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An Accessible Interface for a Mobile Phone-based Travel Information System

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Abstract

Whenever the design of an interface is approached, it is of foremost importance to consider factors that contribute to a message being accurately transmitted to users. In the particular case of an inclusive interface to be used by people with learning difficulties and others this is even more the case as aspects usually taken for granted need to be revised and adapted to this specific user group. This paper describes the design of an inclusive interface for mobile phone-based travel information system using a set of field experiments.

1. Introduction

The experiments that have allowed us to study design factors listed below were developed in the context of a research project name DAISY (Dynamic Assistive Information System). DAISY is a follow-up to a previous project DIMPLE (Dynamic travel Information to Mobilise People with LEarning difficulties). DIMPLE established the importance of location-based instructions, information and reminders delivered in various forms for people with learning difficulties. DAISY concerns the development of a hand-held device to enable people to obtain pre-recorded information about their location, thus being able to navigate with greater independence.

To fully understand our user group's needs we devised a set of experiments. Two different user groups were invited to take part, one of them involving people with learning difficulties, the other one tourists. The age range of both groups was between 25 and 65 year-old. The methods included the use of drawings, photographs, cartoons; discussions sessions to obtain in-depth responses. We have received feedback on specific suggestion for the interface design.

People with cognitive difficulties often experience spatial disorientation, have greater difficulty retracing and memorising routes. They also have greater difficulty maintaining spatial orientation with respect to external objects and perceiving information from the surrounding environment. Yet they are often entranced by visual stimuli. Working with them we sought to understand and capitalise on this characteristic. So we carried on studies with them to determine the best forms of conveying visual stimuli and the ways in which information and instructions can be delivered so that is clear and understandable for all intended users.

2. Design of the interface

The design of an appropriate interface is critical to the users' success in operating the system. In order to make correct decisions during the design development, it is essential to carry out an analysis of users' needs, as well as a detailed examination of the context in which the product will be used. We consider interaction with an interface to be a process, which involves the following sequential steps:

- perception of an input,
- deciding a course of action and
- implementing the action.

The design of an interface involves the manipulation of a series of audio-visual elements, such as photographs, cartoon images, symbols, text, spoken instructions, sounds, and the layout of the screen.

Mobile devices are often used in dynamic, noisy environments, and users may be moving. This makes designing interaction techniques for mobile devices challenging, and classical approaches used on desktop may not always be appropriate.

Design of the interface for the device was developed taking into consideration the seven precepts for usability and accessibility recommended by TechDis (Technology for Disabilities Information Services). These proposals were suggested primarily for use on

web pages; therefore they were carefully analysed and reinterpreted in order to adjust them to the development of an accessible software interface on a mobile phone.

2.1. Visual presentation and customisation

We kept the content simple and we minimised complexities in the design by reducing the number of colours or font used and the textual information density. We avoided flickering or moving text, blinking images, backgrounds sounds as they can create confusion because it makes it far more difficult to understand. The interface has been designed to look attractive and contemporary, nevertheless we aimed not to include excessive details that would distract the user from the actual purpose of the system.We used contrasting colours for the text and the background on which is sits making the text stand out.We used a variety of audio-visual tools such as illustrations, icons, cartoons, videos, sound, spoken instructions to convey an element of information as one method of input alone may not be sufficient.
Use of photographs is extremely useful to remind a user of a particular landmark during the journey, thus providing an instant recognition of current location. We found out that photographs were the best option for people to recognise a critical point in the route. In the particular case of people with cognitive difficulties it is extremely important that the image on the screen is shown from exactly the same viewpoint, as it will appear to users on their approach. The outcome of the field experiment had indicated just how precisely this viewpoint must be photographed in order for recognition to take place as shown in Figure 1.

Figure 1: Photographs taken for users.

Symbols can be a useful recognition device for users. In addition to words, internationally recognized symbols are a good resource to avoid
any language barrier. The success of symbols depends on consistency, simplicity and legibility as shown in Figure 2.

Figure 2: Examples of text/symbol messages

2.2. Text descriptions for images

Given text description of images is important as it gives a source of redundant information. As previously mentioned this redundant information increases the chance of the user remembering what was shown.

