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Ergonomics of human-system interaction —

Part 920: Tactile and haptic interactions

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Partie 920: Interactions tactiles et haptiques

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Contents

Page

Foreword

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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 ISO documents 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).

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This document was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 4, *Ergonomics of human-system interaction*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 122, *Ergonomics*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 9241-920:2009), which has been technically revised.

The main change is as follows:

— The document has been updated to reflect newer research in tactile/haptic interactions.

A list of all parts in the ISO 9241 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.

Introduction

Tactile and haptic interactions have become increasingly important interaction modalities. Mobile interaction relies on gesture-based touch interaction and tactile/haptic control devices and can utilize vibration-based displays as one of several ways to provide information or experiences to the user. Touch, vibration and tactile/haptic interactions are also found in special-purpose computing environments (e.g. simulation, remote control or surgery) and in assistive technologies.

While considerable research exists, a lack of ergonomic standards in this area can possibly result in systems being developed without sufficient concern for either ergonomics or interoperability, leading to serious difficulties related to ergonomics for users of multiple incompatible or conflicting tactile/haptic devices or applications.

This document provides ergonomics requirements and recommendations for tactile and haptic hardware and software interactions, including guidance related to the design and evaluation of hardware, software and combinations of hardware and software interactions. The guidelines are not technology-dependent and will also be applicable to future technologies.

ISO 9241-910 provides a common set of terms, definitions and descriptions of the various concepts central to designing and using tactile/haptic interactions. It also provides an overview of the range of tactile/haptic applications, objects, attributes and interactions.

ISO 9241-940 provides ways of evaluating tactile/haptic interactions for their usability, the validation of requirements and the verification that systems meet the requirements.

ISO 9241-960 focuses on gestures as a specific type of tactile/haptic interaction and describes their features and usability requirements. Information on gesture-based interfaces can be found in the ISO/IEC 30113 series. Information on contactless gestures can be found in ISO TS 9241-430.

For guidance and recommendations on the accessibility of tactile/haptic interactions, including information on the use of braille, see ISO 9241-971. It does not provide recommendations specific to braille but can apply to interactions that make use of braille.

Ergonomics of human-system interaction —

Part 920: Tactile and haptic interactions

1 Scope

This document specifies requirements and recommendations for tactile/haptic hardware and software interactions. It provides guidance on the design and selection of hardware, software and combinations of hardware and software interactions, including:

— the design or use of tactile/haptic inputs, outputs and/or combinations of inputs and outputs, with general guidance on their design or use as well as on designing or using combinations of tactile and haptic interactions for use in combination with other modalities or as the exclusive mode of interaction;

— the tactile/haptic encoding of information, including textual data, graphical data and controls;

— the design of tactile/haptic objects;

— the layout of tactile/haptic space;

— interaction techniques.

The recommendations given in this document are applicable to a variety of tactile/haptic devices, representing the real world or virtual or mixed realities (e.g. exoskeletons, wearables, force feedback devices, touchables, tangibles) and stimulation types (e.g. acoustic radiation pressure, electrical muscle stimulation) and they can also be found in virtual and augmented environments.

This document provides general information about how various forms of tactile/haptic interaction can be applied to various user tasks.

This document does not include guidance on the role of walking in virtual or mixed realities for tactile/haptic interaction.

NOTE It is recognized that some interactive scenarios can be constrained by the limitation that a real workspace is to be modelled in a virtual environment. Objects can be in suboptimal positions or conditions for tactile/haptic interaction by virtue of the situation being modelled.

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 terminology databases for use in standardization at the following addresses:

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

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