ISO's Work on Guidance for Haptic and Tactile Interactions

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Abstract. Tactile and haptic interaction is becoming increasingly important and is no longer restricted to assistive technologies and special purpose computing environments. The technology has gone through numerous breakthroughs and replications and is now entering a period of developing empiricism, the phase in which the first benefits of this new development are becoming available. While considerable research exists, the current lack of ergonomic standards results in systems without sufficient concerns for either ergonomics or interoperability, leading to difficulties for users of multiple, incompatible or conflicting applications. ISO (through working group TC159/SC4/WG9) is working toward international standards, which are being dual-tracked as both ISO and CEN standards. This paper gives an update on the status of the Draft International Standard on tactile/haptic interactions and the recently initiated work on a framework for tactile/haptic interactions.

Keywords: guidelines, haptics, human computer interaction, standards, tactile.

1 Introduction

Ergonomic standards go beyond providing consistency and interoperability. They help enhance usability in a number of ways including: improving effectiveness and avoiding errors, improving performance, and enhancing the comfort and well-being of users. Ergonomic standards provide a basis for analysis, design, evaluation, procurement, and even for arbitrating issues of international trade.

Work on tactile and haptic interactions started as part of ISO's work on accessibility when expanding ISO TS 16071 into the international standard ISO 9241-171. However, it was recognised that tactile and haptic interactions were not limited to accessibility issues and it was decided to initiate work on a new standard. The working group taking up this work (WG9, see Figure 1) started by the end of 2005. We gave our first progress report during EuroHaptics 2006 [1]. WG9 is continuously looking for potential ergonomic contributions and for ergonomic experts to help in its work. At this moment, WG9 has planned the following work items:

- ISO 9241-900 Introduction to tactile and haptic interactions will be a technical report providing an overview of the 900 series. It will be regularly updated to

M. Ferre (Ed.): EuroHaptics 2008, LNCS 5024, pp. 936–940, 2008.

include references to the various parts of the 900 series and to other standards containing guidance relevant to tactile and haptic interactions.

- ISO 9241-910 Framework for tactile / haptic interactions will provide a detailed explanation of the model used to initiate work in ISO 9241-920 and the definitions used for the 900 series. This model will identify the various dimensions and properties of tactile/haptic interactions. ISO 9241-910 will also describe how this model can be used to analyze, design, and evaluate interfaces that make use of tactile/haptic interactions.
- ISO 9241-920 Ergonomics of human-system interaction - Guidance on tactile and haptic interactions, see section 2 for a progress update.
- ISO 9241-930 Haptic / tactile interactions in multimodal environments will provide guidance specific to immersive and other multimodal environments.
- ISO 9241-940 Evaluation of tactile / haptic interactions will provide guidance on evaluation methods suited for evaluating tactile and haptic interactions. This part will require mechanisms for evaluating the overall effects of the multidimensional nature of tactile and haptic interactions that are identified in ISO 9241-920.
- ISO 9241-971 Tactile / haptic interfaces to publicly available devices will provide guidance relating to specific accessibility concerns of using tactile / haptic interaction in public environments and systems, and especially those systems where assistive technologies cannot be connected by users.

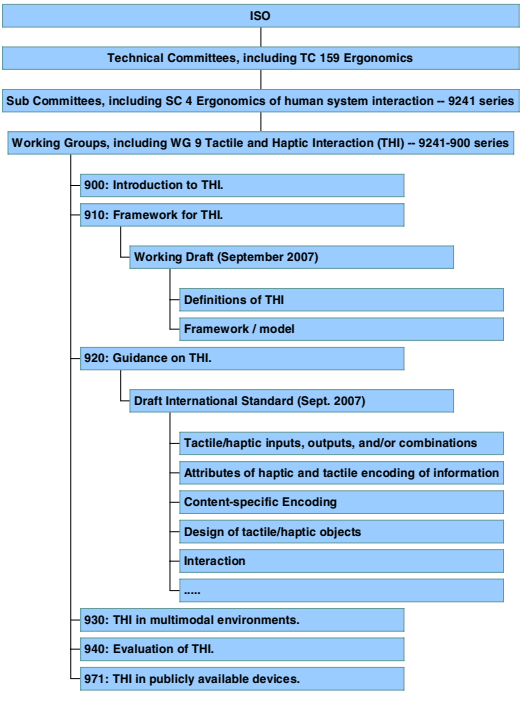

Fig. 1. The position of Working Group 9 (WG9) in ISO's organizational structure, and the documents planned as output of WG9

At this moment, WG9 is working on two work items: 920 on Ergonomics of human-system interaction - Guidance on tactile and haptic interactions, and 910 on the Framework for Tactile and Haptic Interaction. The 920 work item has gone out for ballot as a Draft International Standard by the end of 2007. We present an update on this work item in Section 2. The work on 910 has started in 2007, and we present our preliminary progress on this work item in Section 3. As of 2008, the following countries are actively participating in WG9: Canada, United Kingdom, The Netherlands, Sweden, Germany, South Korea, and Japan.

2 Status on ISO's Work on Guidelines

ISO 9241-920 has been send to ballot as a Draft International Standard (DIS) by September 2007 and is planned to go out as a Final Draft International Standard in 2008. ISO 9241-920 includes the same two step compliance procedure as many other parts of the 9241 series. Developers are first to identify the guidelines which apply to their particular situation. This procedure does not allow developers to use this as a means of ignoring guidelines that are inconvenient. Rather it allows for the documentation of why selected guidelines really do not apply. Guidelines that are recognized as applying then become part of the requirements that need to be satisfied. The second part is to evaluate whether guidelines that apply have been satisfied.

