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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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## Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

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](http://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](http://www.iso.org/patents)) or the IEC list of patent declarations received (see <http://patents.iec.ch>).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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](http://www.iso.org/iso/foreword.html).

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 35, *User interfaces*.

This second edition cancels and replaces the first edition (ISO/IEC 17549-2:2015), of which it constitutes a minor revision.

The main changes compared to the previous edition are as follows:

- in [Figures 2, 3, and 4](#) supplementary explanations have been moved into notes;
- the alternative text for all figures has been included as alternative text in the PDF rather than provided in notes beneath the figures;
- an editorial error in [Table 2](#) has been corrected;
- Annex B (informative), which was erroneously included, has been deleted;
- ISO/IEC Guide 37 and IEC 82079-1 have been moved from Clause 2 to the Bibliography as they are not cited normatively in the text;
- minor editorial corrections have been made throughout the document to fully align with ISO/IEC Directives.

A list of all parts in the ISO/IEC 17549 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](http://www.iso.org/members.html).

## 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 customized for the individual user. In such a scenario, a 4-direction device is used to navigate the menu shown in the display area, where the menus are normally structured.

This document provides guidelines for the design and use of menu structures, as well as recommended types of navigation with 4-direction devices.

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

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# Information technology — User interface guidelines on menu navigation —

## Part 2: Navigation with 4-direction devices

### 1 Scope

This document gives guidelines on the design of navigation methods for selection menus with the use of a 4-direction device. The guidelines are applicable to any information equipment on which the display area is associated with a 4-direction device.

This document also provides recommendations for parameters for display screen settings, character sets and languages in use.

This document is not applicable to safety-related uses on menu navigation.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. 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*

### 3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

#### 3.1

##### **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

Note 1 to entry: The 4-direction device is a mechanism directly manipulated by users, for example, a cross-key of a remote controller.

#### 3.2

##### **ladder menu**

list of items displayed vertically in one dimension, one of which is to be selected

#### 3.3

##### **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”.

### 3.4

#### **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 used is one, the action is “next”. If the number of keys used 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.

### 3.5

#### **activating**

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

### 3.6

#### **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.

### 3.7

#### **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

### 3.8

#### **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 they are dealing with a navigation item or not

### 3.9

#### **tile menu**

set of items displayed with a number of rows and columns, one of which is to be selected

## 4 Conformity

A navigation method conforms to this document if it meets all requirements of [5.1](#), [5.2.2](#), and [7.1](#).

## 5 Basic considerations

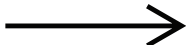
### 5.1 Common and general ergonomic aspects

The following basic ergonomic aspects are taken into account when designing 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 the menu hierarchy;
- b) control shall be consistent both in design and operation, including meeting the 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/IEEE 82079-1;
- d) control shall be bi-directional and enable the user to return to the previous operation;
- e) clear feedback should be given when the user is at the end of the list and when they are 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 the first item in the list;
- i) in the case where a substantial number of options is required for an item of a ladder menu, the most frequently selected option should be the default option;
- j) item categorisation that depends on functionality should be shown to the user (by separation bars, sounds, etc.); a sub-menu should present a title semantically linked to the upper-menu and, as far as possible, all the cascading hierarchy should be shown 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 such as adding something, deleting something, calling someone, activating something, etc.); consequently, items for navigation should be displayed differently from items for action;
- l) where possible, hierarchies shall be organized to be broader rather than deeper; it has been shown<sup>1)</sup> 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 ( $8 \times 8 \times 8$ ); moreover that  $32 \times 16$  is better than  $16 \times 32$ ;
- m) a list longer than three items should enable wraparound manipulation;  
 EXAMPLE      Scrolling beyond the end of the list should return to or render the beginning of that list (see [5.2](#) for this screen rendering).
- 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, etc.) shall enable visual display, audio display and, if possible, tactile display;
- s) the menu list for attributes and the menu list for selecting associated values should not be in the same list;
- t) when the user goes back in a hierarchical menu, the item selected from the upper menu shall be the one linked to in the sub-menu previously selected;
- u) navigation items should be displayed through texts or icons, with an added visual icon and with audio alternative (specific sound such as «bip», «sub-menu» or «link»), for example:

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.

| Function   | Preferred graphical symbol                                                        | ISO/IEC registration number |
|------------|-----------------------------------------------------------------------------------|-----------------------------|
| Move right |  | IEC 60417-5107B             |
|            |  | IEC 60417-5022              |

## 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 document is limited 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:

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

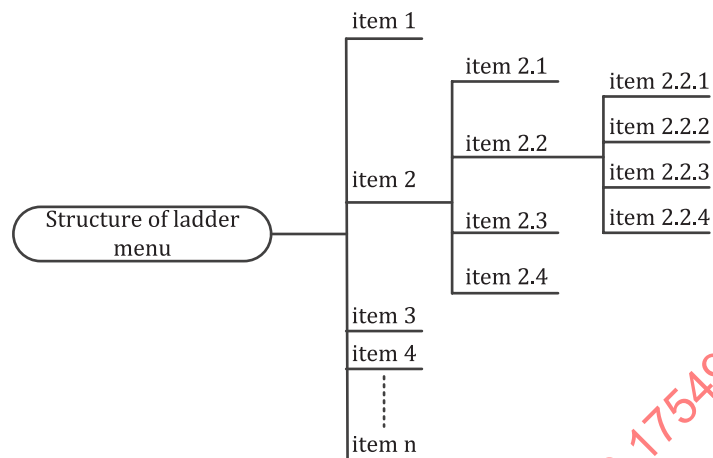
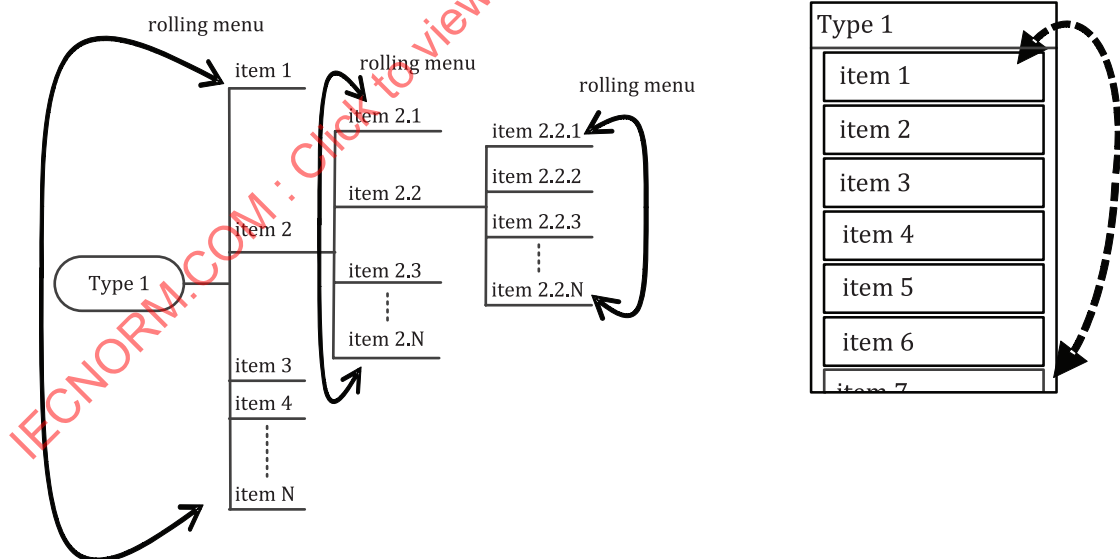


**Figure 1 — Example structure of ladder menus**

## 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](#).



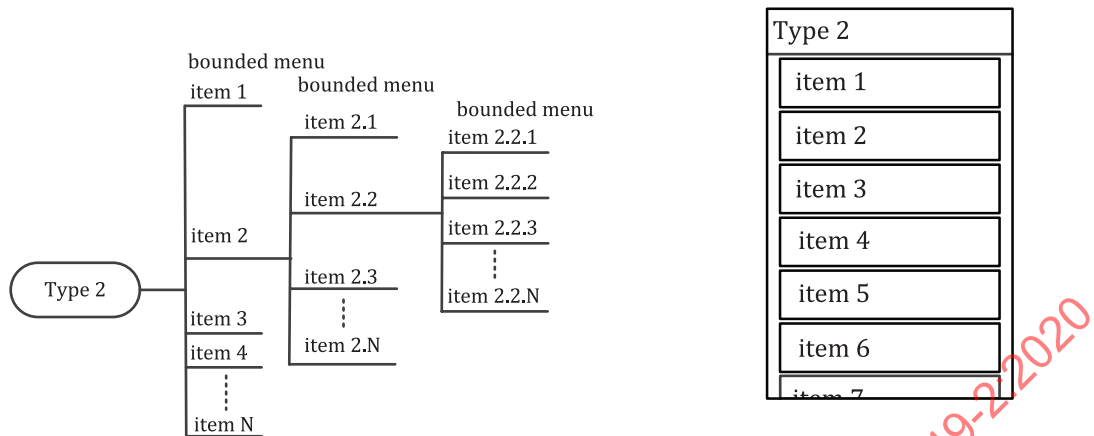
NOTE 1 ✓| OK keys enable selection and are sometimes equivalent to the right navigation key.

