Snapster: A collaborative desktop photo sharing application

ABSTRACT

As digital image file sizes become larger, the act of sharing images becomes more complicated when problems for transmission and storage are introduced. We propose an application design that utilizes peer-to-peer (P2P) networking concepts. P2P enables users to share images directly with their intended audiences. Image tags, both user and system defined file attribute labels, produce an image file management system that abstracts away from the hierarchical file system on the hard disks. The design unifies the management environment and the sharing environment into one seamless experience.

INTRODUCTION

What we propose is a peer-to-peer sharing environment that integrates a local image management system with a sharing system. Instead of uploading or sending images to recipients, images are instead tagged with viewing privileges. Friends and family who are granted viewing rights can then browse these images from their local machine. Thumbnails and metadata of shared images pass automatically from host to recipient when both users are online. Just as one organizes and browses images with tags on their local machine, the same methodologies are applied when one browses and collects images from friends. Downloads of full size images occur when both users are online. Requests for downloads are queued when a connection is not available and performed automatically when the connection is reestablished.

We began this project with inquiries into the current use of social networking applications in general and image sharing applications in particular. From these studies, we narrowed down the functions of our applications as well as the target population our design is meant to serve. This application is intended to work with high-speed broadband connections, such as those found on most college campuses and now increasingly in homes as well. For this reason, the members of our target population are college students, although anyone with a broadband connection could benefit through the use this application.

Today, consumers of online image sharing span many demographic categories such as male vs. female and teenagers vs. adults. We have chosen to focus on college students because they often have free access to broadband connections and spend countless hours online. For those who no longer live within close proximity to their family and friends, this system allows them to "keep in touch" by automatically sharing their experiences through the images on the P2P network. Combining digital image organization with P2P file sharing will provide a way to integrate a more group-based approach to photo sharing.

We conducted a study with six subjects in order to evaluate the interface of our system. We also wanted to probe the subjects' conception of P2P sharing and tagging. Through testing, we came to the realization that CSCW systems are composed of two distinct elements: the interface and the concepts driving the interactions within the system. In this paper we describe our design, the evaluation of the interface and our proposition for a study to test the P2P sharing concept.

BACKGROUND

Digital image file size and digital camera purchases are increasing in lock step with one another. The Photo Marketing Association reports that year-to-date digital camera sales are up 23% from 2004 and analog camera sales are down 38% in that same period [8]. The striking changes, though, are found in specific megapixel ranges. Sales of cameras 3 megapixels and lower fell by 82% whereas sales of 7 megapixels and greater cameras soared by 637% in the year-to-date. Large megapixel images consume significant amounts of disk space. At 7 megapixels, 1 gigabyte of disk space can hold about 409 images (1024mb of disk space storing images with an average size of 2.5mb). In contrast, 1 gigabyte of disk space can hold 2048 images at 1.3megapixels (1024mb of disk space storing images with an average size of 0.5mb).

Simple, efficient and direct methods of sharing will become essential as image file sizes increase alongside the escalating adoption of digital photography by the general public.

RELATED WORK

The increasing file sizes of large megapixel images presents a problem for users who wish to share these images with others in a digital format. Attaching an image to an email is a simple option, but most service providers cap the size of attachments at just a few megabytes. Perhaps for this reason, several web-based services ([1] [5] and [12]) now exist. They allow members to upload images to a proprietary server and display those images through web browsers. These sites limit the space allocated to basic, free accounts. One must pay fees to gain access to increased storage privileges.

Online applications such as Flickr [1] use tagging as a means of organizing images to escape the concept of

albums which become tough to manage when they are large in number.

A new photo sharing application named Riya [10] automatically tags and edits images based on the people and text in them, using face-recognition technology.

Picasa [2], from Google, enables users to do powerful editing easily. It organizes images into "Picasa collections". These can be exported into the local file-system and uploaded to any online image-sharing website. Alternatively one can share them with friends through email, Hello [3], webpage publishing, or video publishing.

SNAPSTER DESIGN

Our system not only introduces a method of sharing digital images that eliminates files size issues, but it does so in an application environment that provides seamless digital image management and sharing capabilities. One unconsidered consequence of sharing images through an online web portal is the disconnect that develops between the presentation site and the storage site. From our earlier user studies, we have observed that users are apprehensive of spending a lot of time arranging, editing, and commenting the images online due to online speed restrictions, space limitations and security. Especially when they have already invested time into organizing their images on their own machine. Managing image arrangement and commenting on the local machine ensures that that information is at least as secure as any other data a user has on the hard drive. From interviews with members of our target population, we also discovered that users tend to post images online for others to see, but they view their own images on their local machines. Our design bridges this gap between local and shared.

We do this by incorporating a peer-to-peer network sharing model into our design. P2P became extremely popular in the late 1990's and early 2000's when applications such as Napster entered the scene. The concept is a powerful one, essentially bypassing the need to upload data to a central clearinghouse where it is indexed and stored. P2P connects the request for data to the data source and bridges the two together.

