

Automatic Layout Generation for Digital Photo Albums: A User Study

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Abstract. The low cost and ubiquitousness of digital cameras allow ever larger collections of photos. Although storage is not usually a problem, selection for presentation requires time and effort. Studies show the existence of user groups that never tried to create digital photo albums or were discouraged by the difficulty of this task. Trying to minimize the effort to create albums, we developed a prototype called Twingle. Using Twingle the creation of an album requires dragging pictures into a page and the program is responsible for positioning and resizing. To investigate whether such an automatic layout generation could be an alternative to users, we made a study exploring Twingle with users from several ages and professional areas. The related works, the performed user study and its results are discussed here.

Keywords: digital photo albums, automatic layout generation.

1 Introduction

Before the age of digital cameras, several considerations limited the amount of photos taken by most people and affected the practices adopted for their organization and presentation: a small number of photos were taken and developed to be organized as photo albums. The access to digital cameras favored the growth of photo collections [2,8,11], and these much larger collections demand new tools and practices for their organization.

It was observed [4] that even though the most accepted way of viewing pictures are the printed albums, most people do not create them. Some never tried, and some of those who tried were discouraged by the difficulty of creating an album [4]. Users of commercial tools consider the creation of digital photo albums (DPA) a costly and time consuming task [20], since these tools require manual edition of the pages by placing pictures, text, backgrounds and decorative elements [17].

In this context, we believe that the automatic layout generation of DPAs (or part of them) could benefit users who have difficulties to perform this task or do not want to spend time at it. To test this, it is necessary to explore and understand the behavior of

users of such tools and find out the needs that these tools should address. In this context, we developed a prototype called Twingle that automates the process of DPA production using automatic layout generation. Twingle tries to minimize the effort to create albums, since it only requires dragging pictures into a page and the program is responsible for positioning and resizing them.

In order to investigate whether such an automatic layout generation could be an alternative to users, we made a study with people from several professional areas and ages exploring Twingle. The results and a discussion about our findings, as well as the related works, are presented in the following sections.

2 Related Works

Most people are photographed or receive photos at some point in life [18]. In this context, several authors [4,6,7,14,16] tried to understand how people deal with their photo collections and those studies show an evolution in the practices adopted during the transition from non-digital to digital photos.

Photos organized in an album usually tell a story and people feel obliged to organize their pictures for family and friends. When they do not do that, they say that “ought to” or “definitely planned to” [18]. Families usually select and arrange their favorite photos into albums to present them personally to friends and relatives, but the production of photo albums is considered complex and time consuming [4]. The same study also stated that few people spent time organizing their digital photos [4], but they usually “throw” their photos into a folder similarly to a shoe box where pictures are often stored [14].

Another study shows that most people organized their digital photos into directories according to the convention “date/event” or similar [7]. To do this, they use interfaces similar to Windows Explorer, rejecting photo management software. A similar study [1] shows that people place images into directories and feel more satisfied with the organization of their digital photos than the non-digital, as they had “all in one place”, giving an illusion of organization, since the digital photos do not take up physical space.

To ease the organization and creation of photo albums, several studies [1,8,11,13,14,16] have proposed methods and tools to manage large collections of images, integrating resources such as timestamps, GPS data and face recognition information as a way of clustering photos into collections. The goal is to speed up and ease the user experience in time-consuming and tedious tasks [1].

In addition, to understand how people deal with their photo collections, several works [1,5,6,9,16,21,22] focused on the creation of DPAs, and tools [10,19] have been developed commercially to the same purpose. DPAs (or photobooks) are typically produced for printing. The result is usually a file to be sent to the owner of the software, which produces a high-quality printing of the album. These tools (available online or in desktop versions) allow for the free edition of the layout and use templates [10,19] to organize the images on the page. Others [3,9,20] provide solutions for the generation of collages, solve problems of unfilled spaces in album pages, and

generate DPAs with only a few initial selections required. There are still other authoring systems that automate user tasks [5,22] like image grouping, background selection, automatic page layout and other functions.

3 User Study

To investigate whether a simple interactive tool would ease the production of photo albums, helping to assuage the lack of time and knowledge of the users, a prototype called Twingle - characterized by the automatic organization of the pictures and texts in photo albums - was offered to a group of people.

The study had two phases: the first explores the first version of Twingle. In this phase, several enhancement suggestions were given by users to improve their experience with the production of DPAs. The second phase was performed with an improved version of Twingle, containing the most relevant functionalities suggested. Subsequent sections describe Twingle and the two phases of the study.

3.1 What Is Twingle?

Twingle is a prototype that tries to reduce the effort to create photo albums: the user does not need to position or resize images on the page and the layout is done automatically. It was implemented using HTML/CSS and JavaScript, allowing its use in any web browser supporting these languages, and communicates with a server responsible for the layout algorithm.

The creation of an album requires only dragging images into a page, as the program on the server is responsible for positioning and resizing images using an algorithm for automatic layout generation [12]. Briefly, the algorithm receives a set of rectangular items to be placed on the page and estimates the amount of area needed by each item, using a divide and conquer approach to put them all on the page. To each added item, the procedure is performed again to position it in a visually pleasant way, in which images and their assigned regions should have similar aspect ratios. Moreover, the page needs to be homogeneously covered, that is, items should be evenly placed on the page and not cluttered on some region, not leaving excessive empty space and filling the entire page as much as possible.

