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Information technology — User interface guidelines on menu navigation —

Part 2: Navigation with 4-direction devices

Technologies de l'information — Directives sur la navigation dans les menus d'interfaces utilisateurs —

Partie 2: Navigation avec des commandes quadridirectionnelles

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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 document 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 and IEC 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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary information.

The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, Subcommittee SC 35, *User interfaces*.

ISO/IEC 17549 consists of the following parts, under the general title *Information technology — User interface guidelines on menu navigation*:

— *Part 2: Navigation with 4-direction devices*

The following part is planned:

— *Part 1: Framework and convergence matters*

Introduction

Contemporary information equipment on which the display area is associated with 4-direction devices includes sophisticated and complex functionalities within one piece of such equipment.

The equipment needs to be operated in terms of changing default settings and to be customised for individual user. In such scenario, a 4-direction device is used to navigate menu shown in the display area, where the menu are normally structured.

This part of ISO/IEC 17549 intends to provide guidelines for design and use of menu structures, as well as recommended types of navigation with the 4-direction devices.

Note that each figure in this document, although it is not always “image”, includes the alternative text(s) in accordance with ISO/IEC/TS 20071-11. The alternative text(s) are information only.

Information technology — User interface guidelines on menu navigation —

Part 2:
Navigation with 4-direction devices

1 Scope

This part of ISO/IEC 17549 gives guidelines on the design of navigation methods for selection menus with use of a 4-direction device. A 4-direction key is an example of a 4-direction device. The guidelines are applicable to any information equipment on which the display area is associated with the 4-direction device.

This part of ISO/IEC 17549 also provides recommendations for parameters for display screen settings, character sets, and languages in use.

This part of ISO/IEC 17549 is not applicable to safety-related uses on menu navigation.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1503, *Spatial orientation and direction of movement — Ergonomic requirements*

ISO/IEC Guide 37, *Instructions for use of products by consumers.*

IEC 82079-1, *Preparation of instructions for use — Structuring, content and presentation — Part 1: General principles and detailed requirements.*

3 Conformity

A navigation method is in conformity to this International Standard if it meets all requirements of 5.1, 5.2.2, and 7.1 of this part of ISO/IEC 17549.

4 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

4.1
4-direction device
set of physical controls, commonly keys, only one of which is activated at any time, consisting of up-, down-, left- and right controls for respective functionality

4.2
ladder menu
list of items displayed vertically in one dimension, one of which to be selected

4.3
menu bar
set of one dimensional menu items that is always standing-by at the root of a menu hierarchy

Note 1 to entry: A menu bar provides tabular functionality and it is different from a “rolling menu”.

4.4
focus
<4-direction devices> highlighted result of action done by a user through an input device

Note 1 to entry: If the number of keys is one, the action is “next”. If the number of keys is two, the actions are “previous” and “next”. Selecting a key enables highlighting of the next item visually, auditorily, and or tactually to show the action can be activated.

4.5
activating
action done by a user through a validation key, which enables activation of a focus or an item pointed at

4.6
navigation history feedback
visual, tactile and/or audio interface output displayed after a user navigation, which enables a user to know the paths he has already explored

Note 1 to entry: For example, items already explored are highlighted in a different colour if the user already navigated to there.

4.7
separator bar
visual, tactile and/or audio interface output that is rendered in order to facilitate recognition of groups of items categorizations or the start or end of a list

4.8
sub-menu indicator
visual, tactile and/or audio interface output that is rendered in order to facilitate navigation when a sub-list of items is available and which enables user to know if he is dealing with a navigation item or not

4.9
tile menu
set of options displayed with a number of rows and columns, one of which to be selected