NOTE 2 ← | → keys enable hierarchy navigation.

**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](#).

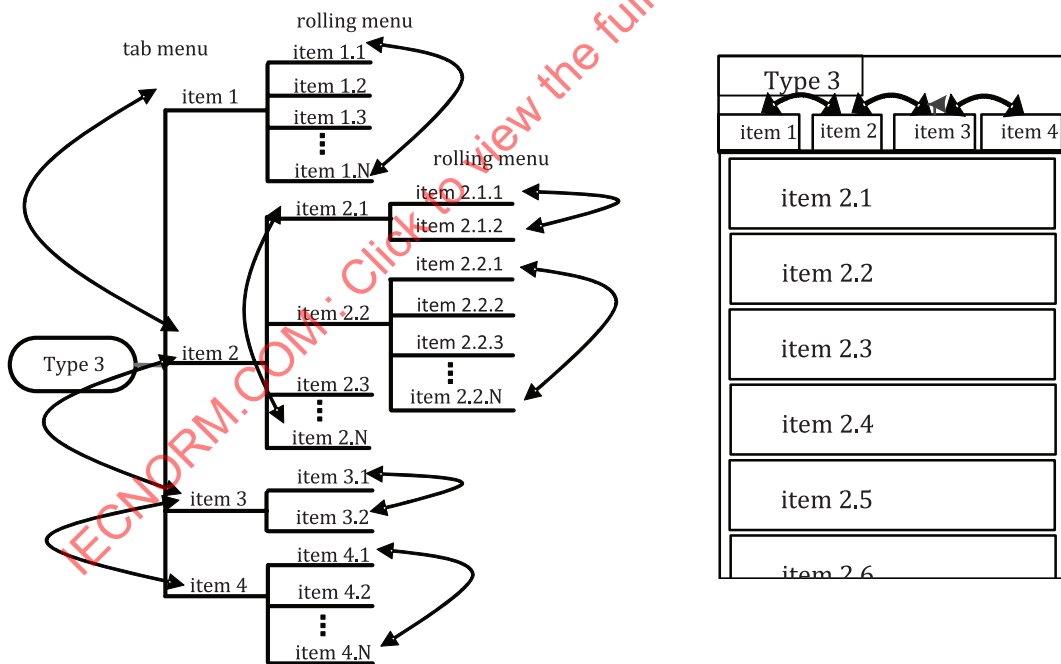


NOTE 1 ✓ | OK keys enable selection and are sometimes equivalent to the right navigation key.

NOTE 2 ← | → keys enable hierarchy navigation.

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 ✓ | OK keys enable hierarchy navigation.

NOTE 2 ← | → keys enable transversal tab first level navigation.

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 |

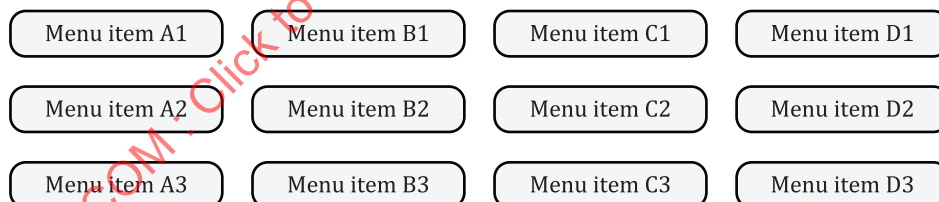
For advantages and disadvantages of the types in [Table 1](#), see [Annex A](#).

## 7 Recommended practices on structure of and operation of tile menus

### 7.1 Structure of tile menus

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

The tile menu structure shown in [Figure 5](#) is a two-dimensional coordinate system.

**Figure 5 — Example structure of tile menus**

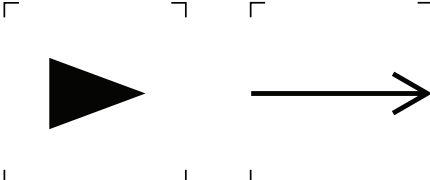
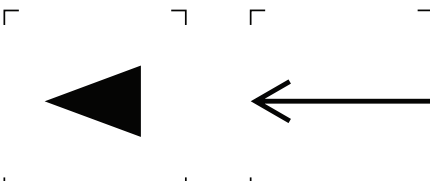
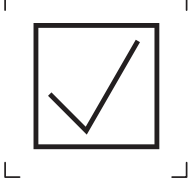
While the examples illustrated in [7.2](#) are based on a left-to-right and top-to-bottom organization, the structure of the tile menu shall also be designed in line with other cultural layouts, such as, a right-to-left and bottom-to-top organization.

