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Software ergonomics for multimedia user interfaces —

Part 1: Design principles and framework

Ergonomie des logiciels pour les interfaces utilisateur multimédias — Partie 1: Principes et cadre de conception

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 14915 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 14915-1 was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 4, *Ergonomics of human-system interaction*.

ISO 14915 consists of the following parts, under the general title *Software ergonomics for multimedia user interfaces*:

— *Part 1: Design principles and framework*

— *Part 2: Multimedia navigation and control*

— *Part 3: Media selection and combination*

Introduction

The design of user interfaces for multimedia applications typically involves a much wider range of design and evaluation issues than that of conventional user interfaces based only in textual and graphical format. Many different techniques and design options are available. Multimedia user interfaces incorporate, integrate and synchronize different media (static media such as text, graphics, images, and dynamic media such as audio, animation, video or other sensory modalities). Within each medium, further distinctions can be made. Graphics, for instance, can be presented either in two- or three-dimensional representation and audio can be further categorized according to the level of sound quality or with respect to mono, stereo or surround sound.

Ergonomic design enhances the ability of users to operate multimedia applications effectively, efficiently and with satisfaction (see ISO 9241-11). This can be achieved by careful design of multimedia applications with respect to user characteristics, the different tasks they are intended to fulfil (e.g. for work, education or performance support) and the environment in which the system will be used. An ergonomic design of multimedia user interfaces can also improve the safety of operating a system (e.g. delivering an alarm both in visual and auditory media).

The range of media available and the interaction of different media have a variety of perceptual, cognitive and other ergonomic implications for the users. Specific characteristics of multimedia are the potentially high perceptual load, the structural and semantic complexity, or the large volume of information to be conveyed through the system. Multimedia applications are often used for communicative purposes. Manipulation of data or information presented in multimedia applications is also often part of the user's activity.

ISO 14915 provides requirements and recommendations on the ergonomic design of multimedia software-user interfaces. ISO 14915 is not intended to provide detailed guidance for the design using only a single medium. It does not, therefore, describe how to design an effective graphical animation or how to cut a particular video sequence. This part of ISO 14915 addresses design issues related to the user interface of multimedia applications, such as the conceptual structure of the interface, the selection and integration of media, user navigation or the controls used for interacting with the different media. The range of applications addressed includes stand-alone and network-delivered applications of various sizes and degrees of complexity (e.g. from a single web page to a complex catalogue or an interactive simulation).

ISO 14915 consists of the following parts.

a) Part 1: Design principles and framework

Part 1 establishes design principles for multimedia user interfaces and provides a framework for multimedia design. The principles are introduced in order to provide the basis for detailed multimedia-specific recommendations described in the other parts of ISO 14915. General recommendations on the process of designing multimedia user interfaces are given.

b) Part 2: Multimedia navigation and control

Part 2 provides recommendations for media control and navigation in multimedia applications. Media control is mainly concerned with functions for controlling dynamic media such as audio or video. Navigation refers to the conceptual structure of the multimedia application and the user's interactions needed in order to move in that structure. It also includes recommendations for searching multimedia material.

c) Part 3: Media selection and combination

Part 3 provides recommendations for the selection of media with respect to the communication goal or the task, as well as with respect to the information's characteristics. It also provides guidance for combining different media. In addition, it includes recommendations for integrating multimedia components in viewing and reading sequences.

Software ergonomics for multimedia user interfaces —

Part 1: Design principles and framework

1 Scope

This part of ISO 14915 establishes design principles for multimedia user interfaces and provides a framework for handling the different considerations involved in their design. It addresses user interfaces for applications that incorporate, integrate and synchronize different media. This includes static media such as text, graphics, or images, and dynamic media such as audio, animation, video or media related to other sensory modalities. Detailed design issues within a single medium (e.g. the graphical design of an animation sequence) are only addressed as far as they imply ergonomic consequences for the user.

This part of ISO 14915 gives requirements and recommendations for the ergonomic design of multimedia applications mainly intended for professional and vocational activities such as work or learning. It does not specifically address applications outside this area such as entertainment, although some recommendations can also be applicable in such domains.

This part of ISO 14915 is applicable to software aspects related to multimedia user interfaces and does not address hardware or implementation issues. The ergonomic requirements and recommendations described in this part of ISO 14915 can be realized through very different techniques, e.g. the delivery system, a scripting language, or the application.