5 Basic considerations

5.1 Common and general ergonomic aspects

The following basic ergonomic aspects are taken into account when designing the user interfaces where navigation with a 4-direction device is considered:

a) users should be able to change menu languages at the highest level of menu hierarchy;

b) control shall be consistent both in design and operation including meeting requirements in ISO 1503;

c) menu items should be in plain texts or comprehensible icons as far as applicable, and in agreement with the relevant provisions in ISO/IEC Guide 37 and IEC 82079-1;

d) control shall be bidirectional and enable the user to return to the previous operation;

e) a clear feedback should be given when user is at the end of list and when he is at the start, and the end and start feedback should be different;

f) for broad and deep menu lists, navigation history feedback shall be provided;

g) important and most frequently used menu items should be simple and comprehensible, and placed at the start of the list;

h) a ladder menu including an item that should logically be first selected by a user should be short and such a menu item shall be placed as first item in the list;

i) in the case that a substantial number of options is required for an item of ladder menu, the most frequently selected option should be the default option;

j) item categorisation that depends on functionality should be shown to user (separation bars, sounds...); a sub-menu should present a title semantically linked to the upper-menu, and as far as possible all the cascading hierarchy should be showed to the user;

k) the user interface should make a clear separation between navigation functions (browsing between items without any modification) and action functions (implying system modification, as adding something, deleting something, calling someone, activating something...). Consequently items for navigation should be displayed differently from items for action;

l) where possible hierarchies shall be organized to be broader than deeper. It has been shown[1)] that a two level hierarchical menu (32 items at the first level and 16 for each sub-level) is better than a three level hierarchical menu (8 × 8 × 8). Moreover that 32 × 16 is better than 16 × 32;

m) a list longer than three items should enable wrap-round manipulation. For example, scrolling beyond the end of the list should return to or render the beginning of that list (see 5.2 for screen rendering this.);

n) focusing rendering should be available through visual and audio information, and should also be available through tactile information as appropriate;

o) separator bar rendering should be available through visual and audio information;

p) start/end list rendering should be available through tactile information;

q) tactile display should be available at least for end/start feedback and item validation;

r) each list element (items, feedbacks, separator bars, sub-menu indicators, focus indicators...) shall enable visual display, audio display, and if possible tactile display;

s) navigation items should be displayed through texts or icons, with an added visual icon (for example: ▶ the graphical symbol IEC 60417-5107B or → the graphical symbol IEC 60417-5022), with audio alternative (specific sound such as «bip», or «sub-menu», or «link»;

t) the list of menu for attributes and the list of menu for selecting associated values should not be in the same list; and

u) when user goes back in a hierarchical menu, the item selected from the upper menu shall be the one linked to the sub-menu previously selected.

5.2 Designing rendering (display screen, audio display, tactile display)

5.2.1 Visual design of ladder menu

The provisions given in 5.1 apply.

5.2.2 Visual designing of tile menu

Where a 4-direction device is used with a tile menu visible on a screen, design of the navigation through tile menus on the screen is an important consideration. Guidance provided by this standard is limited

1) Miller, D. P. (1981). The depth/breadth tradeoff in hierarchical computer menus. Proceedings of the Human Factors Society, 296-300.Parkinson, S.R., Sisson, N., & Snowberry, K. (1985). Organization of broad computer menu displays. International Journal of Man-Machine Studies, 23, 289-297.

to the design of the focus operation through the tile menu and does not deal with the design of menus and the remote controller. Design issues of the tile menu navigation within a display screen (e.g. the navigation of focus between menus) are only addressed with respect to the ergonomic issues related to user controls.

The following general rules apply for navigating in the tile menu :

a) moving wrap-around shall be so that the user continues to move into any menu item by activating one direction key in a remote controller;

b) moving from left to right shall be so that the user moves a highlighted item in the menu from left to right by pressing the right-key;

c) moving from up to down shall be so that the user moves a highlighted item in the menu from up to down by clicking the down-key; and

d) moving in zigzag way shall be so that the user moves a highlighted menu item in the shortest path between the initial and final menu items.

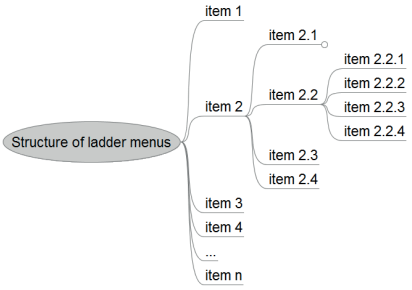
6 Recommended practice on structure of and operation of ladder menus

6.1 Ladder structure

The ladder menus should be structured as shown in Figure 1 as an example, where the menu bar laid vertically at the top is optional. The lists of items depicted vertically are the ladder menus classified according to hierarchies. The highlighted ones are selected options among menu items. In most cases, one of the horizontal or vertical ladder menus is activated and shown on the screen.