### 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 the '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 document, examples are provided in [Figure 6](#).

| Function                               | Preferred label     | Preferred graphical symbol                                                          | ISO/IEC registration number                           |
|----------------------------------------|---------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------|
| Move right                             | ---                 |   | IEC 60417-5107B<br>IEC 60417-5022                     |
| Move left                              | ---                 |   | IEC 60417-5107B (rotated)<br>IEC 60417-5022 (rotated) |
| Move up                                | ---                 |   | IEC 60417-5107B (rotated)<br>IEC 60417-5022 (rotated) |
| Move down                              | ---                 |  | IEC 60417-5107B (rotated)<br>IEC 60417-5022 (rotated) |
| Make a choice about a highlighted item | 'Selection' or 'OK' |  | ISO 7000-1940                                         |
| Enter or exit menus                    | 'Menu'              |  | IEC 60417-6089                                        |

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

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

**Figure 6 — Function of a remote controller**

### 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 |                                                                                      |
|               | Type 3 |                                                                        | moves to the right menu item and at the right end of menu items, moves to a next row |

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 Type 1 is shown in Figure 7 in a pseudo screen image as an example.

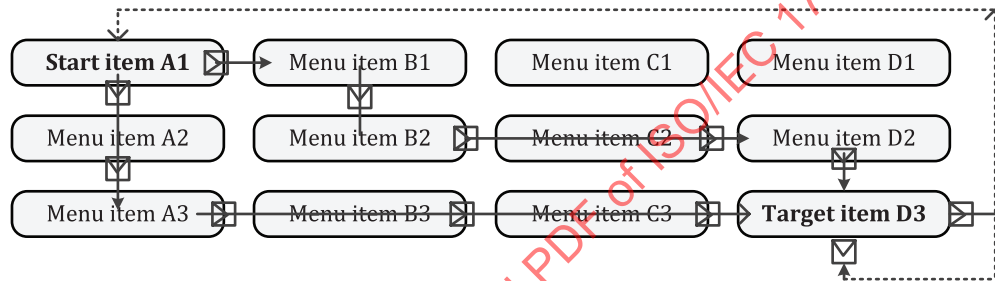


Figure 7 — Example for Type 1

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

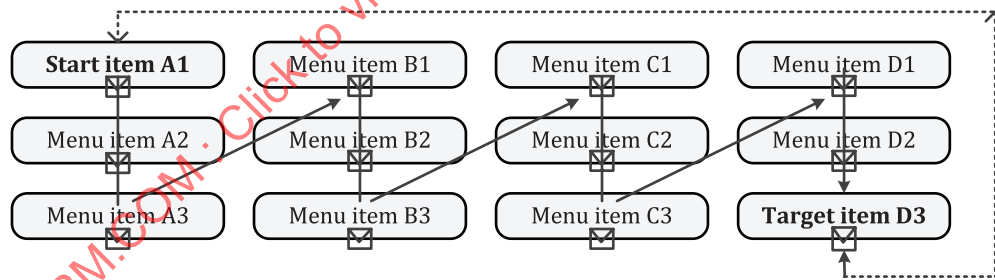
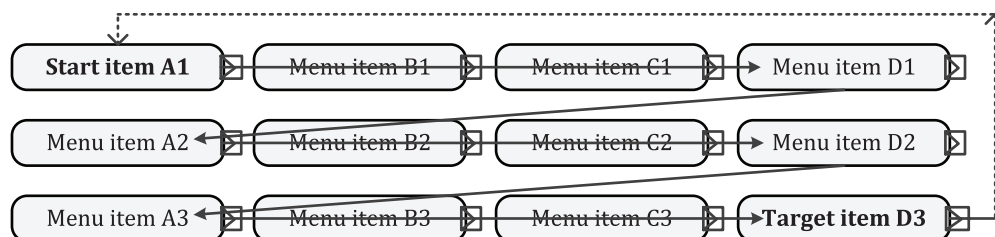


Figure 8 — Example for Type 2

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



NOTE Type 3 is a special case for blind people.

Figure 9 — Example for Type 3

## **Annex A** **(informative)**

### **Advantages and disadvantages depending on navigation types**

#### **A.1 General**

The recommendations provided in this annex refer 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 – 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 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 the top of the list to the bottom.