The focus of this part of ISO 14915 is on multimedia presentation issues. Multimodal input which uses different media such as speech in combination with pointing for entering information is not considered in the recommendations provided.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 14915. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 14915 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 9241-10:1996, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 10: Dialogue principles*

ISO 9241-11:1998, *Ergonomic requirements for office work with visual display terminals (VDTs) — Part 11: Guidance on usability*

ISO 13407:1999, *Human-centred design processes for interactive systems*

ISO 14915-2:—[1)], *Software ergonomics for multimedia user interfaces — Part 2: Multimedia navigation and control*

ISO 14915-3:—[2)], *Software ergonomics for multimedia user interfaces — Part 3: Media selection and combination*

1) To be published.

2) To be published.

3 Terms and definitions

For the purposes of this part of ISO 14915, the following terms and definitions apply. For additional definitions, see the other parts of ISO 14915. A precise definition of media types is provided in ISO 14915-3.

3.1
content
information to be communicated by means of a multimedia application from the originator to the user according to certain communication goals

3.2
dynamic media
media in which the presentation to the user changes according to time

EXAMPLE These include video, music, animation.

3.3
medium, sing.
media, pl.
different specific forms of presenting information to the human user

EXAMPLE These include text, video, graphics, animation, audio.

3.4
metaphor
concepts already familiar to the user employed by the application to aid the user's understanding and prediction of the application's behaviour

3.5
multimedia
combinations of static and/or dynamic media which can be interactively controlled and simultaneously presented in an application

EXAMPLE These include combinations of text and video, or audio and animation.

3.6
navigation
user's movement in and between media objects or presentation segments (see ISO 14915-2) in order to find an object, a particular topic, or a specific piece of information

3.7
static media
media in which the presentation to the user does not change over time

EXAMPLE These include text and pictures.

4 Application of ISO 14915

4.1 Intended user groups

The following groups are the intended users of ISO 14915:

— user interface and multimedia designers who will apply ISO 14915 during the development process;

— evaluators responsible for quality assurance who will ensure that products meet the recommendations of ISO 14915;

— potential buyers, in selecting appropriately designed multimedia products;

— designers of multimedia development tools to be used by user interface and multimedia developers.

4.2 Applying the recommendations

The design principles provided in ISO 14915 are multimedia-specific extensions of the principles described in ISO 9241-10. Multimedia user interfaces should be designed according to both the principles of ISO 9241-10 and the principles described in ISO 14915. For certain contexts (e.g. certain tasks or user groups), the designer may be forced to follow one principle at the expense of another in order to achieve the optimal design.

4.3 Reporting conformance to parts of ISO 14915

If a claim of product or application conformity with this part of ISO 14915 is made, the procedure used in establishing requirements for developing and/or evaluating the multimedia user interface shall be specified. The level of specification of the procedure is a matter of negotiation between the involved parties. ISO 14915 is a multi-part standard and therefore, claims of conformity are related to the individual parts and not to the International Standard as a whole.

5 Design goals and principles

5.1 Design goals

Ergonomic design enhances the ability of users to operate multimedia applications effectively, efficiently and with satisfaction (ISO 9241-11 gives further information on usability). Multimedia information should not be confusing, tiring or frustrating to use.

This can be achieved by careful design of the multimedia applications with respect to the different tasks (e.g. for work, education, and performance support) and the environment in which the system will be used.

The design of multimedia user interfaces should take into account the elements of human information processing, based successively on

— human sensory physiology,

— human perception and motivation,

— human cognition, and

— human communication.

Additional human information-processing concepts relevant to multimedia control and use are exploration and engagement.

5.2 Multimedia design principles

5.2.1 General

Multimedia applications should be designed according to the general principles for ergonomic dialogue design described in ISO 9241-10. Subclause 5.2.2 gives multimedia-specific examples for the principles described in ISO 9241-10. In addition, 5.2.3 introduces further principles which are relevant to multimedia applications.

The design of multimedia applications often raises specific design issues relating to their purpose and specific characteristics. Multimedia applications can be developed for communicative purposes, e.g. for conveying information to the user, supporting task performance or for education and training. In addition, there can be a wide range of user requirements such as preferences for different media or different perceptual styles.