Focus on one of the menu items in the menu bar is moved by down- or up-keys, or left- or right-keys. Focus on one of the items in the ladder menu is moved by left- or right-keys, or up- or down-keys, respectively, depending on vertical or horizontal layouts. Among the ladder menus in the hierarchy, focus is moved by an up- or down key, or a left- or right key.

In the example of Figure 1, when “Item 2” is focused by down- or up-key, the associated ladder menu to “Item 2” will pop-up (“Item 2.1,” “Item 2.2,” ..., and “Item 2.4”). Further when “Item 2.2” in the popped up ladder menu is selected and or activated, yet another ladder menu of the lower hierarchy (“Item 2.2.1,” “Item 2.2.2,” ... and “Item 2.2.4”) results, and so on.



NOTE 1 Primary alternative text: Tree representation of the logical structure of a ladder menu.

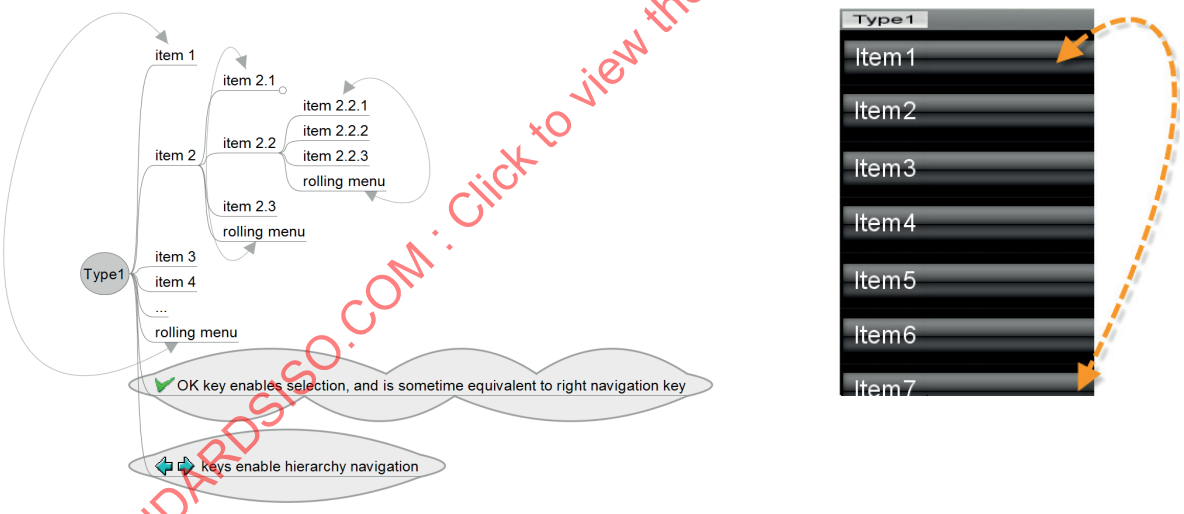
NOTE 2 Secondary alternative text: Hierarchical organization including three levels of item lists (1, 2, 3, 4, and 2.1, 2.2, 2.3,2.4, and 2.2.1, 2.2.2, 2.2.3, 2.2.4).

Figure 1 — Structure of ladder menus, an example

6.2 Recommended types of operation of the ladder menus for the hierarchy

The recommended practice includes the following three types.

Type 1: The focus of operation is moved up or down endlessly in a ladder menu by an up- or down-key, respectively; the focus is also moved among the lower hierarchy and the higher hierarchy of ladder menus by right- or left-key, respectively, as shown in Figure 2.

