IEC TR 63344

Edition 1.0 2021-11

TECHNICAL REPORT

colour inside

Conceptual model of standardization for haptic multimedia systems

IEC TR 63344:2021-11(en)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.160.60

ISBN 978-2-8322-1047-1

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

CONCEPTUAL MODEL OF STANDARDIZATION FOR HAPTIC MULTIMEDIA SYSTEMS

FOREWORD

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

Draft	Report on voting
100/3573/DTR	100/3630/RVDTR

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/standardsdev/publications.

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- withdrawn,
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INTRODUCTION

The multimedia devices covered by TC 100 used to be primarily stationary audio and video devices, but now comprise mobile and wearable devices, for which it is necessary to consider different specifications from conventional stationary devices. At first, this Technical Report clarifies the conceptual model of haptics issues under the scope of TC 100, and then the details are described to understand the standardization items of haptics-related issues under the scope of TC 100.

MULTIMEDIA SYSTEMS – HAPTICS – CONCEPTUAL MODEL OF STANDARDIZATION

1 Scope

This document describes the conceptual model of vibro-tactile-based haptics in multimedia systems and equipment used in electrical appliances, computer interfaces, automobiles, amusements, and communication devices. This model describes possible standardization items.

NOTE Ergonomic aspects of haptics systems are standardised in the ISO 9241 series. The scope of that standard is focused on the physical specifications of the devices, signal properties and formats to ensure the common use with compatibility among various types of devices in haptics systems.

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:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
haptic sensation
sensation, including tactile sensation and kinesthetic sensation perceived by bathyesthesia

3.2
tactile sensation
sensation detected by skin receptors

3.3
haptic display
device to produce touch sensation

3.4
tactile display
device that stimulates the skin receptors

3.5
haptic reproduction
creating realistic haptic sensation in VR and tele-manipulation, targeting a real sensation

3.6
haptic notification
notifying a user of necessary information by haptic stimulation

3.7
haptic guidance
guiding a user or the parts of the body to a desirable state regarding the position, direction, velocity or posture, sometimes synchronized with a specific task

Note 1 to entry: In the broader meaning, it includes guiding the user's other physical/mental conditions to desired states.

3.8
reality class
class of reality supposed in the displayed reality

3.9
haptic broadcasting
sending of haptic signals to multiple users to share the haptic experiences of a specific person

3.10
vibrotactile
mechanical vibration to produce haptic experiences

3.11
phantom sensation
illusional perception that a user feels a point stimulation at an intermediate point between a couple of stimulators placed with a certain distance

3.12
apparent motion
illusional perception that a user feels a continuous motion between a couple of stimulators placed with a certain distance when the stimulators are driven sequentially

3.13
surface haptics
technique to create haptic sensation on a flat panel by vibrations and friction control using electrostatic forces or ultrasonic vibrations

3.14
tactile electrostimulation
stimulating a skin via electrical current in the skin

3.15
mid-air haptic stimulation
stimulating a skin in a non-contact manner using airborne ultrasound or air stream

3.16
surface displacement
skin-surface displacement produced by a tactile display

Note 1 to entry: The direction of the displacement is described with the terms, vertical and lateral.

3.17
surface stress
skin-surface stress, applied force per unit area, produced by a tactile display

3.18
thermal tactile display
tactile display to control a skin surface temperature

3.19
haptic feel transfer
transferring the haptic feel of a real object

3.20
haptic communication
multimedia communication including touch sensation

4 Overview of haptics in multimedia systems

4.1 Purpose

The purpose of the standardization is to define the performance, ensure the compatibility among the different types of hardware and facilitate the development and technical spread.

4.2 Device categories

The device categories of haptics systems are summarized in Figure 1. A vibrotactile device is an apparatus to send vibration to a part of a human skin via specified device such as a game controller, wristband, joystick, or other grip-type/wearable devices, which creates haptic experiences synchronized with visual and audio information. Surface haptic devices produce various haptic sensations on a flat panel via vibration and friction control using electrostatic forces and ultrasonic vibrations. A stylus device reproduces the texture via the vibration of a pen-like device. A wear-type device creates vibrations at multiple points on a body. Tactile electrostimulation, electric current in the skin, can also create haptic with no moving parts, and airborne ultrasound or air stream can produce haptic sensations without contact, which is called mid-air haptic stimulation. The typical applications are illustrated in Figure 2.