The current DIS contains more than 100 (sub-) clauses, providing guidance in the following areas:

- Tactile/haptic inputs, outputs, and/or combinations; including guidance on performance, fatigue, multimodal feedback, individualisation, sensory adaptation, and sensory illusions.
- Attributes of haptic and tactile encoding of information; including guidance on tactile/haptic patterns, sensory substitution, selecting attributes for encoding information, and combining attributes.
- Content-specific Encoding; including guidance on encoding text data, displaying graphical data, and tactile/haptic controls.
- Design of tactile/haptic objects and space; including guidance on perceiving and identifying tactile/haptic objects, and creating discriminable tactile/haptic symbols
- Interaction; including guidance on path planning, identification of landmarks, and interaction techniques.

3 New Work Item on Definitions and Framework

ISO 9241-910 has the status of a working draft with a timeline focussing on a distribution of the committee draft (CD) in July 2008. Its purpose is to provide a framework for specifying, designing, and evaluating tactile/haptic interactions. ISO 9241-910 is divided into three major sections:

The first section will provide the necessary linguistic toolkit in terminology and definitions with tactile/haptic relevance to understand the contents of all documents relating to the ISO 9241-9xx series. It will refer to other definitions relating to tactile/haptic interactions defined in documents of the normative ISO technical committee

(TC) 159/SC4 "Ergonomics of human-system interaction", especially those made in the hardware section of ISO 9241-4xx series "Physical input devices".

The second section will give the actual introduction to the framework of the 9241-9xx series focussing on the usage of the documents and introduction the specific structure of the 910 document.

Within the most comprehensive third section of this part of the standard, typical questions arising from dealing with tactile/haptic interactions will be addressed. This section will be written to give a taste of all topics covered in the ISO 9241-9xx series with appropriate references to the more detailed subdocuments. The topics addressed consider tactile/haptic interactions from various viewpoints:

- Temporal considerations deal with when to make use of tactile/haptic interactions in general.
- Types of interactions and what it means for an object to be "haptic" are defined.
- Interaction tasks and different interaction strategies and techniques are discussed.
- A set of examples for tactile/haptic devices gives an impression of the variety of technical approaches to the topic.
- The mechanical coupling of human-machine systems with haptic feedback is mentioned.
- An overview of tactile/haptic information transfer is addressed with an extra section on symbols and the established haptic effects.
- The document closes with a summary of the grained information of all parts to possibilities of user guidance by the aid of tactile/haptic information.

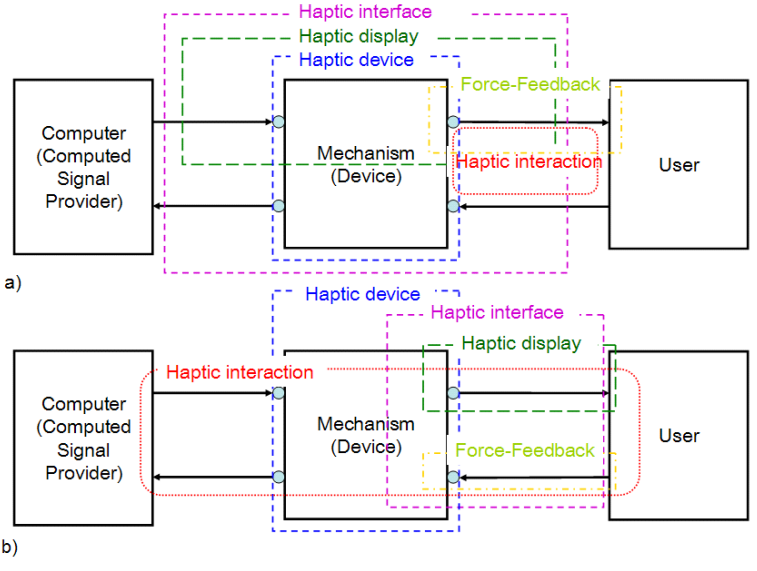

Fig. 2. Two competing illustrative interpretations taken from the draft of ISO 9241-910 of existing definitions for the terms "display", "interface", "interaction", "force-feedback" and "device"

4 Getting Involved

TC159/SC4/WG9 is continuously working on ensuring that all guidelines are technically correct and feasible. You can get involved as an expert member of TC159/SC4/WG9 actively developing drafts of the planned work items or as a member of your national Technical Advisory Group commenting and voting on the drafts produced by TC159/SC4/WG9.

Independent from being officially nominated as an expert the members of WG9 are very interested in your opinion on tactile/haptic-related definitions as part of the CD of ISO 9241-910. Due to its characteristic of being the first document within the series it will cross reference existing normative definitions and introduce new ones for the usage within the following documents. This requires a common understanding of terms among all editors of this document, as otherwise the series will become inconsistent and the expected frequent usage of this standard will exponentially increase confusion. At the current stage there are competing opinions on the exact meaning of frequent terms within the group of experts. As an example figure 2 shows varying interpretations of such relevant terminology-definitions such as haptic/tactile- “display”, “interface”, “interaction”, “force-feedback” and “device”. Due to the interdisciplinary characteristic of haptic researchers and users another ongoing discussion results from the difference in disciplines and their specific way of speech. Should we use "kinaesthetic and tactile devices" as a terminology, or are there just "force-feedback and tactile devices", as most kinaesthetic devices which are not tactile are open or closed loop force controlled? The authors would be happy to get you involved into the ongoing discussion during the conference to get your opinions on terms and definitions.

Reference

1. Van Erp, J.B.F., Carter, J., Andrew, I.: ISO’s Work on Tactile and Haptic Interaction Guidelines. In: Proceedings of Eurohaptics 2006, Paris, July 2006, pp. 467–470 (2006)