REACTION ON REMARKS OF STEPHAN SCHEUER OP ECE/TRANS/WP.29/GRSG/2008/3 (CMS)

2.1.2.4
Definition of Luminance contrast

Different definitions of contrast exist. A common definition is (from Wikipedia):

Various definitions of contrast are used in different situations. Here, luminance contrast is used as an example, but the formulas can also be applied to other physical quantities. In many cases, the definitions of contrast represent a ratio of the type

$$\frac{\text{Luminance difference}}{\text{Average luminance}}.$$

The rationale behind this is that a small difference is negligible if the average luminance is high, while the same small difference matters if the average luminance is low (see Weber–Fechner law).

This definition is used in the proposal. Another definition, e.g. from ISO 15008 can be used as well. When dL/Lav = 0.20 (as the threshold contrast in the proposal) is equivalent to a contrast ratio of 1.25. So, the one definition can easily be converted into a threshold value for the contrast ratio. The important thing is that we argue that the (lower) contrast ratio threshold of 1.25 is more appropriate than the higher value of 2 (used in ISO 15008) for the following reasons:

1) the border corresponds better with the perceptual border
2) the measurement is more robust against veiling luminance differences (see TNO report).

2.1.2.6
Definition of “critical object”

In the proposed method the representative critical object size is used. The shape is not important. The advantage of the method is that from it one can deduce whether a CMS will function in various situations. This means that the configuration does not need to be specified, and the test does not have to be repeated for different configurations. Furthermore, the test leads to quantitative threshold measurements which are determined in an objective test (i.e. not subject to variantions in subjective judgments), and allows for statistical testing (e.g. whether the threshold value is significantly different from the required value.

It is not clear to be how the test is performed with a real object and what determined whether the system passes the test of not. Especially in boarder cases (i.e. not clear cut) this will be more of a problem and whether the system passes will depend largely on who performs the test. This can be improved by training persons to create a common idea of the threshold.

I agree that for CMS producers it may be convenient to perform tests with real objects, to get an impression of the quality of the system. In that case, a white spherical object may be used with a black triangle painted on top of it. This allows one to judge whether the object can be seen, and also whether the orientation of the triangle (oriented towards to camera) can be judged.

When doing certification tests a quantative and objective test is required. Moreover, the TOD test can be used to determine whether for a given configuration, critical object size (which may be different for different classes) the CMS passes the test.

2.1.2.7.
The crucial proposed change is the removal of the 8 arcmin and replacing this by a multiple times. The important thing is that the ratio between the smallest discernable detail and the diameter of the critical object is 8. For the naked eye of a standard observer the smallest discernable detail is 1 arcmin (acuity of 1), so the critical object spans 8 arcmin at threshold distance.

When using a CMS, the detection distance can be calculated from the smallest discernable detail of the system. At this distance the critical object spans an angle 8 times the smallest discernable detail size.

2.1.2.9
In Annex 10 of our proposal it is specified how the critical viewing distance can be determined. For viewing distances smaller than the critical viewing distance, the smallest detail is determined by the system. For larger viewing distances, the smallest detail will be reduced due to the resolution limitations of the human eye.

6.2.2.2.1

The basic idea is to specify in the regulations the circumstances and requirements under which the CMS should function well, and state in the appendix which test can be used to test this. If additional things should be specified we're open for suggestions.

In the blooming test we have proposed to use a light source of 5 deg. since this is easier to use than a light of 1 deg (goven the high luminance output required). When it appears to be possible to use a smaller light an still create such high output we're open for changes.Rationale behind our choice was that the lab-test should be ***representative*** *for the real situation, not necessarily the equal. A system that performs poorly in the test should perform poorly in reality; this is the hypothesis.*

Appendix 9
Our proposal is to determine together which circumstances should be specified. Maybe TUV can come with a proposal for which parameters should be specified(?), e.g. lightsource of D65 etc

Appendix 10
The model described in the current document for calculating system performance is over-simplified. We therefore propose to measure the resolution with a TOD test. Along with it certain definitions were omitted for the revised document.

It may be necessary to specify the TOD-test better, e.g. number of observers and visual functions (visual acuity).

Conclusion
The TOD-method (with observers) has various advantages over more subjective methods (objective, general, linked to existing theory about object recognition, validated). In the end it may be possible to develop an automatic method, but current models are not yet good enough.

Maarten Hogervorst & Harry Jongenelen
16 april 2009