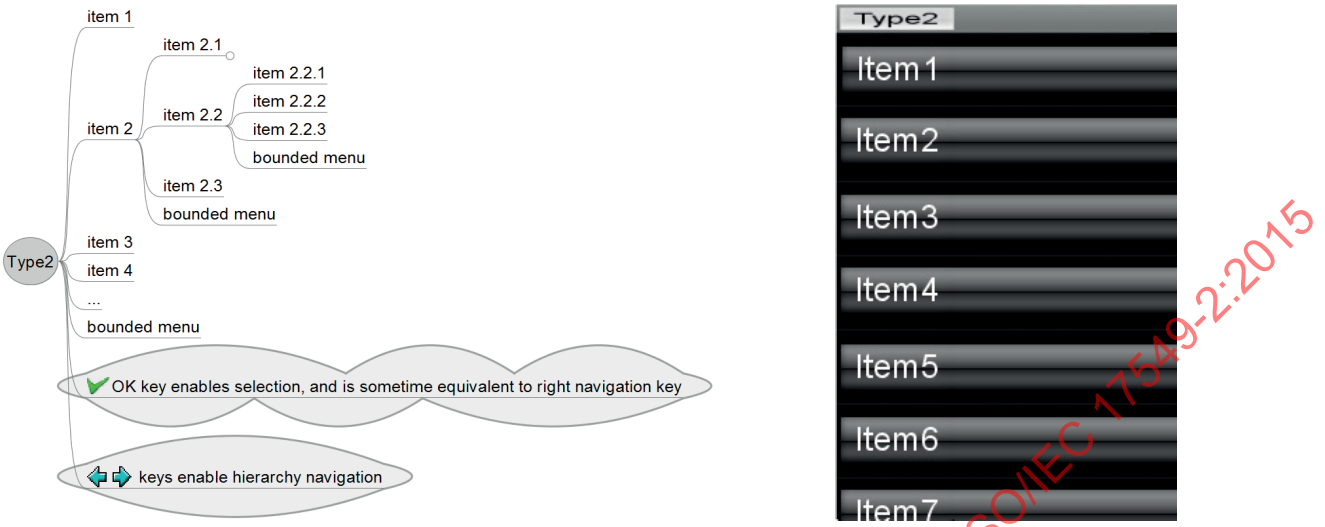


NOTE 1 Primary alternative text: Tree representation of a Type 1 ladder menu and a screen view of one hierarchy level on a mobile phone.

NOTE 2 Secondary alternative text: Tree representation of a Type 1 ladder menu including three levels of item lists. At each level, arrows from top to down show that each list is a loop (rolling menu). Comment indicates that for each level «Ok» key enables selection, and is sometimes equivalent to the right-key, and «left-right» keys enable hierarchy in-depth navigation. On the right side of the figure a vertical list view on a mobile phone screen is shown. The list of titles is situated at the top of the screen, and five items are vertically displayed. A round arrow express that this is a rolling menu.

Figure 2 — Type 1: rolling up-down start/end menus with left-right navigation keys

Type 2: The focus of operation is moved up or down in a ladder menu by an up- or down-key, respectively, and stops at the top or the bottom of the ladder menu; the focus is also moved among the lower hierarchy and the higher hierarchy of ladder menus by right- or left-key, respectively, as shown in Figure 3.

