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Attendance

Day 1: Thursday, 19 November 2009, ASFINAG, 1010 Wien, Rotenturmstrasse 5-9

Stefan Egger	IIID, Austria
Lucie Jagu	High-Performance Vienna / IIIDspace, Austria
Eric Kenis	European Commission, Directorate General for Energy and Transport, Belgium
Theo Kamalski	TomTom International BV, The Netherlands
Antonio Lucas	University of Valencia, Spain
Hans Remeijn	Rijkswaterstaat-DVS, The Netherlands
Peter Simlinger	IIID, Austria
Michel Smuc	Danube University Krems, Austria
Gunilla Thyni	Swedish Road Administration, Sweden
Ulrich Zorin	DARS, Slovenia

Day 2: Friday 20. November 2009, ASFINAG, 1230 Wien, Klingerstrasse 10

Alberto Arbaiza	DGT, Spain
Christoph Brugger	Psychologist, Austria
Wolfgang Ernst	Swaco Futurit, Austria
Antonio Lucas	University of Valencia, Spain
Martin Foessleitner	IIID / High-Performance Vienna, Austria
Alena Morrison	IIID, Austria
Prof. Wolfgang Radner	Optometrist, Austria
Hans Remeijn	Rijkswaterstaat-DVS, The Netherlands
Peter Simlinger	IIID, Austria
Gunilla Thyni	Swedish Road Administration, Sweden
Gilberto Tognoni	North Italy Communications, Italy
Ulrich Zorin	DARS, Slovenia

Day 1:

VMS Information Structure, classifying information and the need of further research

When it comes to VMS information structure, full matrix displays/freely programmable VMS allow for possibilities other displays cannot provide:

- several pictogram and text combinations
- animated (pictograms) or information elements.

P. Simlinger reported: In the final report of SOMS (Substituting/Optimizing (variable) Message Signs for the Trans-European Road Network), which was merged with IN-SAFETY* an information structure has been conceived that allows to align 2 to 4 lines of text with one or more than one full size pictogram.

* the report is available for free download from http://www.iiid.net/SOMS/Project_Report.aspx

The information structure also allows for showing, somehow smaller, easily comprehensible and discriminable road signs (e.g. indicating speed limits) with additional short text information below, equally easily comprehensible and discriminable (e.g. a distance in meters or kilometers).

The standard would be three lines of text with x-height (height of lower-case letter without descender and ascender) of 24.2 cm (capital letter height 33.0 cm). In exceptional cases also two lines of text with x-height 35.2 cm (capital letter height 48.4 cm) could be shown.

Scenarios and “personas” had been developed to tell stories of drivers planning a trip to a fictitious destination. The messages that could occur were shown animated as they would be seen by drivers at a speed of 100 km/h. The test persons then were prompted to recapitulate the shown information and were asked which action they would take. The responsibility for the execution of the tests was with Danube University Krems.

Insights were gained that differing values need to be attached to “information elements”, depending on the comprehensibility and the discriminability of their graphical elements. This resulted in a (preliminary) classification of pictograms (excerpt):

Class 1 comprising

- Vienna Convention pictograms and symbols/pictograms not regulated by the Vienna Convention, that have yielded comprehension scores of correct understanding above 88%.
- Europeanisms (traffic relevant vocabulary identified and investigated by INFOTERM for understanding throughout Europe) presented as “keywords“ and
- place names.

Class 2 comprising symbols/pictograms not regulated by the Vienna Convention, that either have been accepted after convincing scores when tested for judged comprehensibility or yielded comprehension scores between 77% and 88%.

Class 3 comprising symbols/pictograms not regulated by the Vienna Convention, that have yielded comprehension scores between 66% and 77%.

The classification of pictograms is one of the topics that should deserve thorough evaluation.

Legibility criteria, the smallest graphical detail and what it means for typeface and pictogram design

S. Egger and M. Smuc reported on design considerations and test results obtained by comparing the TERN typeface (for “Trans-European Road Network”), designed by Prof. Erik Spiekermann, with other most advanced typefaces: DIN (Germany), Transport (Great Britain) and RWS (The Netherlands).