2.3. Accessible elements

We make sure that all elements contain all required labels and alternative text if they are not displayed. We applied a similar idea in software design in order to ensure that there are no problems displaying elements on user interfaces and all required the information is presented to users.

2.4. Accessible issues for other media types

Where media is used (e.g. audio or cartoons) we provide an alternative text representation. This is important to ensure that the media is stable and will always be available. Missing media will cause a lot of confusion to users.

2.5. Help, errors and documentation

A “Help” function is required to assist users if they struggle to perform functions in the system. We provide Help for all the functions. It may be useful to provide illustrations on how to perform tasks rather than simply describing processes in words to make the information clearer and more memorable for users.
If errors occur in the system it will not always be useful to present them to the user. In general the user will not be able to cope with error messages and they will only serve to confuse. To prevent this confusion errors should be dealt with internally by the system perhaps by retrying an operation or performing alternative actions.

2.6. Use and presentation of written language

We presented written language in good, clear English. We kept it simple and understandable using a clear structured format. Examples of written language are shown in Figure 3.
Experimental data from our experiments has shown that fonts from "sans serif" family enhance readability. Among the various sans serif fonts, Arial, Helvetica, Verdana achieved the best results. A mixture of both upper and lower case letters showed highest readability scores in our test.

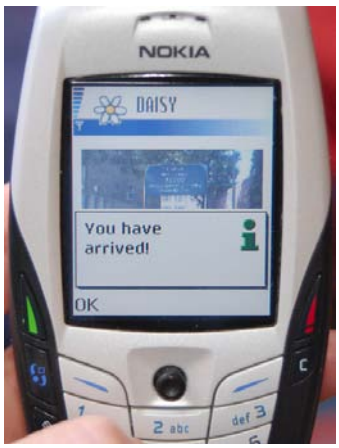

Figure 3: Examples of text messages

2.7.Navigation and layout

The navigation structure is dependable. This means that it must be possible to move through all sections of the software without failure or errors arising during the navigation.
The layout of the interface is based on common design, which is consistent throughout the system. This consistency makes the system more familiar to users and reduces the requirements for remembering how to use each component of the system. If all information is presented in the
same way it is more likely they will remember where to look for what they require rather than repeatedly having to study different layouts.
Such consistency will improve the user recognition of the system and reduce chances of confusion. By reducing the confusion it is more likely that the user will tolerate the system rather than quickly becoming irritated by it and losing interest in using it. See Figure 4.

Figure 4: A consistent layout

3. User guide
3.1. Starting up

To start up the application select DAISY icon from the main phone menu, this bring up the DAISY user system main screen as shown in figure 2.

3.2 Selecting a route

To select a route open the route selection interface. This is done using the "Select Route" command in the left soft-key menu. The route selection list displays all possible routes that can be followed. See Figure 3

Figure 2: Main screen

Figure 3: Select a route interface

To select a route from the list scroll up and down the list using the joystick until the route that you desire to use is highlighted. Once is highlighted press down on the joystick to select the route.

3.4 Show a route

The interface displayed is a list of all the media in the route. By pressing select from the main screen or by electing the "Show the route" command from the main user screen.
To view a particular media in more detail scroll through the list until it is highlighted and then press the select button again. This action brings up the single route media display, when the route media is displayed the instruction media is played. As well as viewing this screen with the title bar it is possible to view it in full screen mode by pressing "Up".

3.5 Tacking

Tracking can be enabled using a GPS. Selecting "Connect GPS" from the menu activates the tracking mode. Locations are then obtained from the GPS device and reported to Daisy. When tracking the background of the route node interface will be coloured in to indicate position.

- Green bars at the top and bottom indicate that you are moving in the correct direction.
- Red bars at the top and bottom indicate that you are moving in the wrong direction
- A solid blue background indicates you have arrived at the desired destination.

3.6 Assistance/ Help

The assistance/help interface can be brought up from any point in the user system by selecting the assistance option from the menu.

4. Conclusions

We have aimed through this paper to delineate crucial steps that should be taken into account during the development of an accessible travel information system, as well as to enunciate those factors playing a relevant role in conveying information to people with cognitive difficulties.

5. References

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