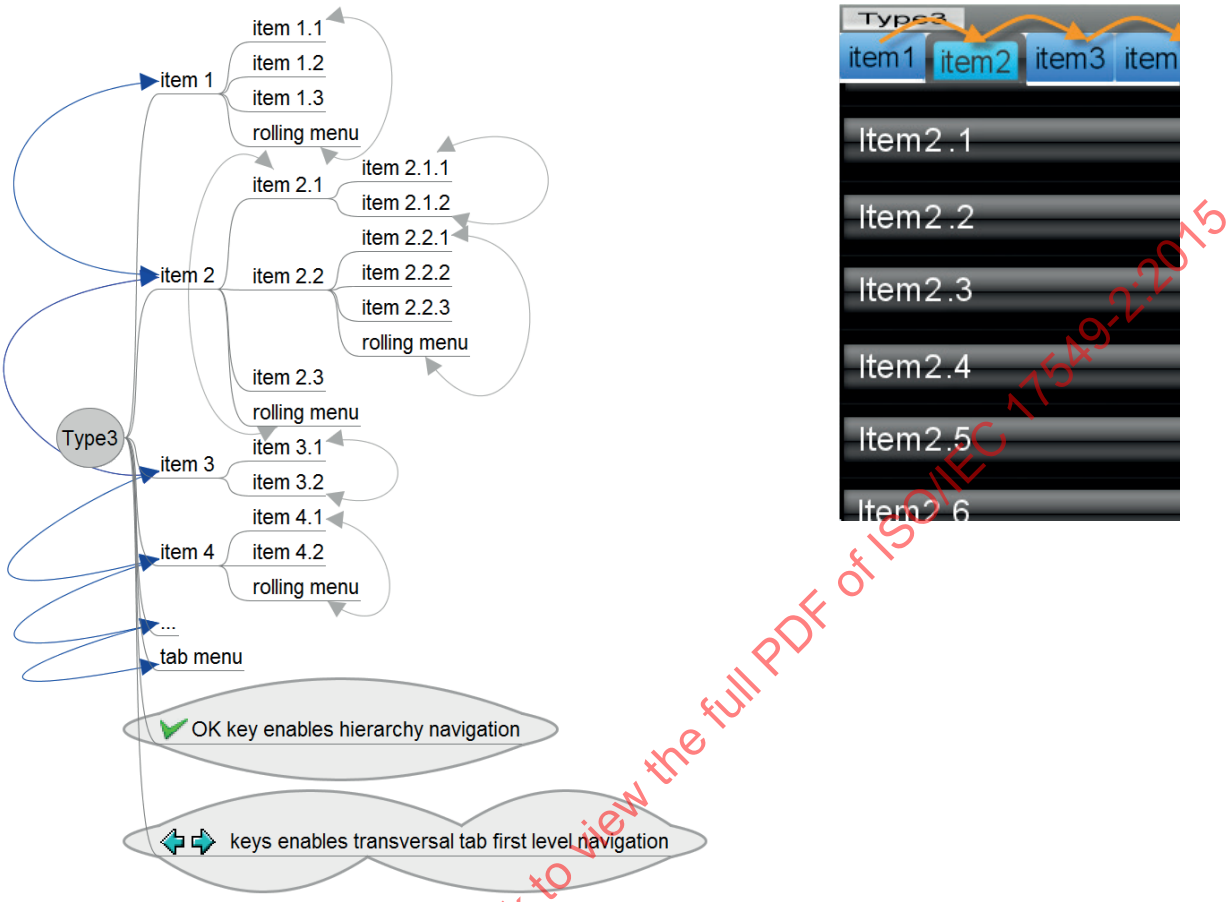


NOTE 1 Primary alternative text: Tree representation of a Type 2 ladder menu and a screen view of one hierarchy level on a mobile phone.

NOTE 2 Secondary alternative text: Tree representation of a Type 2 ladder menu including three levels of item lists. Those lists are not rolling menus. Comment indicates that for each level «Ok» key enables selection, and is sometimes equivalent to the right-key, and «left-right» keys enable hierarchy in-depth navigation. On the right side of the figure a vertical list view on a mobile phone screen is shown. The list of titles is situated at the top of the screen, and five items are vertically displayed. Nothing expresses that it is a rolling menu.

Figure 3 — Type 2: bounded up-down menus with left-right navigation keys

Type 3:.The focus of operation is moved up or down endlessly in a ladder menu by an up- or down-key, respectively; the focus is also switched to right or left menus in the menu bar by a right- or left-key, respectively, as shown in Figure 4.



NOTE 1 Primary alternative text: Tree representation of a Type 3 ladder menu and a screen view of two hierarchies levels on a mobile phone.

NOTE 2 Secondary alternative text: Tree representation of the logical structure of a Type 3 ladder menu including three levels of item lists, rolling menu indications, next-previous items navigation and a screen view of two hierarchies levels on a mobile phone through tabs and list. Comment indicates that for each level «Ok» key enables hierarchy navigation, and «left-right» keys enable transversal tab first level navigation. On the right side of the figure a vertical list view on a mobile phone screen is shown. Four tabs are situated at the top of the screen, and five items are vertically displayed.

