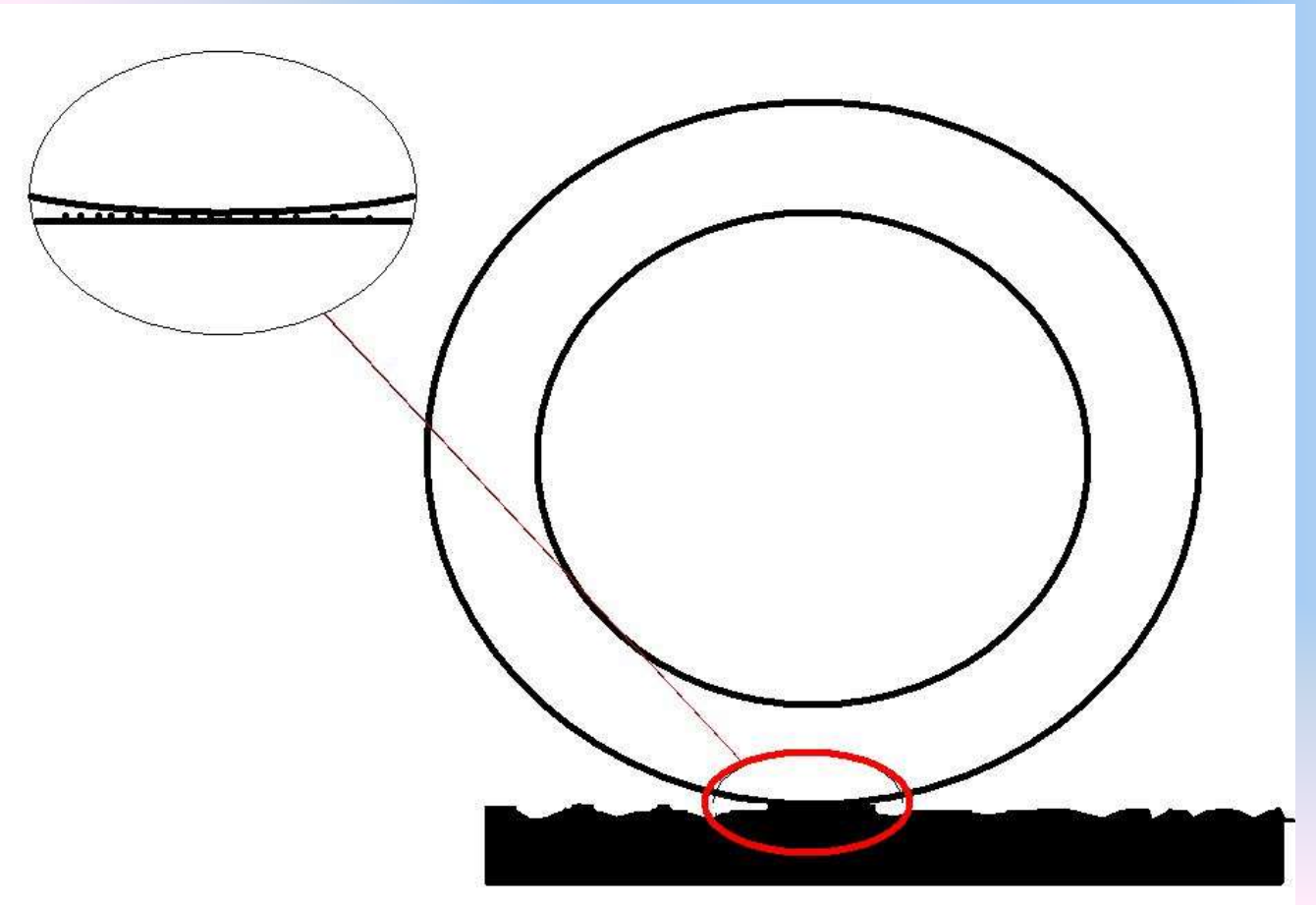
The Hungarian motorway network

Pavement type	Length (km)	Share (%)
Asphalt concrete	1,024	85.7
Cement concrete	171	14.3
All	1,195	100.0

CC pavements have been built in locations where maintenance needs and traffic volume do not allow the effective use of asphalt concrete pavement.

