Submitted by the expert from Germany

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Agenda item 5.)

1st Progress Report of ISO/TC22/SC17/WG2 (ISO 16505)

"Camera monitoring systems", 2012-03-20

Scope

ISO 16505 gives minimum safety, ergonomic and performance requirements for Camera-Monitor-Systems replacing legacy mirror classes in road vehicles. It addresses Camera-Monitor Systems (CMS) that will be used in road vehicles to present the required outside information of a specific field of view in vehicle. These specifications are intended to be independent of different camera and display technologies unless otherwise stated explicitly. ADAS Systems (such as parking aid) are not part of this standard.

Structure of ISO/TC22/SC17/WG2

The main topics to be discussed are

1. Viewing conditions
2. Image quality and real-time behavior
3. Ergonomics
4. Functional Safety

These four topics are handled in separate taskforces.

Meetings

Until now, four face-to-face meetings of WG2 took place:

- 1st meeting, 2010-11-05, London, United Kingdom (Kick-off)
- 2nd meeting, 2011-02-08 to 2011-02-09, Paris, France
- 3rd meeting, 2011-05-18 to 2011-05-20, Troy, USA
- 4th meeting, 2011-11-10 to 2011-11-11, Stockholm, Sweden

In addition, several telephone conferences took place within the working groups and with the task force leaders. In parallel and in preparation, the task forces are working on the progress with regards to contents. The function of the WG2 meetings is to discuss, consolidate and approve the work done by the task forces.

Participants

In total, WG2 has 53 members from the following nationalities: Germany, France, USA, United Kingdom, Japan, The Netherlands, Sweden, and Italy.

Current status with regards to contents

General

WG2 has decided to proceed along a depth-first approach: All the items to be investigated by the taskforces are focused on field of view III (passenger cars) for a first step.

In a next step, the results for FOV III will be transferred to the other field of view classes. Regarding ECE R46, this will be FOV I, II, IV and VII.

Taskforce 1: Viewing conditions

Scope

The scope is to clarify requirements regarding the fields of view to be provided by camera monitor systems replacing legacy mirrors. This includes as well the width or the angle of the field of view as the required detection distance.

Finished tasks

Formulation of the following proposals:

The CMS field of view shall cover the FOV at least that is required by the national body for conventional mirrors.

The angular size α_{CMS} of a critical object within the drivers view angle provided by a CMS shall be at least as big as the angular size α_{Mirror} of the same critical object provided by the mirror to be replaced by the CMS.

This implicitly secures that the detection distance of the CMS is at least as large as the detection distance of the legacy mirror to be replaced.

α_{Mirror} hereby depends on

- The size of the critical object
- The distance between the critical object and the mirror
- The distance between the driver's eye points and the mirror
- The radius of curvature of the mirror

α_{CMS} depends on

- The size of the critical object
- The distance between the critical object and the camera
- The viewing angle of the camera
- The viewing angle of the monitor
- The size of the visible display of the monitor
- The distance between the driver's eye points and the monitor
- The angle between the monitor surface normal and the driver's line of sight

Open tasks

It has to be finally decided to adopt the proposals instead of using other approaches e.g. working with concrete definitions of critical objects

Compared to the usage of mirrors, the field of view of a camera monitor system cannot be enhanced by moving the driver's eye points. Therefore, it has to be clarified if there are use cases which cannot be safely handled only with the legacy mirror field of view without the

possibility to enhance it. If there are such use cases, an appropriate requirement taking this problem into account has to be formulated.

The results have to be adapted to all fields of view.

Taskforce 2: Image quality and real-time behavior

Scope

The scope is to describe all parameters worsening the ideal mapping of the real world scene via a camera-monitor-system and to define corresponding measure methods. Furthermore the real-time behavior of a camera-monitor-system has to be described and the corresponding measure methods have to be defined.

