Elcano, a Tangible Personal Multimedia Browser

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ABSTRACT
This article presents Elcano, a system allowing to browse multimedia data by the means of tangible widgets and RFID sensors and to create multimedia albums that can be associated to tagged personal objects. The Elcano project targets home usage by creating an integrated device on which a memory stick can be plugged. Users can then browse its multimedia content, see pictures, watch movies, listen to music tracks or create a multimedia album associated with personal objects that can be further used to access and play directly the album. This article presents the Elcano system, the results of a preliminary user evaluation and early observations.

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General terms: Design, Human Factors, Experimentation

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INTRODUCTION

Nowadays, it is possible to store a great quantity of documents on various storage mediums. The storage will continue drastically increasing in the future. A natural drawback of having more documents on the same storage medium is that browsing becomes increasingly difficult. Therefore it is important to ease interaction between humans and their information, through shortcuts that can take the form of personal objects. In this context, tangibles interfaces and tangibles visualizations have proved to be adequate [2]. The goal of the Elcano project is to develop a simple and intuitive tangible browser providing original views of the multimedia content of a storage medium, facilitating navigation using tangible sorting and filtering mechanisms and interactive visualizations. In this case, a memory stick is used as storage medium to provide mobility to the user.

The search of documents in the Elcano project will be facilitated by tangible interactive visualizations, which is the subject of the first upcoming section. In the second section, we present the RFID-based interaction used to ease the navigation through multimedia documents and to create links between documents and personal objects. A scenario of use of Elcano is further presented. The last section explains the various user evaluations performed to improve the usability of Elcano and test users' satisfaction.

INTERACTIVE AND TANGIBLE VISUALIZATIONS

Elcano provides interactive visualizations to ease navigation through a great quantity of documents. The main visualization (see Figure 1B) is divided into two parts. On the left part, documents are plotted according to two axes and are represented by circles in the resulting scatter plot, different circle colours being mapped onto different types of files (jpg, mp3, avi), and a circle's size representing the actual size of the document it stands for. To navigate in this plot, i.e. to select a subset of documents, two physical sliders, each one being connected to one axis, are used to move a rectangular selection box. A special "rotator" button may also be turned to resize the selection area, or pushed in order to zoom in and out in a cyclic way. In the case of zooming in, the scatter plot is rescaled to contain the selected elements only. Hence the navigation space is narrowed down through physical filtering. On the right part of the visualization, a "sunburst" represents a sample of the tree structure of the memory stick. Directories to which belong the selected documents in the scatter plot are highlighted in the sunburst. This gives a compact preview of the selected documents' locations in the tree structure, rather than the exact directories containing the documents, which would take up more room.

When the satisfying subset of documents has been selected in the scatter plot, the user may switch to the documents wheel visualization (see Figure 1C) by clicking on the appropriate button. In the documents wheel, documents names are displayed around the perimeter. The rotator button triggers the rotation of the circle in order to select a particular document. Pushing the rotator button runs the selected document. Three additional buttons map onto other tasks: (1) create an album, i.e. a link between a personal object and a document, (2) read an album and (3) switch back to the scatter plot view. The technology used to attach a document to a personal object is explained in the next section.
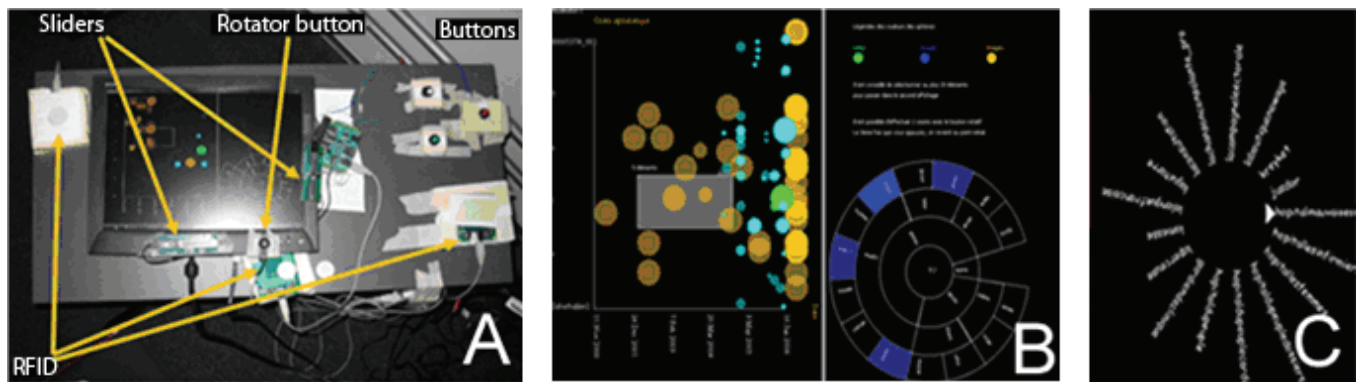
Figure 1: A) Overview of the Elcano system prototype; B) Scatter plot; C) Documents wheel.

RFID INTERACTIONS

Sorting and filtering algorithms as well as binding to personal objects are activated using physical tokens augmented with RFID tags. Radio Frequency Identification (RFID) is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders which are read by RFID antennas. The Elcano system uses three RFID antennas. Two of them allow users to choose the sorting algorithms for the axes. The last one allows users to associate documents to personal objects, in order create a direct link between one's digital memories and an object of the real world.

In the scatter plot, filtering and sorting mechanisms are available. Filtering reduces the amount of documents displayed, while sorting algorithms applied on the axes of the scatter plot re-organize the layout of the documents accordingly. Three types of sorting algorithms are useful for any type of files: alphabetical order, modification date of file, frequency of use. The remaining sorting algorithms are suited to music files: album's date, author's name, real name of song, style of song, album's date.

SCENARIO OF USE

John is looking for a song from the band Radiohead. To ease his research, he decides to display only music. For that, he places the tag corresponding to this filter on the appropriate antenna. Then he chooses to sort elements according to the album date and style of music by placing tags on the two antennas associated with the axes. He moves the selection box on the interesting elements using the sliders. The documents contained in the selection box being too numerous, John zooms on the area of interest. When satisfied by the number of selected documents, he pushes the button that switches to the "documents wheel" displaying the selected elements. He then uses the rotator button to rotate the ring until he finds the desired song. At this point, John decides to listen to the song, by pressing on the rotator button, and then to associates it to a physical photo of the band, by placing a tagged photo on the antenna and pressing on the green button to confirm the association. A few months later, John wants to listen to the song(s) associated to his photo of Radiohead. He places

again his photo on the antenna, and then pushes the red button to play the music.

EVALUATION

A heuristic evaluation has been performed by three usability experts to detect usability problems. Experts followed a list containing ten themes, which guided them in discovering 30 major usability problems, mainly falling in the category "Match between system and the real world". For example, the position of the phidgets was not found adequate. Most usability holes have been fixed and a satisfaction evaluation, on 8 users, conducted afterwards showed encouraging results: users found the visualizations useful and agreeable, and most of them were in favor of using it for a home usage, while they highlighted some difficulties to interact with the tangible devices.

CONCLUSION

This article presents Elcano, a simple and intuitive tangible browser providing original views of the multimedia content of a memory stick. It facilitates navigation on large multimedia documents archives using tangible sorting and filtering mechanisms and interactive visualizations. Moreover, user can associates documents to personal objects. Through heuristic and satisfaction evaluations, tangible personal multimedia browsing seems promising, since it allows rematerializing multimedia content and physical interaction and seems a more sociable mean for home environment than a regular PC.

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