The aim of this work is achieving the swedesh vision zero

Micro roughness



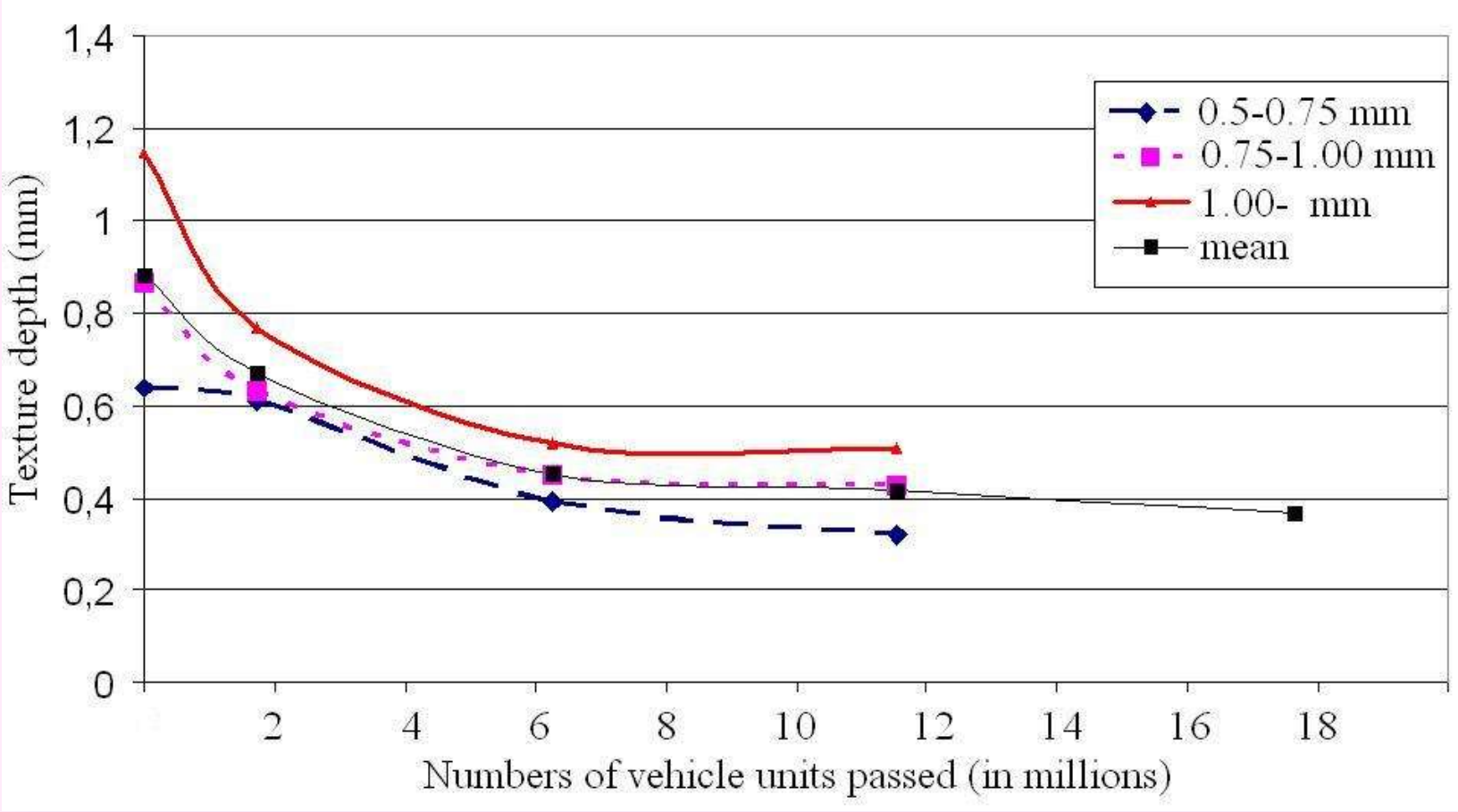
Macro roughness

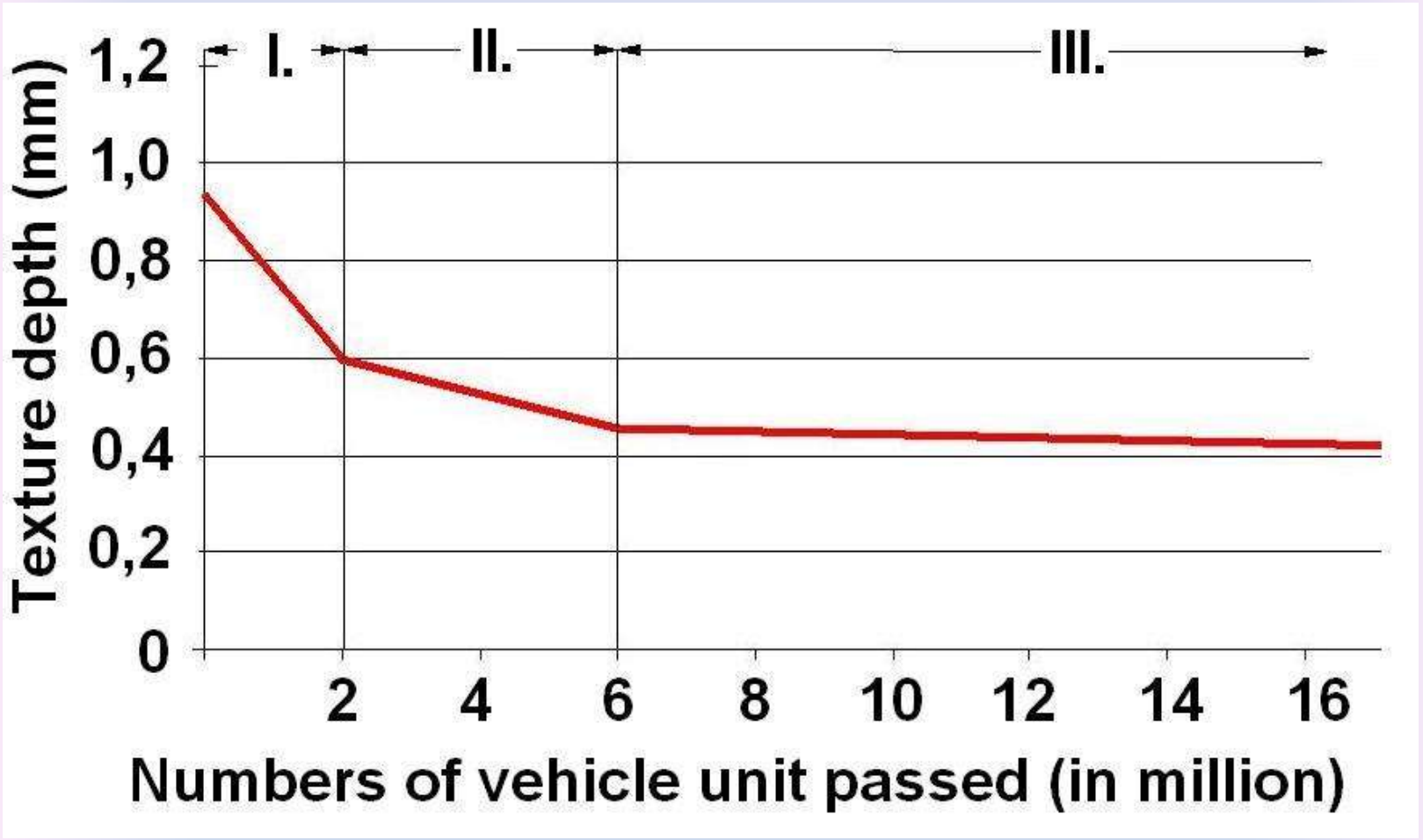
METHODOLOGY

The research on surface texture deterioration started from simple rectilinear uniform motion of vehicles and it followed with complex curved movements in roundabouts.

Linear movement

Texture depth deterioration on the cement concrete pavement of the trial section on road No.7538 as a function of vehicle units passed