Figure 4 — Type 3: rolling up-down start/end menus with left-right keys for transversal, tab navigation at the first level only and OK key for sub-menu navigation keys and selection

The specific functionality of each of these types is summarized in Table 1.

Table 1 — Overview of recommended types

Key operation		UP	DOWN	LEFT	RIGHT	OK	BACK/ CANCEL
Focus	**Type 1**	Moves upward continuously and cyclically.	Moves downward continuously and cyclically.	Returns to the upper hierarchy level.	Moves to the lower hierarchy level.	Optional	Optional
	Type 2	Moves upward and stops at the top.	Moves downward and stop at the bottom.	Returns to the upper hierarchy level.	Moves to the lower hierarchy level.	Optional	Optional
	Type 3	Moves upward continuously and cyclically.	Moves downward continuously and cyclically.	Moves to the left menu item in a menu bar.	Moves to the right menu item in a menu bar.	Moves to the lower hierarchy level, or activates item.	Returns to the upper hierarchy level or cancels action.

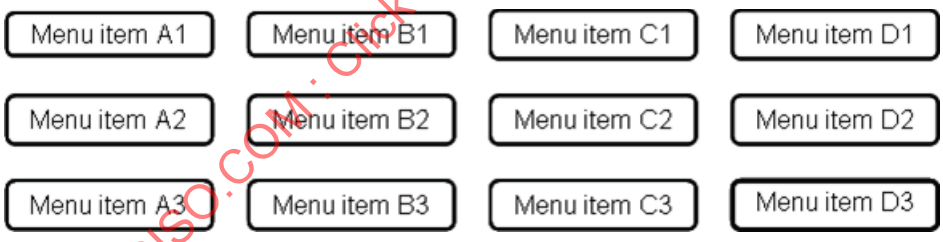
For advantages and disadvantages of the types in Table 1, see Annex A.

7 Recommended practices on structure of and operation of tile menus

7.1 Structure of tile menus

The tile menus should be structured as shown in Figure 5 as an example, where set of options displayed with a number of rows and columns, one of which is to be selected. The highlighted ones are selected options among menus items when pressing direction key. The highlighted menus are activated and by moving step by step into next menu items.

The tile menu structure shown in Figure 5 is a two dimensional coordinate system.



NOTE 1 Primary alternative text: Screen rendering of the tile menu.

NOTE 2 Secondary alternative text: Several columns and rows are displayed in a table containing menu items.

Figure 5 — Structure of tile menus, an example

While the examples illustrated in 7.2 are based on a left-to-right and top-to-bottom organization, the structure of the tile menu shall also be designed in line with other cultural layouts; such as a right-to-left and bottom-to-top organization.

7.2 Navigation for selecting tile menus

Navigation within the tile menu displayed on a screen is usually controlled by the 4-direction devices of a remote controller where each direction key is marked by the arrow-head shaped graphical symbol IEC 60417-5107B or IEC 60417-5022 for navigation. See Figure 6.

Button shapes are consistent with their function, providing a simple feedback mechanism to confirm a button press (e.g. a click). To make a choice about a highlighted item in the menus, the user can click

'Select' or 'OK' button; graphical symbol ISO 7000-1326 or ISO 7000:1940. 'Access' or 'menu' or 'guide' buttons are used to enter or exit the on-screen guide menus; graphical symbols IEC 60417-6089 or ISO 7000-2814. Additionally, 'TV' or 'out' or 'return or 'exit' buttons (optional) can be pressed to exit the guide screens and return the user to viewing TV.

A label for each of remote control functions should be selected on the basis of respective cultural and linguistic background. Although the labels of remote controllers incorporating the 4-direction devices are not part of this standard, examples are provided in Figure 6.

Function	Preferred label	Preferred graphical symbol
Move right	---	
Move left	---	
Move up	---	
Move down	---	
Make a choice about a highlighted item	'Selection' or 'OK'	
Enter or exit menus	'Menu'	

NOTE 1 The preferred label is not part of the standard because a label is adopted according to various cultural and linguistic backgrounds.