H. Remeijn reported of a recent decision to start using three of the specially crafted TERN bitmap versions in The Netherlands. In Austria the vectorized TERN, designed for use on standard sign boards, plus a condensed version (especially ordered by the Austrian Traffic Safety Board to complement the standard TERN) is expected to become law in 2010.

S. Egger commented, that all TERN versions are now available from IIID (<http://www.iiid.net/SOMS/Typeface/Tern.aspx>)

The key role of the Smallest Graphical Detail (SGD) for legibility and discriminability was discussed, and its relevance for typeface and symbol/pictogram design.

Improvements of symbol/pictogram design and naming were indicated (*arrow to right junction*) (*arrow to right intersection*).

Triggered by the x-shape of the presented IN-SAFETY symbol "Motorway entry ramp/junction" A. Lucas explained the shift from a conceptual depiction to a user's view by indicating the different concepts of the development of the traffic-symbol “double bend” (Vienna Convention: A, 1c and A, 1d).

Harmonizing graphical information on in-vehicle displays and VMS

T. Kamalski informed

- about the pioneering role of TomTom,
- that it is the policy of Tom Tom to not rely on funded research projects (however, one exception was mentioned: the automotice environment project Eindhoven - Leuven/Louvaine - Aachen, that attracted EUR 65 mio. funding over 2 years)

and that

- harmonizing information and
- harmonizing routing

are crucial.

S. Egger informed T. Kamalski on the pictograms elaborated in the SOMS/IN-SAFETY project and their suitability not only for VMS but also for in-car navigation systems, as they are designed to be able to be adapted to any in-car device screen resolution without quality loss/distortion.

Day 2:

Visual acuity of the healthy eye

P. Simlinger, referring to the next to impossible task to provide information on motorways large enough for drivers with visual acuity 0.5 ("normal" visual acuity is 1.0) summed up insights determining the size of information to be displayed:

- 1) The "smallest graphical detail" matters: 1 M.o.A./minute of arc = for people with "normal acuity" (1.0) is ~ 3 mm if seen from 10 meters away.
- 2) No graphical element must subtend 1 M.o.A. (3mm seen from 10 meters)
- 3) Three lines of text should relate to one pictogram. This is in harmony with the average complexity of pictograms and of lower case letters.
- 4) Catering for drivers with visual acuity 0.5 requires doubling the size of information determined for drivers with normal eyesight.
- 5) Information displayed smaller than calculated can result in drivers initiating breaking manoeuvres causing chain reactions, thus increasing the risks of accidents.
- 6) Visual acuity varies, depending on light conditions.

Prof. Radner: a change of legislation (raising the required visual acuity of applicants of a driving licence or not allowing drivers with poor eyesight to drive on motorways or imposing speed restrictions on them) would be most difficult to enact. He argued that it is easier to optimize the technical aspects of the signs rather than changing the legislation applicable to drivers with poor eyesight. Moreover the latter would turn out to be an extremely time-consuming affair.

What realistically could be done:

- Imposing speed restrictions ahead of displayed traffic information should such be required to increase the time the information needs to be seen and acted upon.

and:

- Limiting the number of information elements displayed on signs.

For this purpose further research is needed:

- 1) Investigating the distance from which LED based information can be seen in comparison to "painted" information on standard and retro-reflective backgrounds.

Important differences:

- due to LED's reflection angle, for the last 20-30 meters one is not able to read the sign. This means, an LED sign seen from a distance of 100 meters one has $100-30 = 70$ m readability;
- black/white contrast \neq light contrast.

W. Ernst: "the most important parameter affecting legibility is the luminance ratio".

- 2) For sign boards showing both “painted” and LED information: researching the possibilities to add lighting to the “painted” information to make it as conspicuous as the LED information – compared to the cost and effectiveness to also display the “painted” information in LED.

- 3) Reviewing the “Danish” formula**) with regard to
 - the requirements of LED-based information
 - the varying values of “information elements” depending on their conspicuity and comprehensibility.

**) taken from the “Danish technical handbook for VMS”:

$$t = 2 + n/3 \text{ seconds}$$

where t is the necessary reading time and n is the number of standard information elements on the sign.