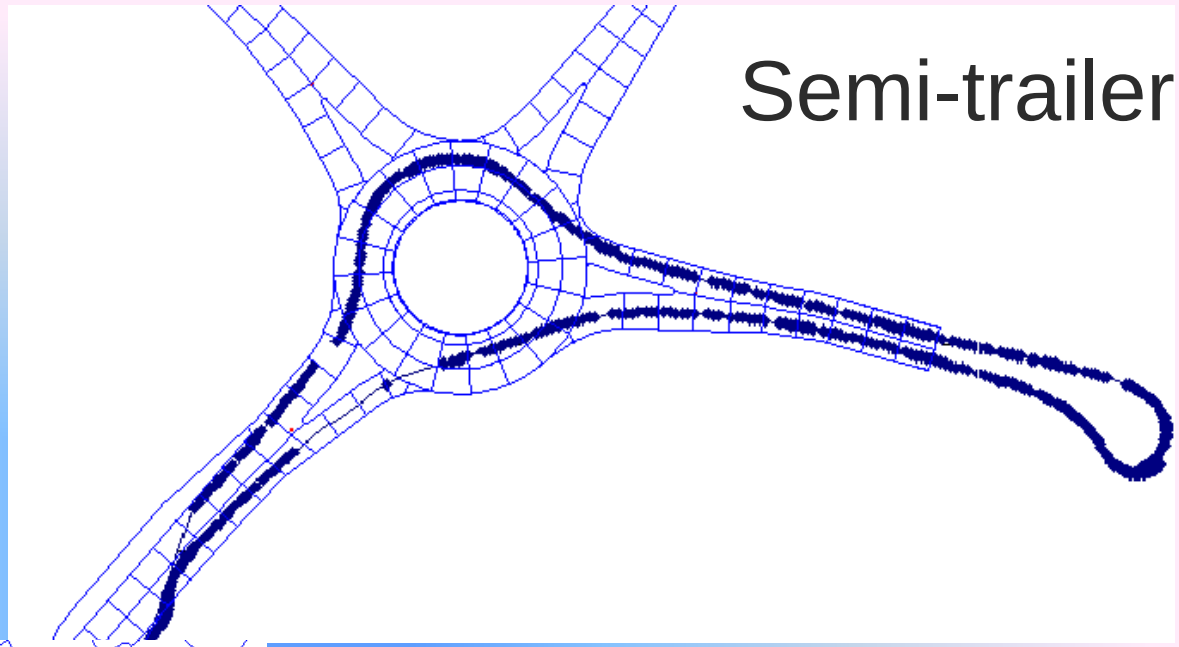



I.
II.
III.
Texture depth (mm)
1,2
1,0
0,8
0,6
0,4
0,2
0
2
4
6
8
10
12
14
16
Numbers of vehicle unit passed (in million)

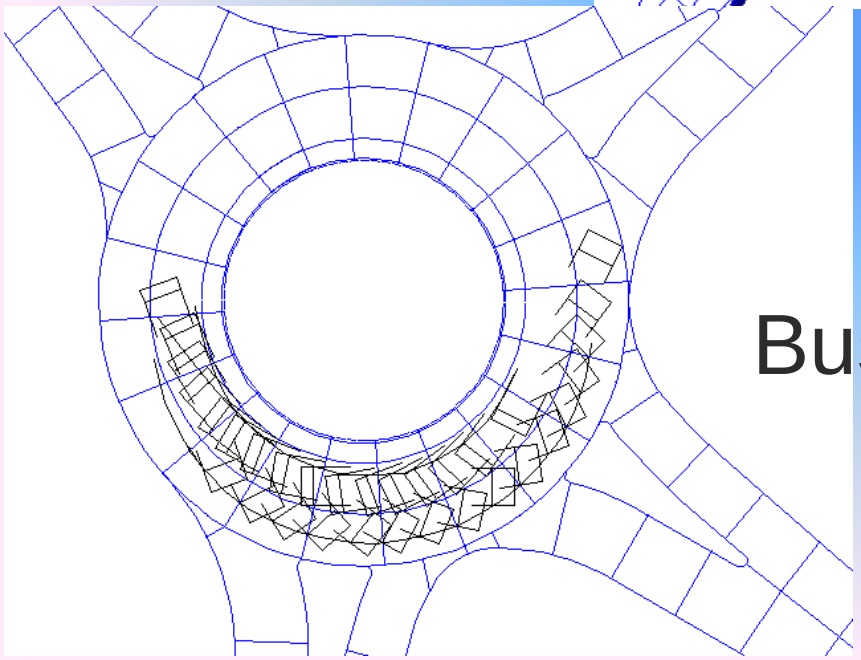
Movement in arc

Simplified texture depth deterioration curve on an asphalt concrete pavement roundabout (junction of roads No. 75 and No. 76) and slip signs on cement concrete pavement on the roundabout in Vecsés