NOTE 2 One of options of graphical symbols is selected to be independent of cultural and linguistic background.

NOTE 3 Primary alternative text: the tabular figure showing in each row are functions, labels and their associated graphical symbols.

NOTE 4 Secondary alternative text: «move right», «move left», «move up» «move down» functions are associated to graphical symbols, respectively, of a filled-in arrow heads and open arrows graphical symbols. «make choice about a highlight item» function is associated to buttons with «ok» label, or «select.» label, and also to the graphical symbol of a V check marking. «Enter or exit menu» function is associated to a button with «menu» or «exit» label, and also to the graphical symbol of «page list with a pointing arrow».

Figure 6 — Buttons in remote controller (informative)

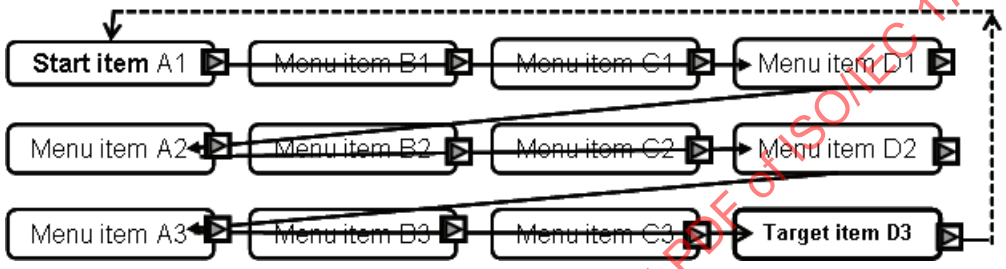
7.3 Recommended types of operation of the tile menus for the hierarchy

The recommended practice includes the following types as shown in Table 2.

Table 2 — Overview of recommended types

Key operation		DOWN	RIGHT
Focus	**Type 1**	Moves downward or upward or right or left on any menu item	
	Type 2	Moves downward and at the bottom of menu items, moves to a next column	Moves to the right menu item and at the right end of menu items, moves to a next row
	Type 3		
NOTE 1 Replace "DOWN" by vertical (either "DOWN" or "UP") and replace "RIGHT" by horizontal (either "RIGHT" or "LEFT"). NOTE 2 Text is needed for cultural choices.			

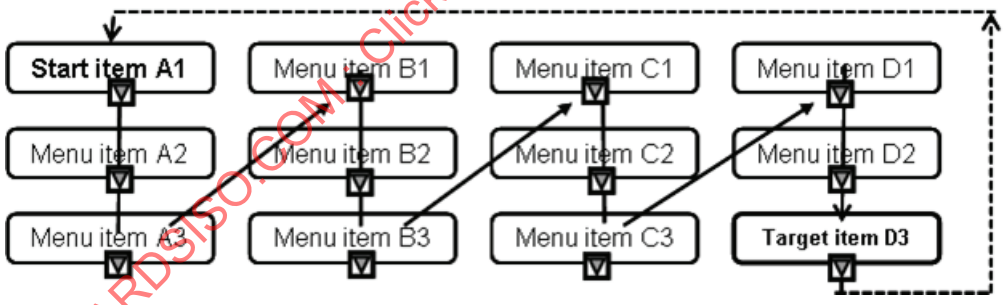
The functionality of the Type 1 is shown in Figure 7 in a pseudo screen image as an example.



NOTE Alternative text: Starting at the left-top menu item, focus is moved down, down; right, right and right to end at the target menu item. Alternatively, focus is moved right, down, right, right and down to end at the target menu item.