Specific characteristics of multimedia are the potentially high perceptual load, the structural and semantic complexity, or the large volume of information to be conveyed through the system. Manipulation of data or information presented in multimedia applications can also be part of the user's activity.

5.2.2 Dialogue principles

For the design and evaluation of multimedia interfaces, the general ergonomic principles described in ISO 9241-10 should be applied. These seven principles are important for the design and evaluation of interactive applications. The principles are as follows:

a) Suitability for the task

EXAMPLE For learning musical instruments, the application shows the hand movements in a video or animation, plays the music and presents the current notes.

b) Self-descriptiveness

EXAMPLE When moving the cursor over a hot spot on a web page, a pop-up is shown that contains a description of the hot spot (e.g. where the link leads to).

c) Controllability

EXAMPLE Audio output can be switched on and off by the user.

d) Conformity with user expectations

EXAMPLE 1 Control elements for playing and stopping a medium work the same way in all videos and animations in a multimedia application.

EXAMPLE 2 Control elements are placed consistently on the screen.

EXAMPLE 3 Control elements operate consistently across different media.

e) Error tolerance

EXAMPLE If a video has been unintentionally stopped by the user, it can be restarted at the current position so that the user does not have to return to the beginning.

f) Suitability for individualization

EXAMPLE Users may set preferences (e.g. preferred output medium, settings for audio parameters) or use bookmarks and annotations.

g) Suitability for learning

EXAMPLE 1 A visual representation of a navigation structure in a multimedia application is provided.

EXAMPLE 2 Media combinations are used to represent a subject matter from different viewpoints.

5.2.3 Multimedia specific design principles

In addition to the general principles of ISO 9241-10, this part of ISO 14915 describes specific design principles for the design of multimedia user interfaces:

— suitability for the communication goal;

— suitability for perception and understanding;

— suitability for exploration;

— suitability for engagement.

These principles specifically focus on multimedia applications but they may also apply to the design of user interfaces in general. As with most design criteria, the actual design can require trade-offs between the different principles, associating different priority or significance with each of them. These trade-offs require deliberate decisions in the design process and appropriate justifications.

In 5.2.4 to 5.2.7, these additional multimedia specific principles are introduced and described. Design recommendations related to these principles are presented. The set of recommendations given for each principle here is not necessarily complete. There might be other recommendations conforming with these principles.

5.2.4 Suitability for the communication goal

A primary purpose of multimedia applications is to convey information from an information provider to a recipient. A multimedia application is suitable for the communication goal if it is designed to match

— the goals of the provider(s) of the information to be conveyed, and at the same time;

— the goal or task of the users or recipients of this information.

In order to achieve this, the provider or designer of the information should define the intended goal of the communication and design the multimedia application accordingly. The application should also be designed with respect to the goals of the recipient, their tasks and information needs.

Overall intended goals on the part of the provider could be to teach, inform or entertain users. Specific goals could be to summarize, explain, present, convince, justify, impress or motivate in a multimedia communication. Users' needs could include learning requirements, information needed for performing tasks, or engaging design features.

EXAMPLE 1 Summarization can be enhanced by using designed images (diagrams).

EXAMPLE 2 Convincing or justifying arguments are shown using redundant or salient media in order to emphasize key items in a message.

5.2.5 Suitability for perception and understanding

5.2.5.1 General

A multimedia application is suitable for perception and understanding if it is designed such that the information to be conveyed can be easily perceived and understood. This is particularly important for multimedia applications as the presentation can be complex and volatile, and several media can be presented simultaneously. To facilitate the intended perception, the following characteristics described in ISO 9241-12 should be observed for each of the media involved

a) Detectability

EXAMPLE A sufficient contrast between the background of a screen and a set of navigation buttons is used so that the user can easily detect them.

b) Discriminability

EXAMPLE In a description of a still image, voice is used over a music background. The voice is loud and clear enough to be discriminated from other sounds.

c) Clarity

EXAMPLE In a graphical animation of an engine, the different parts are shown in different colours in order to facilitate the user's perception of the parts relevant for the current task.

d) Legibility

EXAMPLE An animated text banner moves at a speed which enables the user to read the text easily.

e) Consistency

EXAMPLE The controls for playing or stopping a presentation are designed in the same manner for different media such as audio, video or a graphical animation.