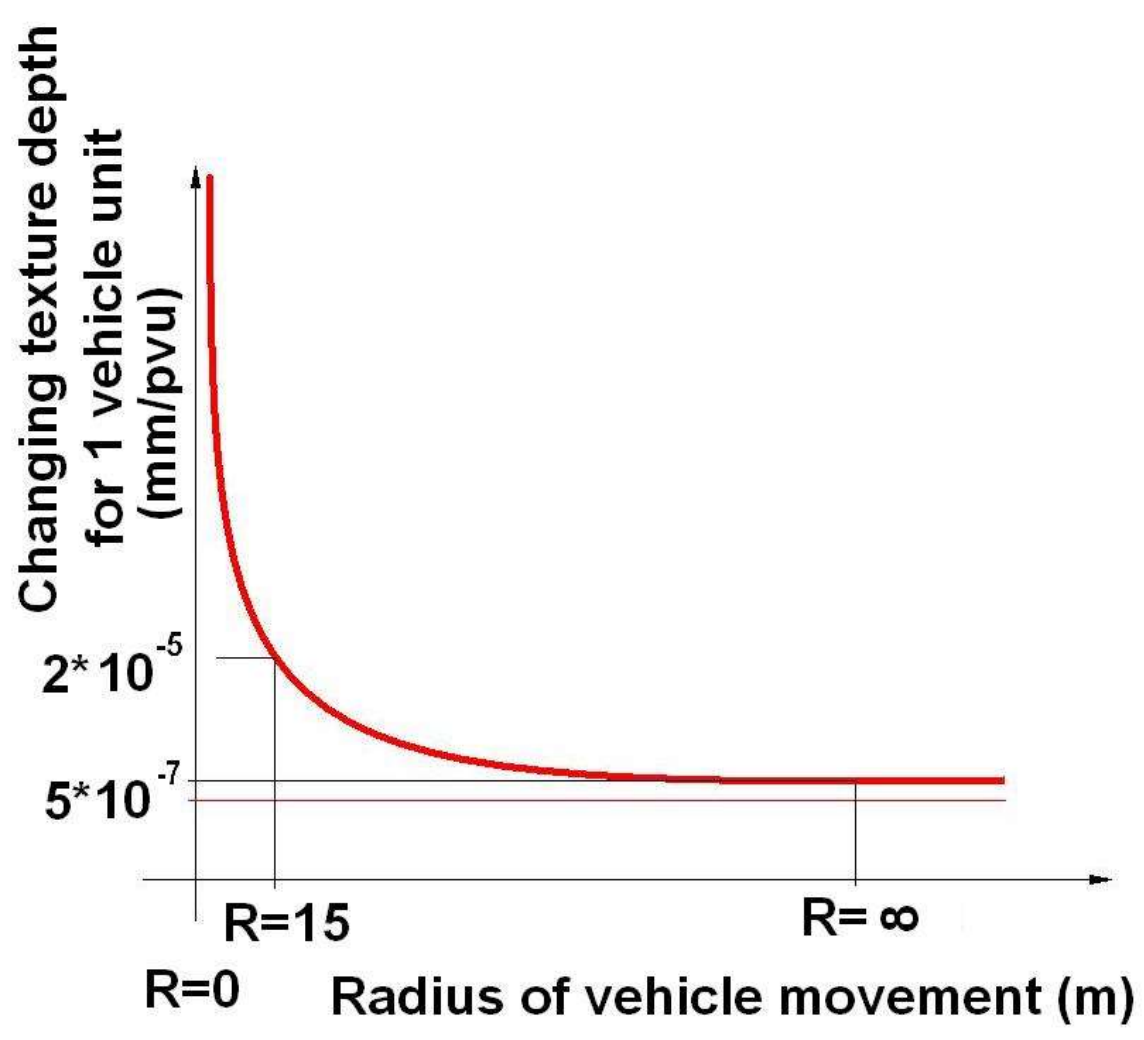
GPS with cm precision tracked movement



Semi-trailer



Bus

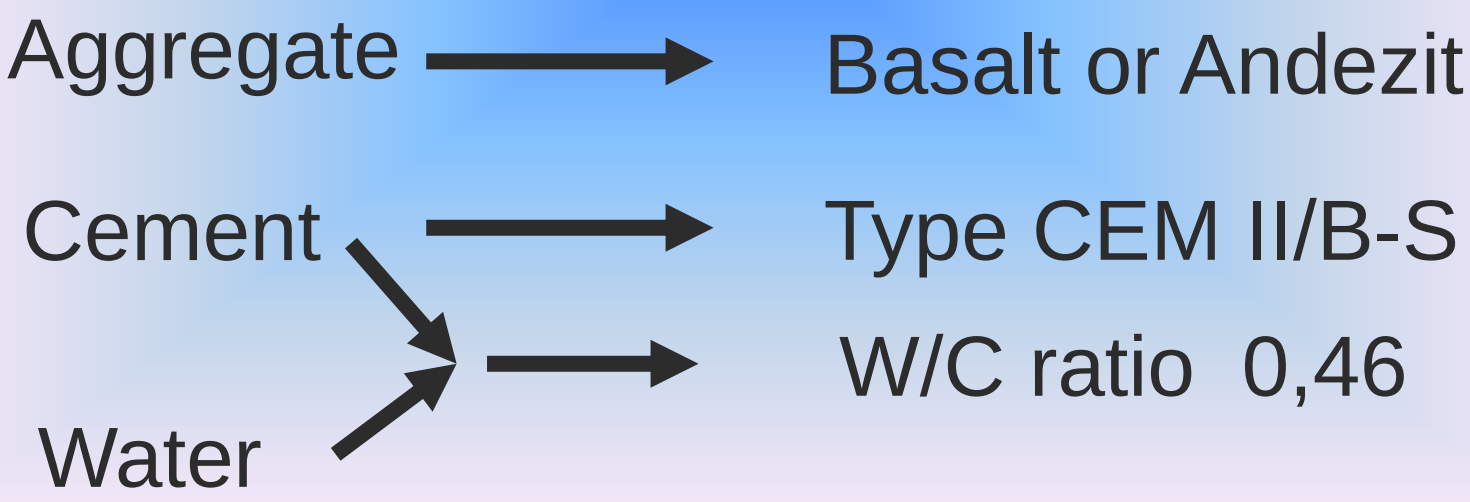