P2P file sharing applications still exist and can be used to share digital images among other file types. Our design is unique because it introduces the combination of a simple yet powerful organization system with a transparent P2P sharing scheme. Users enter their email address into their local copy of the image sharing application. To connect to a friend's digital image collection, a user creates a friend account and provides that friend's email address—the same one registered to the remote image sharing application. Users may only view images to which they have been granted privileges. In other words, a user has the option to make specific images visible to specific people.

When users browse a friend's images, they will find thumbnail representations of all the images that they have permission to view. The thumbnails are downloaded and updated automatically when the system detects connected systems are online. To download full size images from a friend's machine, users save the thumbnails to their local machine. The files are then queued and downloaded. If that particular friend is not online at the moment, the queue forms as usual, but the program waits until the specified system is back online before commencing the download.

Viewing privileges are just another type of meta-data that users can associate with an image. Our design eschews the hierarchical file system and adopts a file tagging system as an organizational method. As a piece of data, a digital image is a rich source of information. The context and content of an image make it an interpretable data source. Embedded folders force a user to choose one context or one aspect of the content as the key reference for purposes of storage. Tagging an image with multiple descriptors allows users to associate an image with unlimited contexts and to highlight any content elements. The benefit of tags is that browsing images on the local system or on a friend's system will occur in the same environment.

Applying tags to images demands a bit of labor from the users. To make this task easier, we include "Auto-tagging" that labels each image with pervasive information already associated with it such as any descriptions, folder names from the hard drive storage location, and date of creation. We also include a feature that allows users to browse images horizontally. When searching for images with a specific tag, the ten most popular tags of the resulting image set will appear in a "related tags" tags window. We are currently planning additional usability tests to determine the usefulness of this feature.

As digital photography replaces film-based photography, it has provided photographers with the ability to manipulate photographs long after they are taken. Photos can easily be correct for lighting, color balance, and crop smaller portions of the original image. One of the main drawbacks to editing digital photographs is that unless the user specifically backs up a copy of the original image, it is lost when changes are made.

Our design addresses this issue by allowing users to manipulate images through filters that change aspects like lighting, color enhancement, and cropping. When users apply these filters to an image, the original image is not changed in anyway. Instead, the applied filters are saved and linked to an instance of the original image. This allows users to create many different versions of an image without actually having to store all of the images separately. In addition, we provide access for users to create their own edited instances of their friends' images leading to cooperative image editing through the P2P network.

USE SCENARIOS

John Smith is a 22 year old sophomore in college. After he returns home from a weekend ski trip, he decides he would like to share his photos of the trip with his friends. He first plugs his digital camera into his computer and downloads the images to the directory where all of his other images are stored. Snapster automatically finds the images in this directory.

John then starts the Snapster application and selects the "new" tag, which trims the library view down to only recently added images. He then selects the images from the ski trip, this action highlights them in the active images panel. John then creates a new tag titled "ski trip" and applies it to the active images by dragging the tag to the active images panel.

Now that the images have been tagged, he would like to share them with his friends Susan, David, and George. With the images still selected in the active images panel, John drags the names of his friends from the "friends" panel to the active images panel.

Now that Susan, David, and George have access to view John's photos from the ski trip, John would like to see if Susan has any pictures from the weekend. He clicks on Susan's name in the friends panel to switch to friend view. The application interface remains the same, but the library and tags panels now display Susan's images and tags.

John clicks on the "skiing" tag to limit the library to only skiing-related images. He notices that there are still too many images displayed, so he clicks on the "2005" tag to display photos that are tagged with both "skiing" and "2005." John finds an image of himself and his friends at the ski lodge and decides to download the full-size image. He right-clicks on the image and selects "download." Since Susan is currently offline, the image is added to the download queue and will be downloaded the next time that both John and Susan are online.

EVALUATION

We conducted both formal and informal testing throughout the design process. These tests included ethnographic interviews and usability sessions using paper prototype mockups of the interface.

Prototyping and User Testing

For this study we developed a paper-prototype of the interface for our application. We planned the tasks and determined thereby the elements of the interface we would need.

We designed the paper models with a drawing program. This approach was easier and cleaner than hand drawing the interface elements. Figure 1 contains the paper prototype pieces.

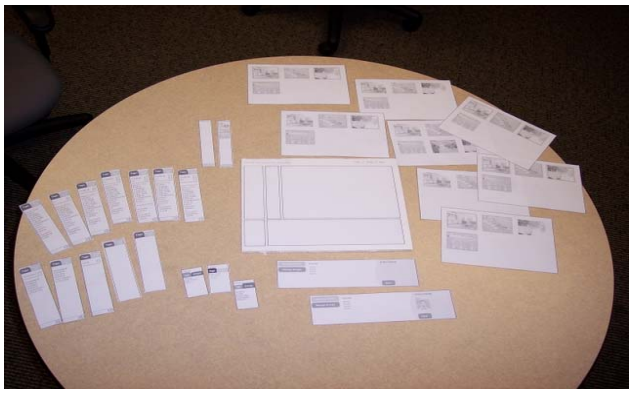

Figure 1 -- Paper Prototype Pieces

In the center of Figure 1 is the main interface. The elements are sized to fit into specific slots on the main interface. As users navigated the interface, we swapped the individual elements in and out to represent their selections. To the left are the tag menu bars that present the tags attached to the images in the main window. To the right are the screens that can appear in the larger main menu.