Prof. Radner: there is no reason to assume that the “Landolt C” (see example below) has become invalid.



Prof. Radner presented the formula

$$d = D/3438 \cdot E$$

which is only valid for best-case static conditions and black and white contrast.

d = opening of what is also called the “Landolt ring” in mm

D = viewing distance in mm

E = visual angle

- For visual acuity 1.0 this results in a letter x-height (height of lower-case letter without descender and ascender) of 145 mm – seen from 100 m.
- For visual acuity 0.5 this needs to be doubled to make 290 mm.

IIID’s calculation deviates. For visual acuity 1.0, IIID has figured out an x-height of 177 mm; for visual acuity 0.5 this would result in an x-height of 350 mm, which is about 20% above Prof. Radner’s guideline.

However, as IIID suggests to take a visual acuity of 0.73 as the minimum, this results in an x-height of 242 mm, which is then 17% below Prof. Radner’s guideline.

For VMS, W. Ernst’s proposed 350 mm for capital letter height equalling an x-height of 275 mm, which is 15 mm or more above the IIID recommendation (242 mm). To our understanding this is calculated using worst-case scenarios.

Thus we have to discuss a range of x-heights between 242 mm (IIID) and 350 mm.

Finally; “about the functioning of the eye of a person in motion we have no data” (Prof. Radner). Consequence: research is urgently needed.

Alerting drivers: The flashing triangle on top of warning signs and reflective alternatives

C. Brugger found that what really matters is the image content of the pictogram which indicates the reason of the warning – with or without additional warning element. The warning element (static or flashing triangle, flashing lights in corners) alerts attention.

If a triangle is superimposed, it should not impair the legibility of elements of the underlying pictogram. H. Remeijn showed examples where the triangle, for his purpose, has been slightly shifted sideways.

A. Lucas explained the ES-4 proposal: showing the pictogram full-size and – near the danger – within the triangle.

W. Ernst suggested flashing warnings to indicate a “just now” occurred change of the displayed information, differing from the one shown on a VMS drivers have passed before.

The use of colours on VMS: advantages and disadvantages

In the Netherlands, according to H.Remeijn,

- yellow is used for “normal” information
- white is used for re-routing information
- red is used to indicate restrictions/prohibitions
- green is not used on text panels.

Prof. Radner: red is a real problem. People with red/green deficiency see red darker as other people.

Technical feasibility / Current state of the art in VMS

W. Ernst: today only full-matrix displays are ordered. For letters, 24 x 480 pixels are most common with a distance between the LED of 20 mm. However, deviations occur. In Slovenia e.g. the distance is 25 mm. IIID in D2.3 of IN-SAFETY recommends 22 mm.

The VMS Unit – on the need to adapt the 1968 Vienna Convention to present and coming times

A. Lucas pointed out the possibility, if not need, to get a Vienna Convention version published that only covers VMS.

He also referred to needs, modifying the Vienna Convention e.g. concerning the recommended sequence of referring to locations.

- Vienna Convention: the next location is referred to on the top of the sign

- On diagram signs (Vorwegweiser) that list the places further on: the next location is referred to on the bottom of the sign.

List of suggested further research:

Typeface

- completion of the "Tern" with a Cyrillic version
- executing a complementing Tern comparison test
- integrating specific symbols/pictograms into the Tern typeface family
- harmonizing/integrating motorway exit numbers
- integrating nationality symbols
- integrating E-numbers and national road numbers

VMS Information Structure

- classifying information elements
- determining an evaluation method for composite messages
- developing guidelines for scenario building and programming
- realizing full-scale test installations
- determining principles of diagram signs
- determining VMS positioning criteria for information which is too voluminous to be placed on one sign and therefore needs to be split up and placed on two signs
- determining criteria governing the repetition of information.

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Peter Simlinger/
Alena Morrison/
Stefan Egger

International Institute for Information Design (IIID)
Palfygassee 27/17, 1170 Wien/Vienna, Austria, Europe
T: +43 (0)1 4036662, F: +43 (0)1 4036662-15
<http://www.iiid.net>
info@iiid.net