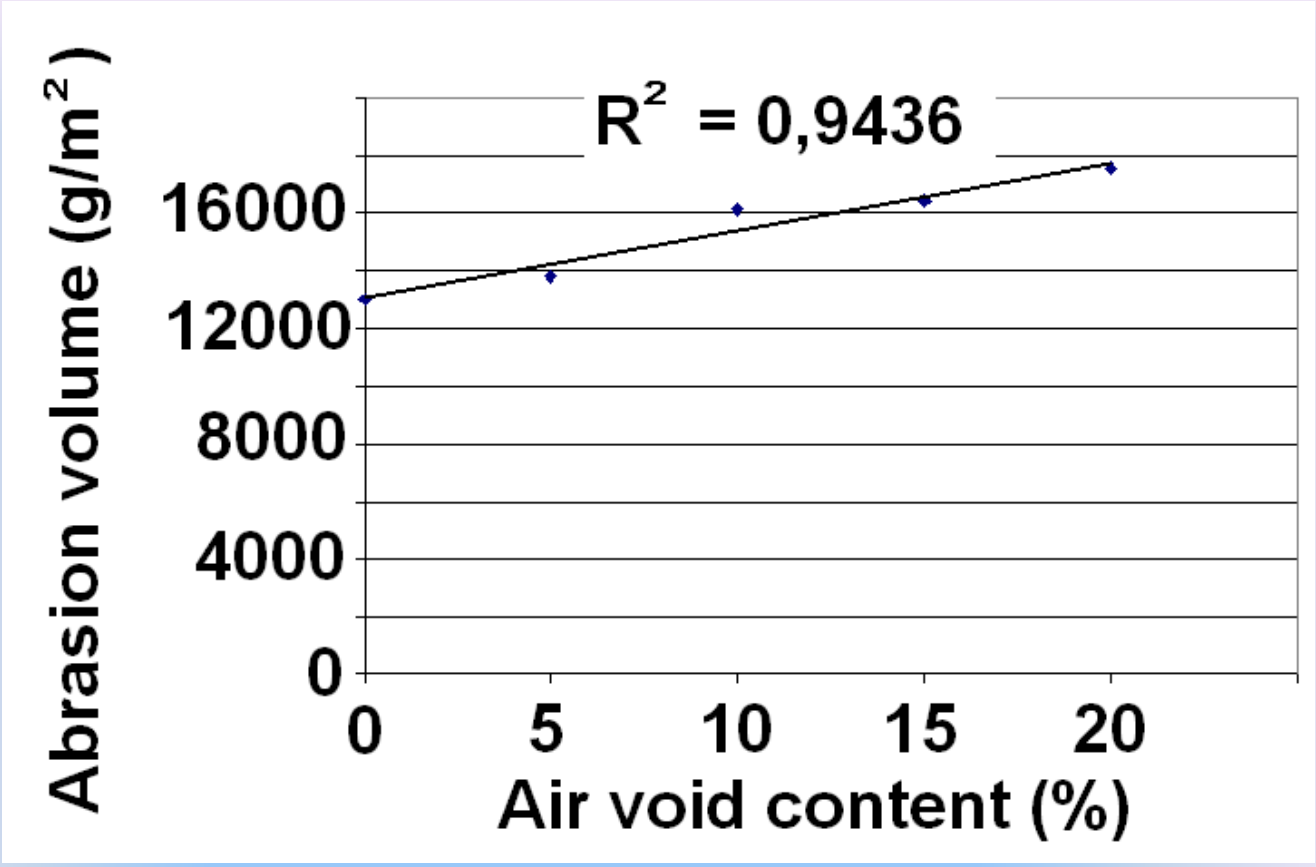
Relationship between radius of vehicle movement and changing of texture depth by each passing

