

Consideration on Point Light Source and Grey Scale Rendering

Point Light Source

Loss of road environment perceptibility caused by strict requirements on PLSDF.

The slide shows some image examples resulting of camera adjustment to satisfy strict PLSDF requirement, which is presently proposed for adoption within UN Regulation 46 as a requirement for CMS.

The proposed PLSDF value only evaluate the system from one specific aspect, in which it gives priority to observe the point light source in interest as an absolutely separated two point light source.

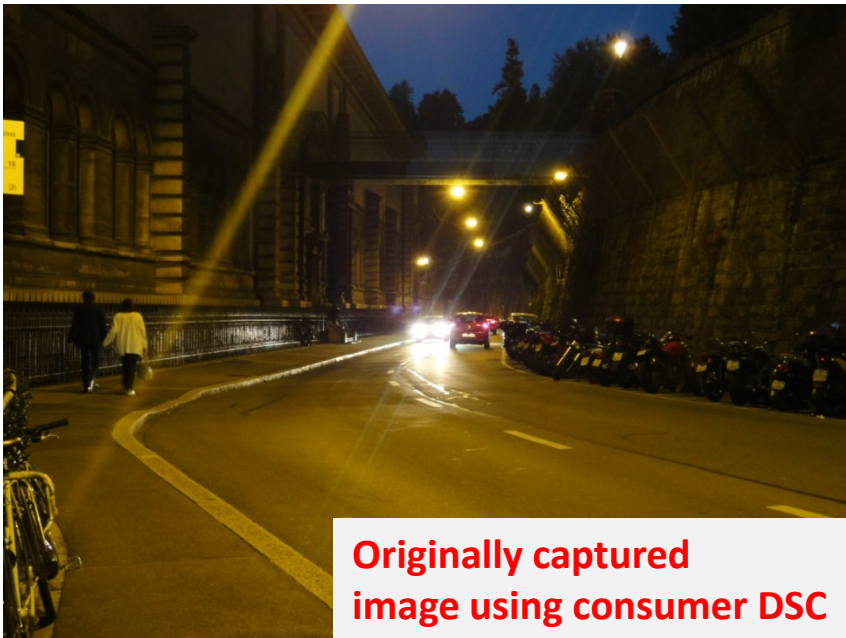
On the other hand, driver's perception and interpretation of the scene is achieved by the observation of details at the central vision and in parallel by a combination of perception of scene surrounding the object in interest, where the later has a large impact on the physiological process (perceiving – detection – **analyzing – judgment** – decision) and the loss of the later information has significant impact on decision making.

From a general safety perspective, a balanced adjustment of the CMS image is essential to fasten physiological process and not only emphasizing a specific aspect of the Point Light Source in the CMS.

If strict requirement is imposed on PLSDF value, the CMS will have to adjust the operation of the system to show images like in the example shown at upper left image. **The driver loses a large amount of safety relevant visual information which is essential in the scene interpretation and decision making, by doing so.** Example of an urban scenario in Tokyo.



Another example of urban scenario where pedestrian get lost if adjusted to meet PLSDF high requirement.



The importance of the rear view information provided by devices for indirect vision may differ by driving scenario. Giving emphasis only to Point Light Source reproduction may result in large loss of critical visual information depending on driving scenario, especially in urban area driving scenario or low to middle speed maneuver scenario.

It is therefore suggested that in case a “strict high requirement on Point Light Source” is an indispensable requirement at specific driving scenario, the adoption of the requirement is made such that the CMS is adjustable to have a manual or automatic operation mode where CMS satisfy the above strict high requirement on Point Light Source.

- Wording proposal to be adopted into Regulation 46:

CMS shall be adjustable whether manually or automatically, such that an operation mode is reserved to satisfy the PLSDF>[TBD], according to test method and condition as described in Annex 12, paragraph XX[to be created].

Justification:

Some driving scenario may require high reproducibility of the point light source from an overtaking vehicle passing beam light. Similar to the operation of dimming function available in some type of optical mirrors, an operation mode should be available to driver whether manually or automatically to improve visibility and perception of the point light source of the passing beam.

If PLSDF test is optionally applicable as requirement necessary to lane merge mode,

Test condition applicable for PLSDF measurement:

- The PLSDF distinguishability criteria $PLSDF \geq 2.5$,
- PLSDF measurement for class I and II devices shall be such that the two light passing beam head lamp separated is separated by **1.3m** and located at a distance of **150m[TO BE DETERMINED]** behind the installation onto the vehicle.
- Expected entire time of merging decision shall be less than the time a vehicle is at the acceleration/merge lane. Some of statistical data revised so far does not show any justification to require 7sec for elderly driver.

Grey Scale Rendering

Wording proposal:

The devices for indirect vision shall be capable to represent enough tonal steps to secure a smooth tonal image of the field of vision on the monitor. The CMS monitor shall be able to represent at least 12 distinguishable steps of a grey scale chart on the monitor display.

Justification:

The grey scale rendering is introduced as test to verify that enough tonal steps are secured for displaying the field of vision through the CMS.

It is a common practice to improve the perceptivity of the content of image by controlling the input and output response, adjusting the contrast of the image to the viewer, and thus fastening the physiological process of perception.

On the other hand, an excess of contrast enhancement resulting in loss of minimum tonal representation to the output image may deteriorate this physiological process of perception. It is therefore necessary to limit it to keep a minimum tonal step on the displayed image.

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