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TECHNICAL REPORT

3D displays -
Part 1-3: Generic - Human depth perception and the determination of the position of 3D object on the non-physical screen

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IEC TR 62629-1-3 has been prepared by IEC technical committee 110: Electronic displays. It is a Technical Report.

The text of this Technical Report is based on the following documents:

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Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 62629 series, published under the general title *3D displays*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,

– withdrawn, or

– revised.

1 Scope

This part of IEC 62629, which is Technical Report, is intended to gather technical information on human depth perception and the determination of 3D object positions on a non-physical screen.

Clause 4 and Clause 5 describe the human depth perception and its threshold. This information will be helpful in designing 3D displays of the non-physical screen type such as the possible depth difference of 3D objects. In the measurement of the display, understanding the response and limitation of the user is useful. Clause 4 and 5 provide such perception information in determining the distance of 3D object on the non-physical screen.

It is not the intention of this document to set the requirement of the measurement system in determining the position of 3D object on the non-physical screen.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62629-1-2, *3D display devices - Part 1-2: Generic - Terminology and letter symbols*

Bibliography

[1] IEC 60050-845:2020, *International Electrotechnical Vocabulary (IEV)* (available at www.electropedia.org), 845-22-006: Fovea

[2] ISO 9241-302:2008, *Ergonomics of human-system interaction Part 302: Terminology for electronic visual displays*

[3] S B Steinman, B A Steinman R P Garzia, Foundations of Binocular vision: A clinical perspective, Chapter 4 The Horopter, The McGraw-Hill Companies (2000)

[4] I P Howard, B J Rogers, Perceiving in Depth, Volume 2, Chapter 12 Binocular fusion and rivalry, Oxford university press (2012)

[5] R Patterson, Review Paper: Human factors of stereo display: An update, Journal of SID, vol.17, No.12, p987-996 (2009)

[6] D M Hoffman et al, Vergence-accommodation conflicts hinder visual performance and cause visual fatigue, Journal of Vision, 8(3): 33,1-30 (2008)

[7] IEC 62629-52-1:2024, *3D displays - Part 52-1: Fundamental measurement methods of aerial display - Optical*

[8] IEC 62629-62-11:2022, *3D display devices - Part 62-11: Measurement methods for virtual-image type - Optical*

[9] IEC 63145-20-20, *Eyewear display - Part 20-20: Fundamental measurement methods - Image quality*

[10] K Hong et al., "*Experimental evaluation of spatial resolution and depth of focus in digital holographic display*," Frontiers in Optics + Laser Science APS/DLS, OSA Technical Digest, paper JTu4A.100, 2019

[11] IEC 62629-22-1, *3D display devices - Part 22-1: Measuring methods for autostereoscopic displays - Optical*

[12] H Hong, A method to measure the uniformity of the virtual image distance in an augmented reality or virtual reality device, Journal of SID. Vol.30, p335-343 (2022)

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