Mixture

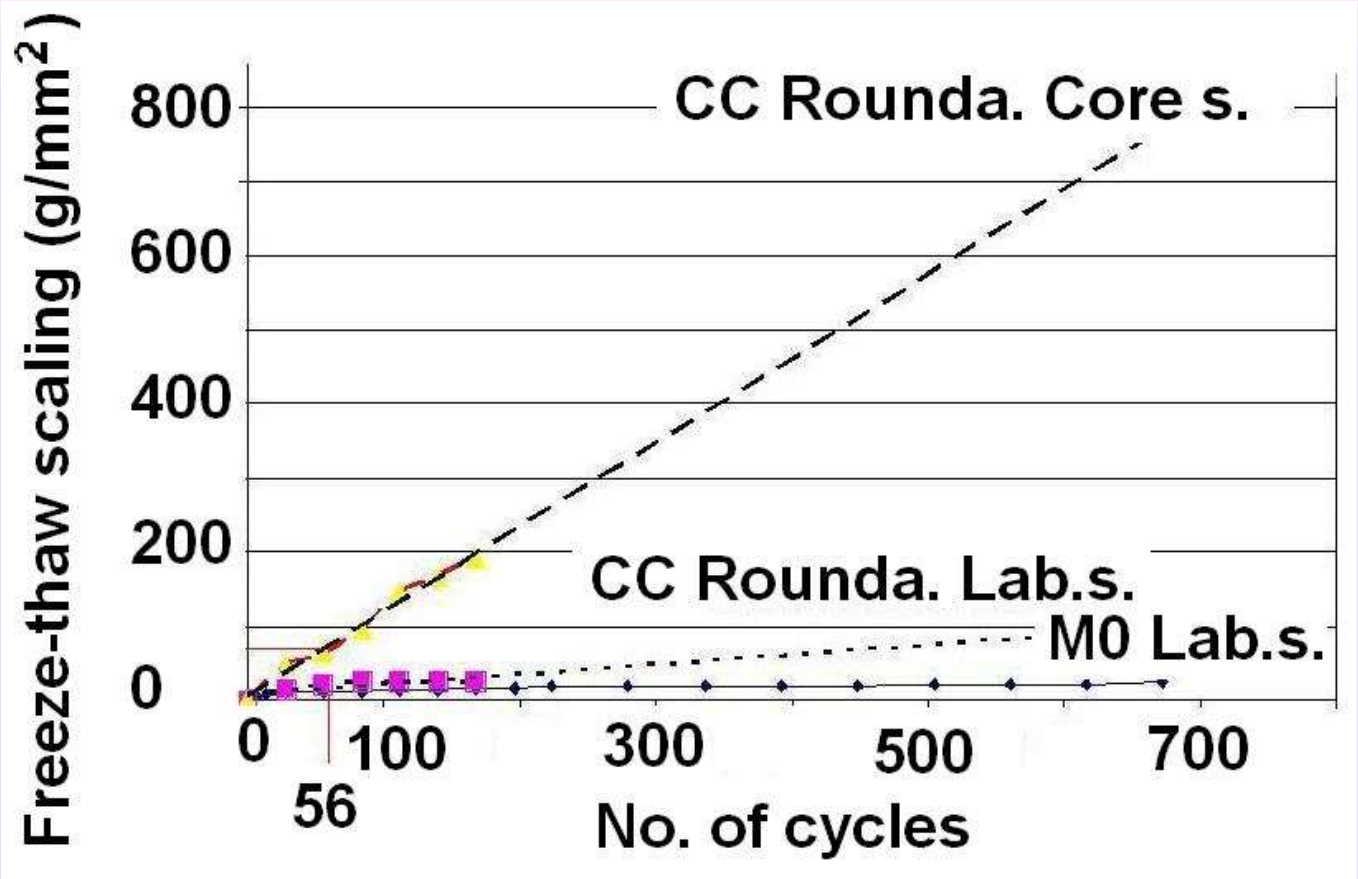
Deterioration modell of the mixture

Abrasion and freeze-thaw scaling





Relationship between air void content of mixture and surface abrasion volume



Freeze-thaw surface scaling as a function of the number of freezing cycles

MACRO TEXTURE DETERIORATION

$$X = D - \frac{e'P}{(AxF)\,M}$$

where X actual texture depth (mm),
D initial texture depth (mm),
e' extra loading factor from curved vehicle ride (mm/ v.unit),
P number of axle units passed,
A wearing factor from abrasion resistance,
F wearing factor from frost-thaw resistance,
M wearing factor from mixture characteristics.

