

Software Products Accessibility Evaluation Metrics

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In this article I will present the interface facilities, their quantification and the measure factors required for a software product to be classified as accessible and easy to use by persons with disabilities. The metrics proposed will take into consideration the accessibility necessities for persons with seeing, hearing and movement disabilities who cannot use software products without these facilities. They will also consider the persons without disabilities, whose work becomes easier by using these facilities.

Keywords: Metrics, accessibility facilities, accessible interfaces.

Introduction

Until recently, the development, evaluation and testing of software products didn't take into consideration the facilities offered to all its users, but only to majority of them. In the last period this point of view is changing fast into a new view: universal utilizability. This means that all processes, from the design to testing and delivering to the final user will take into consideration the need to be used by all users, including people with disabilities, not only by the majority. This approach is more necessary especially because in time, users migrate from the first group to the second group, the minority. These are the persons who lose some abilities with years (for example in the last decade there are many persons who lost their ability to see because of the prolonged computer use).

Another reason that leads us to the final objective of this change of view is the fact that those facilities needed by persons with total or partial disabilities make software products easier to use for persons without disabilities. An economical thinking on the tendency of the market share of software products make this universal point of view to be adopted very fast by the market providers.

Adding accessibility facilities is removing the existing barrier for the persons with partial or total disabilities giving them the possibility to integrate into society activities.

The general industry trend in software development is to standardize products to include accessibility functions in the products core,

as standard functionality, and not as modules or additional functions needed only to persons with disabilities.

Accessibility functions

Sec The division of people into two categories: with and without disabilities, is not a useful approach that would lead to the development of accessible products. In fact, most of the persons who in the past were placed in the first class actually need facilities to use software products, but they are not dependent on them because they have only partial disabilities. Basically, they can use software programs, but adding such features would allow a lighter, easier use, which would lead to increased industrial efficiency, thus constituting an important economic objective.

Recent studies in the field of human computer interaction show that the majority of functionalities and concepts needed to be applied in developing software products for people with disabilities are also used by many other people for an easier interaction, increased efficiency in the use of computers or to prevent future occurrence of partial malfunctions. The results of these studies are also used in other purposes, like the facility of program control by voice command, which is successfully used in remote programming or devices control via a phone call.

Seeing disabilities are divided into two categories. Total disabilities are found in people who cannot use a computer monitor. These people need a different type of interface to receive information from the computer. Par-

tial disabilities are found in people who can use a computer monitor, but find it very hard to distinguish visual objects. Generally, they are forced to use tools to increase font and objects to distinguish and understand the information. For the first category of people, software solutions for screen reading provide voice information regarding the objects on the screen text, controls, icons, etc. To their help come the Braille displays, which complement the image shown by reading software.

To interact with these software programs, such categories of people use very often the "TAB" key and navigation arrows: left, right, top, bottom. This allows the conduct of the lists, reading menus, etc. While browsing through the user interface, the screen reading software provides information about the new state of "focus" on the screen. These people use "mouse" or other graphic dispositive very rarely or not at all. An issue becoming increasingly difficult to solve is large-scale development of graphic interface. It is obvious that, for now, screen readers read the information text and not images, icons and other graphical characters, which is why it is crucial that developers must use accessible names for the objects. So screen readers will be able to reproduce in Braille or in voice the information about the graphic object on the screen.

For the second category of people with seeing disabilities the main problem is that they need to use computer software or hardware to increase a section of the screen. As a result this category of users will use only a portion of the screen. This leads to limitation of the possibilities of information processing, because practically the information is taken out of context, at least in the visual area, and then reintroduced to understand its significance.

Assistive technologies and facilities offered:

- Screen reader software allows users to navigate the windows, menus and other controls while receiving information about the screen status and the controls by voice messages or Braille displays.

- Braille screens provide information about screen status and allow the user to browse the interface controls.

- Tools that turn text into voice language.

- Tools to increase the screen – provide the facility to increase a portion of the screen, including graphic controls, in order to accurately distinguish the interface.

Physical disabilities represent people's impossibility to move or manipulate objects. For these users, the necessary functionalities to ease their work with computer programs are accelerator keys, who offer shortcuts to certain functions or operations.

The increasing number of people with disabilities is produced by the recurring affectation by external factors for long periods of time (RSI).

Assistive technologies and facilities offered for these people:

- Alternative pointing device, allowing users without hands or with low skill capacity to control mouse movements.