Figure 7 — Diagram as an example for the Type 1

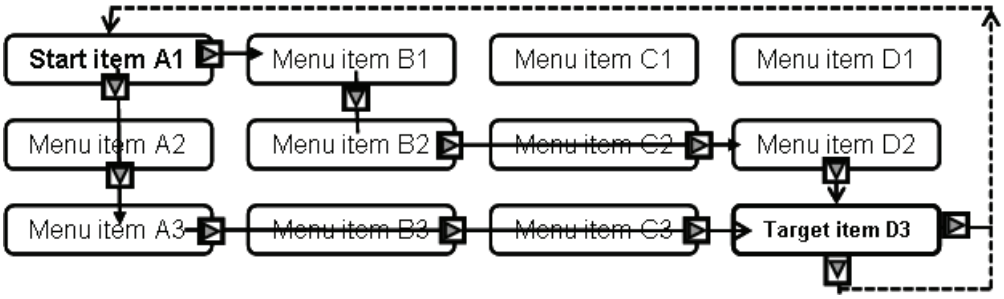
The functionality of the Type 2 is shown in Figure 8 in a pseudo screen image as an example.



NOTE Alternative text: Starting at the left-top menu item, focus is moved down, down; then when it cannot move down any further the down key moves the focus to the top of second column, down, down; then when it cannot move down any further the down key moves the focus to the top of third column, down, down; then top of the last column, down and down to end at the target menu item.

Figure 8 — Diagram as an example for the Type 2

The functionality of the Type 3 is shown in Figure 9 in a pseudo screen image as an example.



NOTE 1 Type 3 is a special case for blind people.

NOTE 2 Primary alternative text: Starting at the left-top menu item, focus is moved right, right, right; then when it cannot move right any further the down key moves the focus to the left-most item in the second row, right, right, right; then when it cannot move right any further the down key moves the focus to the left-most item in the last row, right, right to end at the target menu.

Figure 9 — Diagram as an example for the Type 3

Recommendations according to typical cases are given in Annex B.

Annex A
(informative)

Advantages and disadvantages depending on navigation types

A.1 Scope

Those recommendations provided in this annex refers to the ladder menu navigation. The types are defined in Table 1 of 6.2.

A.2 Type 1

A.2.1 Advantages

— type 1 is totally sequential, and therefore easy to make accessible for users with vision impairment or motor impairment;

— hierarchy is homogenous;

— it is efficient because it is easy to go from top of list to bottom and bottom to top;

— a cancel key is not required on the device;

A.2.2 Disadvantages

— the first level sub-menu is not directly shown so exploration is harder, and mental hierarchy perception is more difficult;

— there is no clear separation between forward navigation key (Right key) and validation action key (OK key) nor between backward navigation key (Left key) and cancel action key (Cancel key);

— without clear top-bottom rolling list feedbacks, it is not unusable by persons with some disabilities. So such feedback is mandatory if Type 1 is used.

A.3 Type 2

A.3.1 Advantages

— type 2 is totally sequential and therefore easy to adjust to accessibility requirements for users with vision impairment or motor impairment;

— hierarchy is homogenous.

A.3.2 Disadvantages

— the first level sub-menu is not directly shown so then exploration is harder, and mental hierarchy perception is more difficult;

— there is no clear separation between forward navigation key (Right key) and validation action key (OK key) nor between backward navigation key (Left key) and cancel action key (Cancel key);

— it is not efficient because in the case of a long list, it is very costly to go from top list to bottom.

A.4 Type 3

A.4.1 Advantages

— first and second level sub-menus are directly shown, therefore exploration is easier, and mental hierarchy perception is facilitated for user easier;

— navigation keys are clearly separated from action key. Right-Left navigation keys are for tab navigation, and validation action key (OK key) is dedicated to «go further» (Forward and Validation).

A.4.2 Disadvantages

— for third level hierarchy there is no Backward or Cancel immediate key unless a dedicated Back key is somewhere else on the device. Consequently a Cancel action key is needed on the device;

— there is a risk that solving the “Backward” difficulty at the third level by associating Left key with backward functionality may provide a disappointing experience for the user, and especially for a user with a relevant motor disability. Indeed, the same key used for transversal navigation (access to left tab) and hierarchal navigation (access to upper menu) would be very confusing;

— it needs clear feedbacks in order to be accessible to disabled users;

— it needs a user to construct a bimodal mental model including hierarchal and transversal navigation. This may be difficult for users having some cognitive impairments.