
iCandy: a Tangible User Interface for iTunes

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**Abstract**

For more than half a century, musicians used artwork as a way of visually describing the contents of an album. "Cover art" attracts attention, reminds the listener of the contents, and when printed on the album cover, provides a tangible representation of the music that's easily used for organization and sharing. Over the past few decades, the benefits of the physical album "package" were lost as it changed from a 12 inch vinyl album to an electronic file and thumbnail image downloaded from an online music store. In this demonstration we present a tangible user interface called iCandy that restores the benefits of physical albums for the electronic music in the iTunes multimedia application and provides a method for easy access to recorded media. The system also includes several desktop visualizations that enhance the overall experience especially when dealing with large collections of music and video.

Keywords

iTunes, multimedia databases, tangible interfaces, music sharing, barcodes, information visualization

ACM Classification Keywords

H5.2. Information interfaces and presentation (e.g., HCI): User interfaces.

Introduction

For many years, researchers have focused on designing electronic user interfaces for searching and navigating multimedia. Apple's iTunes is arguably the most popular application in this category when it comes to electronically managing and purchasing media. While many systems like iTunes offer a variety of access methods, few, if any, take advantage of the affordances of paper as a visualization, distribution and retrieval medium. This is in spite of the well known advantages of paper as a user interface [3]. The LeapPad [1] is one example where paper has been successfully used as an interface to multimedia. Users control playback by pointing at words and symbols on the page with a special pen connected to a binder that holds the paper book.

The advantages of a tangible interface to multimedia are clearly shown in our previous work [2]. By transforming video recordings to documents that contain both a visual representation for their content (video key frames) and bar codes that trigger retrieval and display, users reported that the paper representations were much easier to browse and share with others than the corresponding electronic files. Furthermore, the documents could be organized in paper or electronic form; the choice was up to the individual. In some cases (e.g., organizing a collection of video clips), the ability to pile, browse, and sort paper printouts was much more efficient and easier to use than any electronic alternative.

In this demonstration we describe iCandy, a paper-based interface for iTunes that provides similar advantages in access, organization, and sharing. Album cover art (invented in 1939 and in continuous use since [4]) is combined with bar codes linked to an

iTunes library to create paper cards that can trigger the retrieval and replay of the corresponding music. The cards can be used for organizing a collection of albums, just as CD jewel cases. However, the cards are much smaller than jewel cases and easier to use.

We also created a new form of sharing based on the cards. The bar codes contain a standard format that triggers the replay of a designated song. In case the song is not stored locally, the user is asked whether they would like to download it from the iTunes store. This allows our cards to be freely exchanged among people with the assurance that the corresponding multimedia will always be accessible, overcoming the weak points of other solutions [6].

Interestingly enough, our experience with the tangible interface to iTunes suggested two new *online* interfaces we call the Album Map and the Playlist View. The Album Map provides a two-dimensional surface for layout, browsing, selection, and playing of multimedia recordings – capabilities of the paper cards that were not previously available in iTunes or other approaches [5]. The Playlist View transforms a playlist card into a desktop visualization and navigation interface that's populated with the multimedia shown on the card.

iCandy

iCandy is built on top of iTunes and can both control iTunes and be controlled by events that take place within iTunes. The main features of iCandy are:

- printing of albums, songs, playlists or videos;
- webcam-based bar code recognition;
- an interface to the iTunes online store, and
- album map and playlist visualization tools.

Printing

As shown in Figure 1, iCandy produces a kind of *multimedia trading card* representing an album, song, playlist or video.



Figure 1. album (top) and playlist (bottom) cards, all roughly the size of a business card.

Each card contains a visual image based on the content of the media item. For songs and albums, the image is the album artwork. For playlists, a *montage* or collage image is automatically created based on the tracks that make up the playlist. For videos, a key frame from the video portrays its content. A card also contains a unique code that can control playback. In some cases, the code can contain the name of the artist, album, and song(s) that correspond to the artwork. It can be embedded in the card as an RFID tag or printed as a bar code. In this demonstration, we use QR Codes. Cards are printed on almost any printer using the iCandy print dialog. The print dialog interface includes

several layouts and a method for choosing either albums or playlists to print.