MICRO TEXTURE DETERIORATION

2009.09.01 Handover „0” year
2001.04.04. after 2 years
2007.09.10. after 8 years
2012.04.10. after 13 years

	0	1	2	3
Average	79,4	63,4	60,7	51,9
Minimum	66	53	58	50
Maximum	90	72	65	54
Spread	24	19	7	4
Modus	83	59	62	52
Median	80	63	61	52
Deviation	6,55	4,56	1,78	1,29

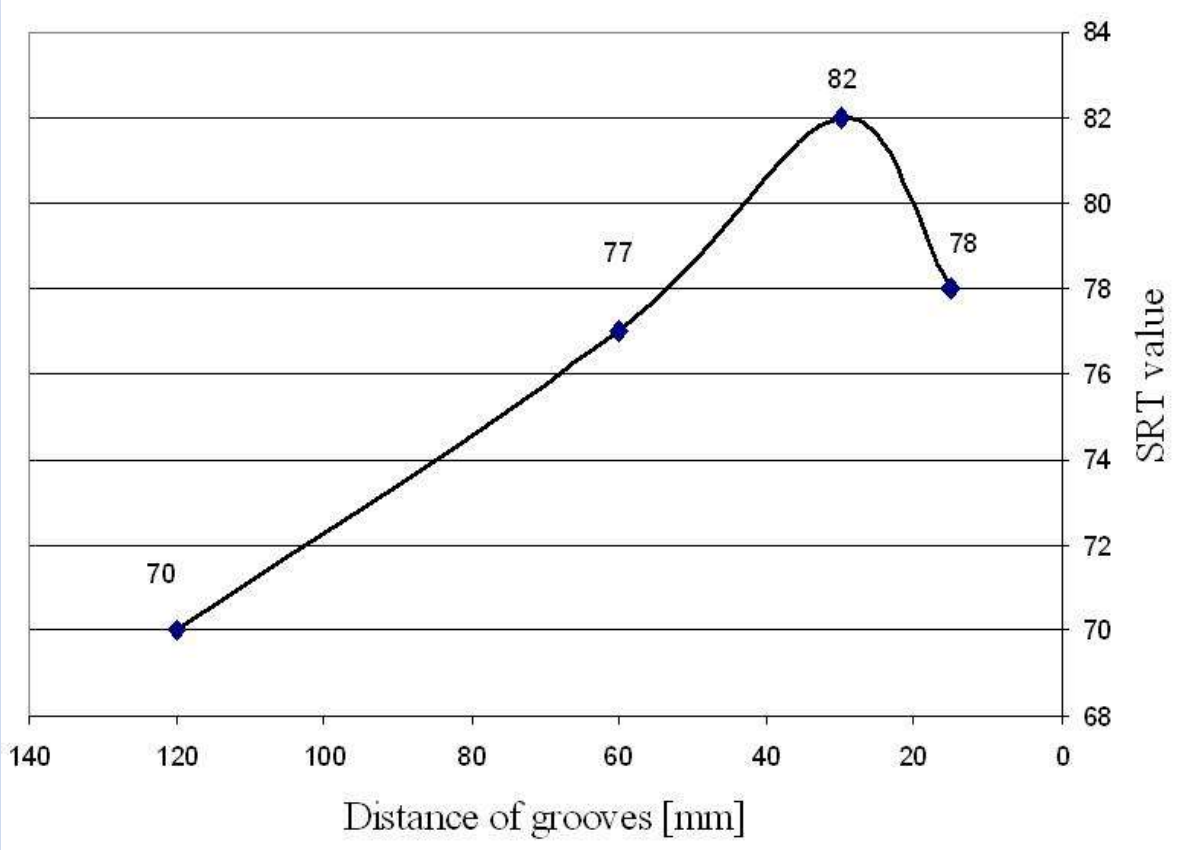
Repair of surface

Grooving
Milling
Cementation

Grooving and it's effect

1. Direction
2. Depth
3. Allocation

Correlation or relationship



or just effect of British Pendulum ?

Summary

The changing of macro and micro texture is different on AC and CC pavements.
By forecasting the deterioration of macro and micro texture the road manager can be prepared to dangerous situations and can prevent slipping accidents.

Thank you for your kind attention!