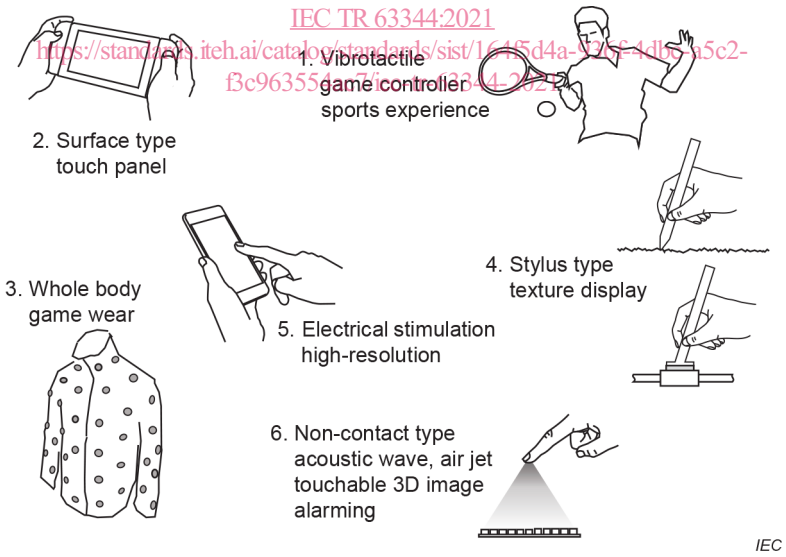
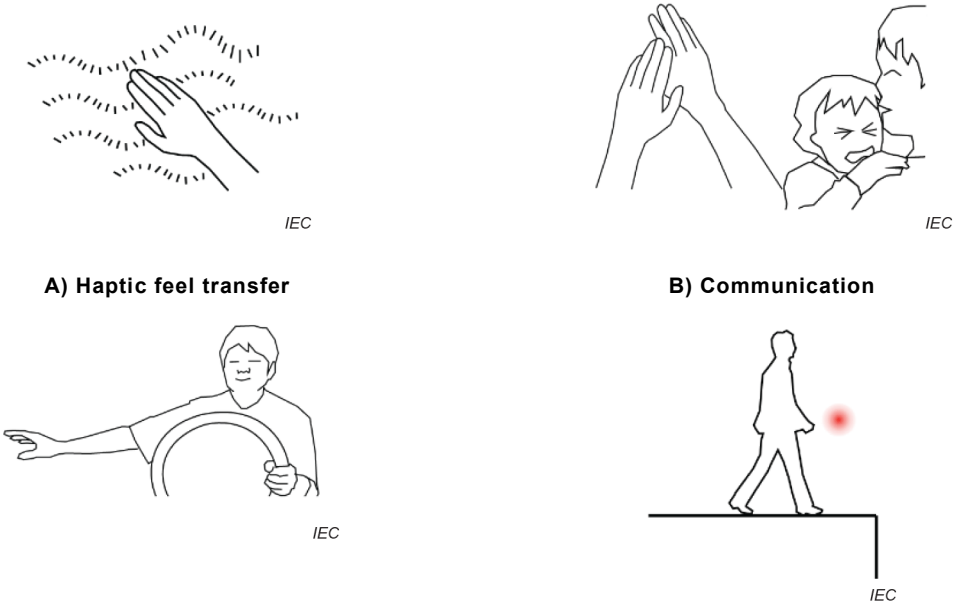


Figure 1 – Device categories



A) Haptic feel transfer

B) Communication

C) Car driver support

D) Alarm, safety

Figure 2 – Applications

Table 1 – Items of haptics standardization

Purpose	➢ Reproduction ➢ Notification ➢ Guidance	
Reality class	➢ Class 1: Physically faithful ➢ Class 2: Indistinguishable ➢ Class 3: Different but useful ---- Subclasses	
Interaction modality	➢ Cutaneous ➢ Proprioception/Kinesthetic ➢ Audio/Visual	
Data format and network	➢ Device category ➢ Number of stimulation point ➢ Body part	➢ Framerate ➢ Data length ➢ Data
	➢ One way, Bidirectional	➢ Bandwidth, delay
Device property	➢ Category definition ➢ Use of universal parameter	➢ Diversity of sensitivity and safety ➢ Calibration method

4.3 Items of standardization

This document deals with mechanical and thermal stimulations to users' bodies, which contains multiple layers of potential standardization summarized in Table 1. This document clarifies the items that should be standardized for:

a) purposes of haptic feedback;

b) class of performance represented by reality;

c) interaction modality;

d) data format and network topology;