TECHNICAL REPORT

ISO/IEC TR 23842-2

First edition

Information technology for learning, education, and training — Human factor guidelines for virtual reality content —

Part 2:
Considerations when making VR content

PROOF/ÉPREUVE

Reference number
ISO/IEC TR 23842-2:2020(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents) or the IEC list of patent declarations received (see http://patents.iec.ch).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 36, *Information technology for learning, education and training*.

A list of all parts in the ISO/IEC 23842 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

 PROOF/ÉPREUVE

Introduction

As industries related to virtual reality (VR) have grown, attempts have been made to bring these technologies into the learning, education and training (LET) domain. VR technology is expected to be introduced into the world of primary and secondary education in the next two to three years.[1] However, there are gaps in criteria between educational experts and content makers when it comes to developing VR content. For example, educational experts say that it is necessary for the learner to distinguish between the virtual world and reality. On the other hand, content makers try to enhance immersion by not distinguishing between the virtual world and reality. Requirements of devices, such as hardware specifications, currently cover only minimum levels for content making.

Many of the issues raised in this document are not limited to the LET domain and can be applied in any environment that uses VR contents.

Annex A provides an example of guidelines for users.

Information technology for learning, education, and training — Human factor guidelines for virtual reality content —

Part 2:
Considerations when making VR content

1 Scope

This document presents considerations for making VR content for the learning education and training (LET) domain.

This document addresses VR content that uses a head-mounted display (HMD) in the LET domain. It does not address VR content using immersive technology and does not address augmented reality, mixed or merged reality content.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
virtual reality
VR
virtual reality has a high level of immersiveness, fidelity of information representation, and degree of active learner participation compared to other forms of mixed reality

[SOURCE: ISO/IEC TR 18121:2015, 3.6]

3.2
mixed reality
display continuum in which both real and virtual images are combined in some way and in some proportion

Note 1 to entry: Augmented reality (AR) and virtual reality (VR) are considered to be on the mixed reality continuum.

3.3
immersive technology
tools that enable the integration of virtual content and the physical environment in a manner that supports user engagement with the resulting blended reality

Note 1 to entry: Some types of immersive activities and experiences include virtual reality, augmented reality, pervasive games, digital twins, telepresence and holography.

Note 2 to entry: Supportive technologies that are used for these activities and experiences may include a combination of different items such as speech recognition, haptics, cameras, 3D displays, headsets, audio, gesture recognition, omnidirectional treadmills, etc.

3.4
augmented reality
virtual objects superimposed upon or composited with the real world

Note 1 to entry: Virtual and real-world objects co-exist in augmented reality systems.

4 Abbreviated terms

HMD head mounted display

LET learning, education and training

UI user interface

5 Information for users on the home screen (initial screen)

Before using the content, it is recommended to specify the following characteristics so that users can check the information about the content to further ensure proper utilization.

— Recommended age.

— Checklist for health status, disabilities and personal preferences.

— Usage space such as seated-scale, standing-scale or room-scale.

— Device status such as battery-level, connection status.

— Curriculum related to content such as subject, grade level and competencies.

If possible, it is recommended to provide sample content for the purpose of checking the VR status of users. Considering the high level of immersion, it is highly recommended that warnings are shown in case of potentially frightening or shocking content.

6 Regular display alert messages

To prevent excessive immersiveness and over usage, it is recommended to display alert messages. To prevent health problems or to reduce confusion between the virtual world and real world, the following messages or a similar variation of them should be considered.

— Please take a break. It has been ___ minutes since you started.

— This is a virtual simulation for the purpose of education. Please do not recreate this situation in a real-world environment.

— This is a virtual simulation and this actual situation may be different in real life.

7 Design to eliminate recognition discrepancies

7.1 General

In VR content, improper design techniques used to enhance immersiveness may lead to VR sickness and discomfort. It is recommended to check the conditions in subclauses 7.2 through 7.4.

7.2 Depth

— Normal mapping in virtual reality should not be used excessively as it degrades the three-dimensional effect.

— Parallax mapping may increase the stereoscopic effect and cause visual confusion when using HMD.

— When an important object is placed too far away, eye fatigue accumulates rapidly.

— If similar (identical) objects appear, they must be set to the same size to increase the stereoscopic effect.

— Make sure that rendering results do not cause confusion in the user's sense of direction.

— It is recommended to check that the objects in the viewer’s position can disperse the view.

— Make sure that the size of a specific object is not distorted by the user.

7.3 User interface

— When use interfaces (UI) are located within 0.75 metres of the eyes, it can lead to users suffering from visual fatigue.

— It is recommended to maintain a set distance between the user and the UI, to avoid eye fatigue through general or regular usage.

— The UI on the outside scales the visual fatigue during prolonged exposure.

7.4 Distance within content

— Make sure the values for distance and size are set based on items in the real world

— In the display, the weighted object should be in a range of 0.75 metres to 3.5 metres, which is a user-friendly setting.

8 Design to improve user convenience and educational effects

It is recommended to unify button functionality within the content. It is also recommended to use the same criteria in brightness, colour and size of materials within the content. If these criteria are not unified, it may degrade the quality of the content.

9 Provide a management system for teachers

Since HMDs are personalized devices, it is difficult for teachers to monitor or support each learner's present situation such as connection status, gaze (content view), learning progress, etc. in real time. To support efficient teaching, it is recommended to provide teachers with a management system that can check the learning progress and effectively oversee students. For example, Google™ [1)] Expeditions has content for teachers that contains a view to access points, the learner’s content observations, learning aids and more. ClassVR™ [1)] also supports teacher–headset control management by launching content simultaneously, with a real-time headset view and activity lock for focus.

1) Google™ and ClassVR™ are examples of suitable products available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO or IEC of these products.