There are several tools and systems mentioned on Section 2 that may be similar to Twingle, however none of them used an automatic layout generation for DPAs composed of texts and images selected by the user. Works that provide an algorithm for automatic layout generation [3,9,20] do not support text inclusion, whereas some commercial tools allow the creation of DPAs, but only using templates [10,19]. Others [1,5,22] have different purposes, automating the task of selecting photos or allowing a different way of interaction [6] or organizing the pictures [16]. Thus, Twingle was designed with a specific goal to investigate the reasons behind the difficulty of producing and presenting DPAs.

3.2 First Phase

In the first phase, besides dragging images to compose a page, Twingle offered the following features: start a new album, add new pages, view the album in full size, generate a PDF file for printing, as well as delete an image from the page, add a caption to a picture or shuffle the images to obtain a new page layout. Figure 1 shows a sample album.



Fig. 1. Page generated by Twingle as images and captions are inserted

Objective.

To study whether a simpler tool for page design would be well received by users. A prototype was tested to produce DPAs just by dragging and dropping images to a page, and layout was produced automatically.

Description.

This study was conducted with 15 users from several professional areas, such as computer science, graphic design, architecture, management and psychology, among others, and ages between 18 and 60 years.

A pre-interview showed that not all users like to make photo albums, and some of those who like sometimes thought the task was too laborious and time consuming. Thus, these users were organized into three groups (five users each), according to their willingness to create DPAs: Group 1, users that like to make photo albums; Group 2, users that would make photo albums if they knew how or if it were “practical”; and, Group 3, users that do not like/do not wish to make photo albums.

To split the users into such groups, their answers to the following four questions were analyzed: Generally, how do you present photos to your friends/family? Do you like to make photo albums? Do you make traditional photo albums (print and place photos in an album)? What is your opinion about making DPAs?

Each user had the opportunity to explore the software and produce albums with it. As the purpose of the study was not to evaluate the tool but to allow users to evaluate a simpler process of automatic creation of DPAs, they were free to ask questions to the observer during the study.

Thereafter, an interview was made with open questions (the same for all groups) and one variable question according to the specific group. The main idea was to identify, during the experience with Twingle, the users' behavior and needs regarding automatic tools for creating DPAs.

Discussion.

Each user was identified by a group number (1 to 3) and a letter (A to E). Among the 15 users, 9 showed previous discouragement about the creation of photo albums due to time and work involved, including some of the users who like to make photo albums, as the case of user 1D, which considers commercial tools too laborious for people not used to designing documents: *"The matter of design is troublesome. As I am not a designer, it took me a month doing an album with another tool, changing the orientation and photos on it."*

Considering these users - who like to make albums - three of them are used to tools for DPA generation. When asked if they would make an album using Twingle, they said they possibly would, but more features need to be available. On the other hand, those who had never used a tool to create albums said that they could use Twingle, as mentioned by user 1C: *"I really liked, it is very practical. It's easier than the programs I normally use to print photos, such as Word. I tried to organize everything into Word or printed directly from Paint, Photoshop."*

Among those in group 2, 2C uses a tool for DPA generation, and 2B did not know these tools; the others knew but did not use them. After the experience of using Twingle, only 2A had restrictions about its use, saying that he would use it only if additional resources were available.

In group 3, only two users previously used a tool for DPA generation: 3A and 3D indicated that it is a laborious task and 3A also highlighted that when using the automatic layout, the results were unsatisfactory: *"I take a long time, until today I used only one automatic tool, but the result was disastrous."*

After using Twingle, when asked about its use for generating albums, 3D said he would not use it because he prefers to have full control over the final layout: *"I am a user who likes to be in control (...). I like to adjust the size of the photos or place of the caption (...) I like to move items to let it the way I want (...)".* User 3A says he would make those without restrictions, and the others would require more features.

When asked whether the results of Twingle could be shown to friends and relatives, only two users had restrictions to the final layout: 1A and 1B, which usually make albums. User 1A indicates: *"As it is today I don't think so, it lacks some features."*, and user 1B said that he preferred to show the photos in full screen. Among the main reasons for presenting the results of Twingle for friends and family, the practical organization of the photos and the pleasing results were mentioned by users from the three groups.

When asked whether they would print the results, there was a trend to use the result in the computer instead of printing albums, and users mentioned emailing or publishing on the internet. Some of the reasons for not printing are the absence of resources they would like and the lack of knowledge about places for printing a PDF file with photo quality.

User comments show that for better results some features are especially important. Among the most mentioned functionalities, were:

- change the position of a picture while keeping the general layout;
- resizing a specific photo;
- choose the page orientation (portrait or landscape);
- have background or ornament effects available;
- be able to place general texts (not captions) on the page;
- free control of the spacing between images;
- preview the results on the screen, including video and interaction.

