Handheld-Mode Interface for the OLPC XO Laptops

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ABSTRACT

The article gives an account of the "Handheld-Mode Interface for the OLPC XO Laptops" research work within OpenUsability project. The introduction of the following document expounds what the OLPC XOs are and which our research task has been. The second chapter explains the three stages of the work, from the concept to the graphic design. The achieved results are briefly summed up in the conclusion.

Categories and Subject Descriptors

H.5.2 [**User Interfaces**]: Graphical user interfaces (GUI), Input devices and strategies, Interaction styles.

General Terms

Performance, Design, Reliability.

Keywords

OLPC, Xo, Usability, Interaction mode, Handheld, Input System, Interaction Design.

1. INTRODUCTION

The research work "Handheld-Mode Interface for the OLPC XO Laptops" is an OpenUsability project [1]. OpenUsability is an initiative to bring more emphasis on usability to FLOSS (Free/Libre/Open-Source Software) development that offers a mentoring programme for students: the Season of Usability [1].

The research team was composed by a usability mentor (Eben Eliason), a technical mentor (Marco Gritti) and a student of Mass Communication at "Sapienza" University of Rome (Alessandro Vona). The student was supported and followed during all phases of the project by the Usability and Accessibility Lab of CATTID [1], the Centre for the Applications of Television and for Distance Learning Techniques of "Sapienza" University.

The work aimed at the design of a handheld-mode interface to be used on Xo, a cheap computer created by the One Laptop Per Child (OLPC) foundation [4]. The mission of OLPC is to empower the children of developing countries to learn by providing one connected laptop to every school-age child.

Xo is a collaborative computer based on Sugar [5], an operating system created on purpose, the operating system GUI will

be based in Python [6]. The structure of the system is set so as to encourage the creative side of working at pc. These small computers can also be used in handheld mode by rotating the screen and by grabbing the pc like a portable game console.

Nevertheless this is still an unexploited scenario, since there isn't an interface able to let the user manage this mode. Thus our research work was intended to fill this gap.

2. HANDHELD – MODE INTERFACE

2.1 Similar forms of handheld devices and their input methods

The "Handheld-Mode Interface for the OLPC XO Laptops" project started with an accurate analysis of other handheld devices **Error! Reference source not found.** already on the market and their input systems.

In the analysis, we tried to mark out the device typologies to take into account.

Four classes of devices have been identified:

- MediaCenter TV/PC
- Mobile (telephone, PDA, smart phone)[8]
- Ultra Mobile
- Handheld Game Console

Each of these categories has been deeply analyzed. The most interesting typology was Media Center (MC).

Though their characteristics are quite different from the OLPC Laptop, MCs and Handheld game consoles are similar to the laptop taken in exam, due to the limited set of buttons available for the navigation.

	MC	*Mob*	*UMob*	*Console*	*OLPC*
Touch screen	x	x	x	x	
Remote control	x			x	
Arrow keys	x	x	x	x	x
Function keys	x	x	x	x	x
Media player mode	x		x	x	
Cross menu	x			x	/
Grid menu	x	x	x	x	/
Vertical menu	x	x	x	x	/

Table 1. Comparative table between handheld devices

As shown in the Table 1, which compares the different input systems of the devices, the closest typology to the Xo is Media Center, since it is the only one that keeps all the necessary navigation features with a limited input system.

After the analysis, we tried to find out a navigation system able to let the user easily advance to deeper navigation levels, avoiding long menus and misleading modalities.

However we worked bearing in mind the existing interface for OLPC in Desktop mode; it would had been senseless not to take in consideration the previous work of the OLPC, and we decided to offer our contribution compatibly with what already done, but with a slight change of standpoint.

2.2 Hypotheses of a possible Handheld mode's System

The second step was to sketch a number of potential solutions for interaction methods [4]. It was necessary first to analyze the main meta-actions of Xo, trying to rebuild the main navigation paths.

We found that the main actions identified are only possible with the same graphic metaphor as the desktop mode's one.

Then we wondered which type of system was the fittest to allow the achievement of the main meta-actions in this new handheld mode.

We faced tree chances:

1.	a whole new system;

2.	an interaction system with the same graphics as the desktop mode but with objects placed in a different way;

3.	the identical graphics of the desktop mode.

We chose the third solution for a specific reason, that is because the child already knows it and he is used to interact with that navigation structure; moreover with this structure is still possible to exploit all the main XO meta-actions used in the desktop mode.

2.3 Comprehensive Specification for Handheld Mode Interactions

The third step was the actual design of the interface. We worked on the graphics and realized a set of guidelines to be used in the further development of the system; here is a list of the main primary problems of interaction for which we tried to find a solution:

- show/hide the frame;
- highlight item;
- focus item;
- change navigation way;
- navigation in the menu;
- jump to the other end of the frame;
- screen rotation;
- show the zoom level.

Here below the solutions we found for each problem identified:

Show/hide the frame: Finding a way to show/hide the frame was the first problem to solve. We decided to use neither the game pad buttons nor the d-pad ones, because none of these buttons could be used to browse the frame and make choices in the various activities as already set in the desktop mode. The button for the rotation rather doesn't have other purpose than to rotate the screen; so we chose to use this button. Since we wanted to maintain also the original function of the button we

decided to use it in a double way: by pressing it in order to show/hide the frame and by holding it down in order to show the screen rotation menu.