Finished tasks

The proposals to define and to measure the following parameters have been prepared: Signal to noise ratio, Lens flare (veiling flare, directed flares, aperture ghosts, ghost images), Aliasing (spatial aliasing, temporal aliasing), Contrast, Distortion, Response on high illuminating sources (blooming), Response under low-light condition, Geometric distortion, Colour rendering, chromatic aberrations, Jitter, Flicker, Depth of field, Haze, Sharpness, Dynamic range issues.

Open tasks

The current proposals for the definition of parameters have to be revised, finalized and adopted by the ISO members. The definition and measure methods for real time behavior has to be described. From the proposals how to define and measure worsening parameters, requirements have to be derived by defining specific thresholds for every parameter/test (together with taskforce 3). And finally the results have to be adapted to all fields of view.

Taskforce 3: Ergonomics

Scope

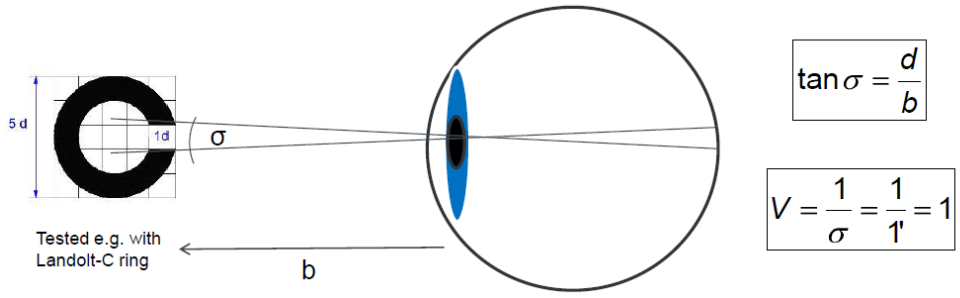
The scope is to clarify requirements regarding the readability (is it possible to see an object) and legibility (is it possible to distinguish objects of the same size and shape from each other) of the CMS mapping of the real world scene. This includes as well the formulation of requirements regarding the system resolution as the definition of thresholds with regard to the parameters worsening an ideal mapping (see Taskforce 2)

- user interaction
- user interface (display position, thresholds for brightness and contrast, …)
- system availability
- latency
- overlays
- frame rate
- depth and velocity perception

Finished tasks

Proposals have been prepared to the following aspects:

Readability and legibility: The visual actuity V_{CMS} of the CMS shall be at least as high as the visual actuity V_{driver} of the driver. This conclusion is the basis for deriving requirements for the CMS system resolution.



The proposals regarding user interaction (what interactions are mandatory, what interactions are forbidden), user interface, system availability, latency, overlays, frame rate and depth and velocity perception are under discussion, but not yet converged.

Open tasks

The proposals have to be completed and to be finally adopted. From the proposals how to define and measure worsening parameters, requirements have to be derived by defining specific thresholds for every parameter/test (together with taskforce 2) and the results have to be adapted to all fields of view.

Taskforce 4: Functional Safety

Scope

The scope is to discuss ISO 26262 and its application for CMS and give guidelines for the manufacturers of CMS.

Finished tasks

An example of a hazard analysis and risk assessment of a CMS according ISO 26262 was performed internally by a group of German OEMs

Open tasks

A proposal for guidelines regarding functional safety for field of view III has to be developed and adopted.

Edition of ISO 16505

Scope

The scope is to edit a final standard document fulfilling ISO regulations.

Finished tasks

The organizational structure to edit the standard has been finalized. A internal merged draft of ISO 16505 is completed.

Open tasks

The edition of committee draft (CD) has to be finalized. The edition of draft international standard (DIS) has to be finalized. And the edition of final ISO standard has to be finalized.

Roadmap

The next milestones will be:

Finishing the committee draft (CD)	5th meeting of WG2 (from 2012-05-09 to 2012-05-10, Berlin)
Finishing the draft international standard (DIS)	6th meeting of WG2 (November 2012, Japan)
Publish ISO 16505	End of 2013 (along an ideal procedure) A delay of half a year is possible, depending on the results of the DIS ballot