Tasks

For the first task we had the users sort through their image library by selecting multiple tags to narrow down the search. As the user selected a tag, we changed the images in the main window to reflect the reaction of the system. The users selected two tags present in the tags window. The third tag they had to find was not present and thus required the users to add it to the list and then apply it to the images.

Once they had completed this, we asked them to browse through their friend's photos and use the tags to once again narrow down the search. The users then downloaded a full-size image from their friend's library and returned back to their images.

Results

The following list shows some components of our interface that need to be addressed in order to make the system more beneficial for the user:

1. The users had different views on how tags should be added to individual or groups of pictures. The majority of users would either select a group of images or drag each individual image over to the tag name.
2. While adding a new tag name to the master list of tags, we expected users to start typing the name into the search box. Once they realized that the tag did not already exist, they would continue typing the name and click on the plus sign (+) to add the new tag. When they did not see the tag on the master list, some users clicked on the plus (+) sign and expected a dialogue window to appear.

3. When users were switching between their own images and their friend's images, some of the users who did not complete the task were confused by the wording of the button 'clear' and some did not associate the button with the task.
4. There were a few areas of the interface that were not used during the testing sessions. One reason could be that they were not directly introduced within the tasks given to each user. Another could be that the users felt that they were not useful. These sections included the active image panel and the related tag panel.

In regards to the issue of tagging images and adding new tags it would be good to develop two to three different methods of accomplishing each task and then ask a user to elaborate on which method they prefer and why. To fix the issue of navigating between one's own images and those of friends, we could change the text on the 'clear' button so that it indicates to the user, more clearly, where it will take them. For this issue, one user mentioned that it would be useful to have a tab at the top of the tags panel that took the user back to their own images.

Future Testing

In order to see how our users understand the underlying concepts of photo sharing with P2P networks we would like to try the following method. We would first gather a group of users in a room. Each user would be presented with a stack of images that include both thumbnails and larger versions of each image. The users would walk around the room interacting with each other and 'share' images. Initially each user would show the other users their thumbnails and if another user is interested in 'downloading' that image he or she can request to see the larger version.

During these interactions, individual users will be asked to leave the room at random times. When users leave the room they will leave behind their thumbnails and take with them the larger version of their images. While users are out of the room the rest of the users may continue to look at their thumbnails. If they want to view the images they will have to place the thumbnail in their queue and wait for the user to come back into the room before they can see the larger version. This whole scenario will represent the peer-to-peer process of the application. When the users leave the room they are simulating the action of being 'offline'. In our program users can only see thumbnails of their friends' images who are offline. With this process we hope to find out if users understand these concepts and are able to successfully interact with their friends.

CONCLUSION

Although our testing demonstrated some minor design flaws within our interface, overall it was very successful in that it has pointed out many positive aspects and also areas for future testing. In the past there has been a lot of success with the idea of P2P sharing, and the impression that we got from our users is that there is definitely an interest for it in the realm of image sharing. From here we plan to pursue this idea and gain more information on how our users adapt and interact with the idea.

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REFERENCES

[1] Flickr, http://www.flickr.com

[2] Google's Picasa, http://picasa.google.com/index.html

[3] Hello, http://www.hello.com/index.php

[4] iMesh, http://imesh.com/

[5] Kodak's EasyShare Gallery, http://www.kodakgallery.com/Welcome.jsp

[6] Kules, Bill Hyunmo Kang, Catherine Plaisant, Anne Rose and Ben Schneiderman. Immediate Usability: a case study of pubic access design for a community photo library. Interacting with Computers 16, 2004, 1171-1193.

[7] Kustanowitz, Jack and Ben Schneiderman. Tools & techniques track: automatically managing media: Meaningful presentations of photo libraries: rationale and applications of bi-level radial quantum layouts. Proceedings of the 5th ACM/IEEE-CS joint conference on Digital libraries, June 2005: 188-196.

[8] PMA Monthly Printing and Camera Trends Report: Highlights and Overviews through September 2005. Photo Marketing Association International (http://www.pmai.org), November 22, 2005.

[9] Raven, Mary and Alicia Flanders. Using contextual inquiry to learn about your audiences. ACM SIGDOC Asterisk Journal of Computer Documentation, Vol 20, 1, 1996: 1-13.

[10] Riya, http://riya.com/

[11] Sarvas, Risto, Mikko Viikari, Juha Pesonen, and Hanno Nevanlinna. MobShare: controlled and immediate sharing of mobile images. Proceedings of the 12th annual ACM international conference on Multimedia. International Multimedia Conference, Technical Session 9, 2004: 724-731.

[12] Webshots, http://www.webshots.com/homepage.html