Highlight and focus item: As regards the second and the third problems, we decided to highlight, immediately after showing the frame, the activity in use. We used a white stroke box to focus as we navigate the frame and gray box for selection **(Figure 1)**.

Figure 1. Highlight and focus item in Handheld mode

Change navigation way: It is possible to move around the frame with the arrow keys. We shifted the corners into active points in order to change the direction of navigation. **(fig 2.)** Standing on a corner, and pressing the arrow key inwards the screen, the focus shifts on the first item of the perpendicular side. That is the corner function.
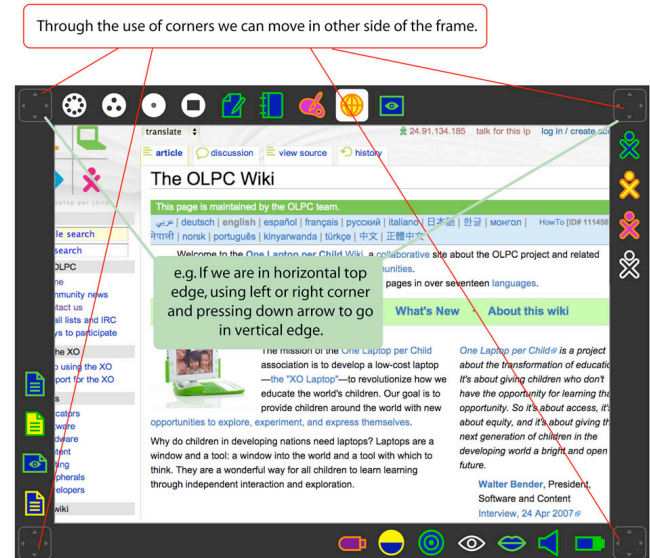

Figure 2. Hot Corners in Handheld mode

We can immediately close the menu by pressing "x" button. We can make a selection with "check" button.

Navigation in the menu: The typical interaction with icons (but the corner ones) in the frame is to press the arrow key inwards the screen, plumb the current frame side, to reveal the menu. It is possible to go deeper in the levels by pressing left or right arrow key, depending on the current frame side, and to come back by pressing the opposite arrow key. The first level of menus always opens towards the centre of the screen, while the following levels open only in horizontal way, where there is available space.

Jump to the other end of the frame: In order to avoid a large number of clicks, we added a loop function which allows to jump to the other end of the side of the frame.

Another way to speed up the navigation is to hold the arrow key in order to see the focus move quicker. The focus stops when the button is released; if we don't release the button the focus stops on the corner.

Screen rotation: The screen rotation is activated by pressing the rotation button. A menu with four XOs will appear. The orientation of the XOs shows how the screen will be. Every XO is linked to an arrow key. **(fig 3.)**
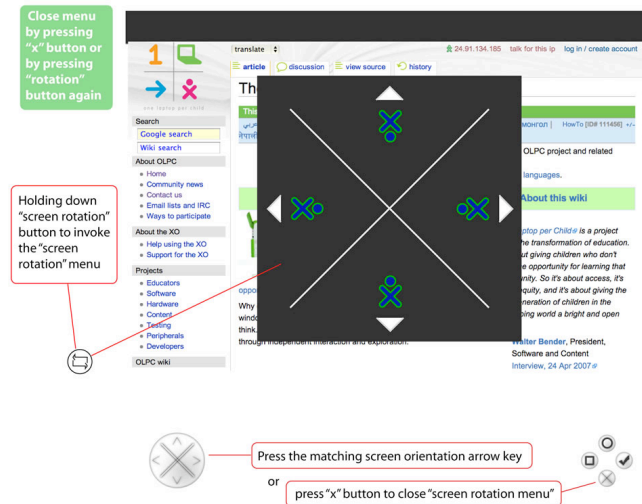
Figure 3. Screen Rotation menu in Handheld mode

Show the zoom level: In desktop mode two kinds of zoom level visualization exist: list view and ring view. The ring view is a circular graphic visualization. In this type of view it is more difficult to move the focus by using the directional arrows that allow horizontal and vertical movements but not diagonal movements, so this view isn't much intuitive. For this reason we decided to show the zoom levels in list view. We also maintained the search filters.

Finally we considered some issues that are still in progress, so our analysis wasn't complete: we discussed about how to slide

quickly in the page, how to skip the page, how to chose and select (experimental hypotheses have been developed but are still open for discussion).

A main problem has been identified in the work area of the activities, that is the separation of the toolbar from the work area. A solution could be the utilization of a show/hide system as for the frame.

3. CONCLUSION

The research showed that without changing the interaction model and using only a limited set of input keys an it is possible to efficiently navigate inside Sugar. Using the same model is the preferred solution because avoids that children get confused, since they already know some specific abilities for the desktop surfing. The interaction solutions founded concern the main meta-actions, which allow surfing through the system. Sugar is a system easily adaptable for a handheld use, but one big problem is still unsolved: to individuate interaction rules that different work teams all around the world can use when designing a specific application for the Xo. The creation and redaction of such rules will be object of further research in the future.

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