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Ergonomics of human-system interaction —

Part 430: Recommendations for the design of non-touch gestural input for the reduction of biomechanical stress

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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

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO 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).

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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 Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 4, *Ergonomics of human-system interaction*.

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.

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Introduction

Non-contacting hand and arm gestures (e.g. mid-air gestures) for interacting with computing devices are emerging as a useful form of input for both consumer and commercial applications.

Non-contacting gestures can be particularly well-suited for certain tasks, equipment and environments, such as with wearable technology (e.g. head-mounted displays, instrumented gloves), in dirty or sterile settings (e.g. kitchens or operating rooms) or for tasks where both hands are also used for other activities (e.g. sorting packages).

This document provides guidance on the design and selection of non-contacting hand and arm gestures and recommends methods for the usability and ergonomic evaluation of gestures in order to prevent fatigue and discomfort during prolonged gesturing.

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

ISO 9241-920 provides basic guidance (including references to related standards) in the design of tactile or haptic interactions.

ISO 9241-940 provides ways of evaluating tactile or haptic interaction for various aspects of interaction quality, such as haptic device attributes, logical space design and usability.

ISO 9241-960 provides guidance on gestures for tactile or haptic interaction. It explains how to describe their features and what factors to consider when defining gestures.

There are many factors to consider in the selection of non-contacting hand and arm gesture sets for human-computer interaction, including task, workstation, environment, natural language, recall, common existing contacting hand gesture sets, technology limitations on gesture recognition, usability, preference, arm and shoulder fatigue and other ergonomic factors. This document provides guidance primarily on usability, preference, arm and shoulder fatigue and biomechanical or kinesiology factors. This document recommends methods to assess these factors based on the reliability and validity of the methods.

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1 Scope

This document provides guidance on the design, selection and optimization of non-contacting hand and arm gestures for human-computer interaction. It addresses the assessment of usability and fatigue associated with different gesture set designs and provides recommendations for approaches to evaluating the design and selection of gestures. This document also provides guidance on the documentation of the process for selecting gesture sets.

This document applies to gestures expressed by humans. It does not consider the technology for detecting gestures or the system response when interpreting a gesture. Non-contacting hand gestures can be used for input in a variety of settings, including the workplace or in public settings and when using fixed screens, mobile, virtual reality, augmented reality or mixed-mode reality devices.

Some limitations of this document are:

— The scope is limited to non-contacting gestures and does not include other forms of inputs. For example, combining gesture with speech, gaze or head position can reduce input error, but these combinations are not considered here.

— The scope is limited to non-contacting arm, hand and finger gestures, either unilateral (one-handed) or bilateral (two-handed).

— The scope assumes that all technological constraints are surmountable. Therefore, there is no consideration of technological limitations with interpreting ultra-rapid gestures, gestures performed by people of different skin tones or wearing different colours or patterns of clothing.

— The scope is limited to UI-based command-and-control human computer interaction (HCI) tasks and does not include gaming scenarios, although the traversal of in-game menus and navigation of UI elements is within scope.

— The scope does not include HCI tasks for which an obviously more optimal input method exists. For example, speech input is superior for inputting text than gesture input.

— The scope includes virtual reality (VR), augmented reality (AR) and mixed reality (MR) and the use of head-mounted displays (HMDs).

— The scope does not include the discoverability of gestures but does include the learnability and memorability of gestures. It is assumed that product documentation and tutorials will adequately educate end users about which gestures are possible. Therefore, assessing gesture discoverability is not a primary goal of the recommendations in this document.

2 Normative references

There are no normative references in this document.

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