- Keyboard on the screen, provides the opportunity to press keys on a graphic keyboard on the screen. This can easily be used with both standard and alternative pointing devices.

- Predictive dictionary tools, process text during typing and provide remaining letters by typing the word correctly, previously choosing it from a list of possible words. As I said above, this technology is used not only for people with deficiencies, but is also useful, for example, for any mobile phone user.

- Voice recognition tools facilitate access for persons with physical disabilities, offering the possibility of controlling the computer via voice commands. The same observation as in the previous point. This technology is used, for example, for quickly calling a number from mobile phone agenda, by persons without disabilities too.

Keyboard features:

- StickyKeys - allow the user to use combinations of keys without the need to press these keys simultaneously, but the use of a single finger for typing.

- MouseKeys - is an alternative to the use of mouse which allows the user to use the keyboard to move the mouse cursor.
- RepeatKeys - is a feature that enables users with poor coordination of hands and fingers to free a key without the character being repeated on the screen.
- SlowKeys - the facility involves waiting a long time before we consider a key is pressed and produce the desired effect. This allows users with poor coordination the use of keyboard without accidental errors.
- BounceKeys - is the feature that requires a period of time between keystrokes before they will be taken into account. This allows users with shaky hands to use the keyboard correctly.
- ToggleKeys - uses a warning sound to announce hitting of certain keys.

Hearing disabilities - people who cannot distinguish the sounds. The interaction of these people with computer should not be based on sounds. Thus any computer sound must be turned into a visual warning.

Assistive technologies and facilities offered for these people:

- Communication devices for people with hearing disabilities to help these people communicate by phone through text terminals or software products of instant messaging.
- Automatic translators, provide translation for the audio column of audio-video materials.
- Sound adapters, from sound to video, allow people with hearing disabilities to receive audio messages through video interface; for example, a beep is transmitted as a screen blink.

Assessment metrics

An important principle that should underpin the development of software interfaces is that what is good and useful for a person is not always good and useful for another person. Deriving from this principle is the fact that applications must be configurable and to always have an alternative for achieving an operation. The software should allow the user

to adjust its input – output interfaces according to his specific needs. This solution is not always sufficient. It is often necessary for applications to allow users to adjust even the work manner; for example, the possibility to use only uni-modal interface instead of multimodal, which is benefic for a significant part of users.

For evaluation of the software program accessibility, we use a model that takes into account the answers to specific criteria and the functions necessary for disabilities. For each specific criterion, we determine the group or groups of disabilities to whom they address, and so we produce a matrix. This helps establishing the application response degree for each group.

The groups of disabilities are:

- Physical Disabilities
- CSR
- Partial seeing disability
- Total seeing disability
- Hearing disability

Based on these categories, the software products answer to the specific criteria as follows:

- Yes - means that the feature is incorporated in the product, and so the criterion is fully satisfied. (100 points)
- Partly - means the criterion is partially satisfied (20-70 score based on criteria)
- No - means the accessibility criteria is not satisfied at all (0 points)

The criteria taken into account (the list is to be extended and / or detailed):

- Access through key shortcuts to all application functionalities
- Using a browsing order for objects, using the "tab" key (from left to right, top to bottom, etc.)
- Implementation of shortcuts in accordance with local requirements
- Avoiding key shortcuts conflicts
- Multiple possibilities to perform operations
- The possibility to use either the mouse or keyboard to perform an operation
- The possibility to use the application for the persons with only one hand, by avoiding the use of combinations of several keys for operations

- Avoiding the use of repetitive taste
- Avoiding the use of difficult menus for current operations
- Encoding of colors and fonts into the application
- Encoding the lines and graphs into the application
- Encoding styles into the application
- Using names with descriptions for all application objects
- Using text objects instead of graphics (where possible)
- Interaction not based on the assumption that the user has heard a warning sound
- Using visual messages in parallel with audio messages
- Enable the user to set the sound volume and range

This list is not exclusive. There is still the possibility to refine certain criteria in order to have a precise result.

Based on these criteria, on the responses and by establishing weights for each criterion and each group of disabilities, a total score will result.

The model can be expanded by adding an attribute of criteria commitment. This means that if the criterion is not satisfied, then the whole group of disabilities has 0 points.

Conclusions

People's increasing migration into the category of people with disabilities asks for the existence of accessibility facilities in software applications. Another reason is the ease of use of software products that incorporate accessibility features by the persons without disabilities. The accessibility assessment metrics will offer software users and developers the accessibility scores and the criteria to be met in order to increase accessibility.

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