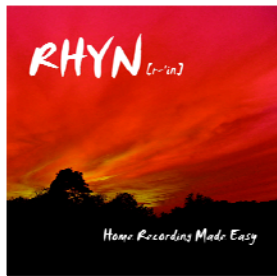
Bar code recognition and Interface to iTunes Store

Bar codes are recognized with a common webcam. iCandy controls the webcam by capturing images and analyzing them for bar codes. If a bar code is recognized, the information in the bar code specifies the media to play. If the media is in the user's iTunes database, it is launched in the iTunes application. Otherwise, iCandy directs the user to the iTunes store where the album can be previewed and purchased. This is accomplished with a URL provided by Apple that, when populated with the artist, album and, optionally, the song, will automatically direct iTunes to the desired album. Once the song or album has been purchased, the original card can be used to initiate its playback.

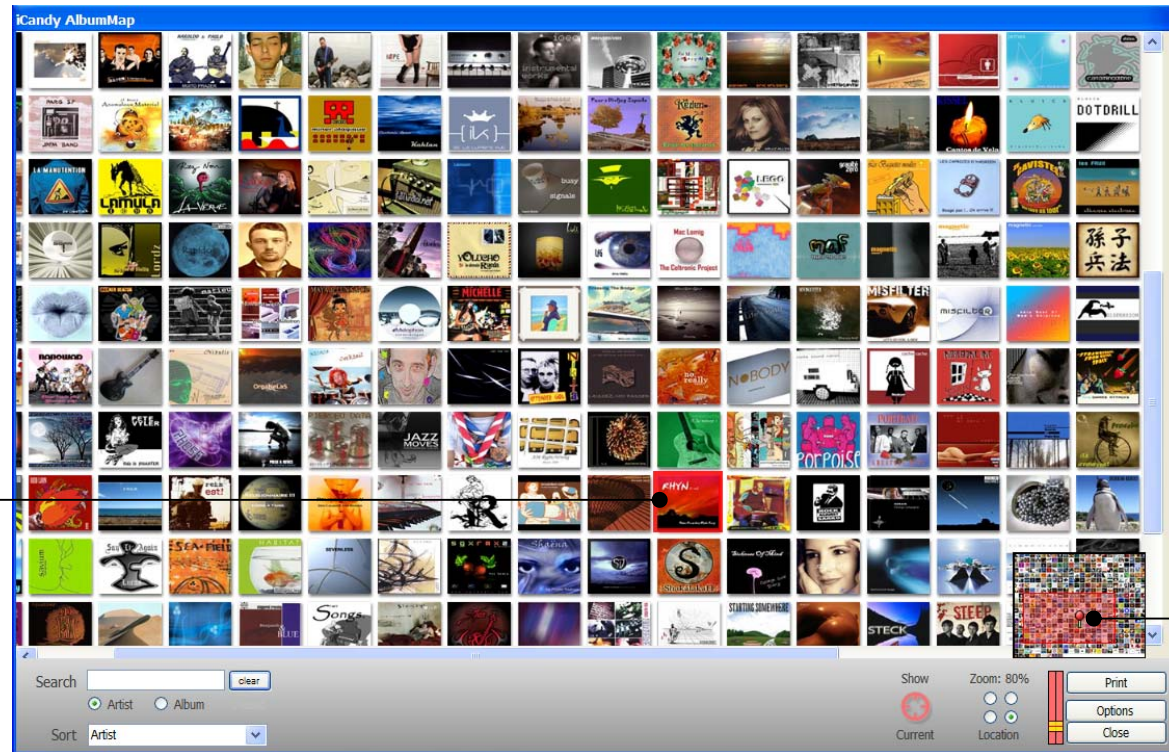
The Album Map

Browsing and locating relevant content in large media collections (e.g., 500+ albums or 2000+ songs) can be a challenge in iTunes. It's easy to forget about certain albums in one's own collection. The iTunes application does not provide a visual overview of all albums other than what is shown in Coverflow. Coverflow, however, only shows a small number of images at one time: the image in the center and only a portion of 3-4 images on either side of the center image. Figure 2 shows an example of what we call the *Album Map*, a two dimensional visualization of the albums in a user's iTunes collection (over 1100 albums are shown in the example).

The Album Map is created by generating a resizable table of small thumbnails (e.g. 102x92 pixels), one for each album. We start with a user-controlled number of



Currently playing album is shown with red highlight in the focus area and a flag pole in the overview area



Overview area with flag pole denoting location of currently playing album

Figure 2. The album map with about 500 albums (roughly 2900 songs). The red area in overview represents current location in map. The slider at left of the Print button is used for shrinking or enlarging the map.

columns and grow only the number of rows depending on the size of the media collection. In the above example, the table is 30 columns by 36 rows. The ordering of the table can be modified depending on the selected sort criteria: artist name, album name, most played artist, most played album, and genre.

An overview widget is provided (shown in the lower right corner of Fig. 2) that's similar to what is found in the Google Map interface. The overview displays a thumbnail image of the entire table along with a red lens depicting the current location in the table. Using a mouse, the lens can be repositioned to any location in

the table. The entire map can be scaled using the vertical scroll widget which is to the left of the overview area. Moving the scroller up shrinks the map image, thereby showing more albums in the main viewing window. To initiate playback, a user can either simply click on the album art to start playback of the entire album or right-click on the image to display a context menu. The menu contains the list of songs from the album that may be selected to begin playback.

The search box on the lower left side of the screen can be used to search by either artist or album name. We use an incremental search that filters albums or artists

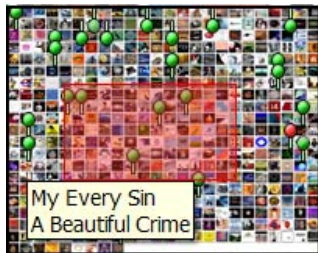


Figure 3. Album map overview area during a search. Green sign posts are displayed in the approximate location of each matched item. Hovering over a sign post displays a tool tip with the name of the artist and album.

as each character is entered. Items that match the search criteria are highlighted in both the map and overview areas. In the overview area, a small green sign post is displayed at the approximate location of the album image, as shown in Figure 3. Hovering over a sign post displays a tooltip with artist and album information. Clicking on a sign post initiates playback.

Users can print iCandy cards from the album map by selecting either the *Albums* or *Songs* buttons located at the bottom right hand side of the window shown in Figure 2. After selecting one of these buttons, all selections, either albums or individual songs are shown in a print dialog box. Once all choices have been made, a print layout is selected to finalize the printing process.

The Playlist View

One of the most popular features in iTunes is the playlist. A playlist is a collection of tracks composed either manually or with criteria like “year = 1990-1999”. The playlist view depicts a playlist as a graphical representation attached to the user’s desktop. Like the album map, the playlist view uses the album artwork associated with each track in the playlist.

Figure 4 shows an example playlist view for 60 songs that would typically be attached to the right side of the user’s desktop. The focus+context method is, again, used for representing the playlist. On the left side is the focus: a larger area providing a zoomed-in representation of the playlist where the user can click on images to initiate playback. On the right side is the context where the tracks are displayed as a thumbnail. The yellow lens shows the current view in the playlist and what is currently visible in the focus area.

A user can grab the lens to reposition the playlist focus area. The images representing the tracks are horizontally staggered to make them more visible when packed together. The currently playing track is enlarged (in both the focus and context areas) and a red border is added to emphasize it. Hovering the mouse over any track causes the image to be slightly enlarged and a tooltip to be displayed with the track and artist information (e.g. “Gars Trans, Western Lointain”). When the cursor is moved away for a few seconds, the playlist view slides off the desktop. Moving the mouse to the extreme right side of the desktop brings it back into view.

Observations

A user study was conducted in a home setting where the system was attached to an LCD TV and left ON at all times for two test subjects, as shown in Figure 5. The five year old created her own catalogue filled with her favorite music. She was shown how to initiate playback with the cards and the webcam bar code scanner. From then on, she knew to place the scanner over the “funny dots on the card” to start the music. During playback, the album art of the current track was displayed in a large window on the TV. We found this to be important since the children associated the music with



Figure 4. Playlist view

an image they liked. The five year old also enjoyed sorting and rearranging her cards.



Figure 5. iCandy in use at home.

This test setting has been in use for more than a year and the children continue to enjoy being in charge of the music. They also enjoy the tangible aspect of iCandy since having a visually descriptive card to “play” with makes the music more meaningful to them. The five year old often uses iCandy to share her music with visiting friends and teaches them how to use the system themselves.

Conclusions

We presented iCandy, a tangible interface for iTunes that makes it easy for anyone to access, organize and share the multimedia in an iTunes library. We have extensively demonstrated the system and built an iCandy software system that can be used on any PC with a printer, a webcam and an iTunes database. The paper-based interface presented here has also been applied to other multimedia databases including the YouTube video sharing site. In this case, cards contain the key frame assigned to the video by YouTube and a bar code that includes the URL for the clip. This is

another example of a multimedia trading card for the online collections of multimedia that are becoming increasingly popular.

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