3.3 Second Phase

To the second phase, Twingle was refined according to the results from the first phase. The most relevant features demanded by users were added: upload (working both for photos and backgrounds), addition of general text/headlines, page orientation, background insertion and interactive possibilities to resize or change the position of a photo, and delete a whole page. Figure 2 shows a DPA created with the new version, containing a headline, several photos, text areas and captions.

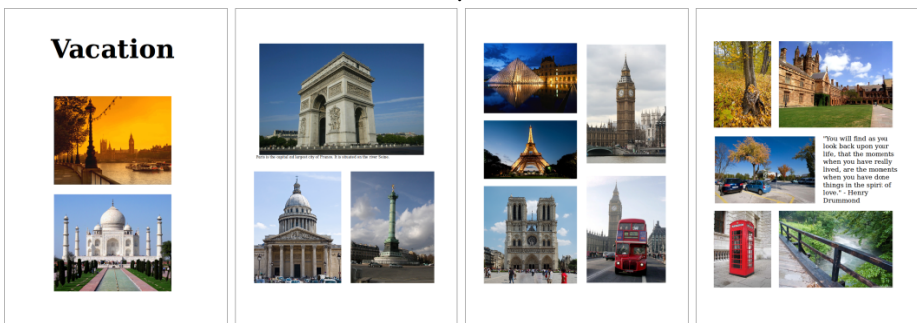


Fig. 2. DPA album generated by new version of Twingle

Objective.

This phase was performed to verify if there was any difference in the results compared to the ones from the first phase and to check if the implementation of the new features had turned the experience of creating photo albums more enjoyable and less complex.

Description.

This phase was performed 8 months after the first one. Participants belong to the same professional and age groups mentioned previously.

To determine whether there was an improvement of the user experience, we called new participants, as well as volunteers from each group from the previous research. The methodology used and the classification of the new volunteers into groups

remained the same from the previous phase. We had the participation of 8 people from the first phase, and 6 new volunteers, totaling 14 participants: five users at Group 1, five at Group 2 and four at Group 3.

The new participants received the same questionnaire of the previous phase according to their classification into the groups, and the old ones answered a new list of questions, among which we mention: What did you think of the new features of Twingle? On what occasions would you use this tool?

Discussion.

For analysis and discussion of the results, the 8 volunteers from the first phase were identified by their previous codes (A to E) and the 6 new users were numbered in sequence (F to G).

Regarding to the new functionalities, 6 from the 8 participants of the first phase acknowledged that both the use experience and the results provided by the new version were better, and 11 from the 14 users said it was “*quite good*”.

Among the 6 new users, 3 never used photo album software and believe such work is tiresome and time-consuming. When Twingle was used for the first time they observed that the process may be quick and practical, and showed interest in using such a tool to organize their pictures for family and friends. Participant 2F said: “*I did not know those tools, I had no idea how easy it was to produce an album. It is more interesting to see the pictures like this, as I use to organize them by event and it would be nice to put them all on the same page.*”. 2G talks about Twingle as an image organizer: “*It's a very simple way I have to organize my photos. I found it very practical, fast, and creating the album was an easy task.*”.

Four participants suggested a new feature for Twingle: to generate pages automatically without the user having to drag the images individually, but just select a folder on their computer and let the program take care of producing the album. User 3A says: “*Since this is an automatic tool, it is interesting that I could insert all my photos and the program returns the pages of the album.*”.

Among the 4 users from the third group, those that dislike or do not consider producing albums, only one continued disliking after using the new version of Twingle. The reason was that this user does not enjoy taking pictures or manipulating them digitally, and does not even publish them in social networks. That user said that he would print the pages and send them to friends and relatives, but only if it was really necessary and if the results were pleasant.

On the other hand, people used to full-featured album tools missed more capabilities. User 1B said: “*It is far from what I want from album software, as this layout is not enough. I wish to place pictures in different positions and change their sizes freely.*”.

Regarding the new features, the possibility to use backgrounds was valued by users, and 7 from the 14 users wished to add titles to the top of the page, to be handled differently from the current model (where texts are placed in a box and positioned as images) and to be manipulated outside the reach of the automatic layout algorithm.

Suggestions for changes among the participants concerned page margins, text fonts, and captions, as well as their color and alignment. Swapping the position of two images was also suggested. When asked about the lack of features of the tool, only 2

from the 14 users found that Twingle needed more functionalities. The participant 3G says: *“I would use [the tool] to print photos, and for doing that I think the features it has are enough.”*

3.4 Final Analysis

The study found a tendency of people to increase the use of digital content and, therefore, a need for ways to publish photo albums in digital format, both as PDF and HTML files.

Some users were receptive to the idea of a tool for making albums in a fast and simple way. In the first phase, 11 from the 15 users who do not use similar tools began to consider the possibility of using them, and respectively 10 from the 14 users of the second phase, especially because of the increased speed given by the automatic layout.

In the second phase 70% of the participants, who are frequent users of social networks, were motivated to use Twingle if there was an application for Facebook, revealing an interesting proposal to be investigated.

With respect to functionality, the amount of suggestions for improvement on the second phase fell considerably compared to the first version. This leads us to believe that the options present in the second version of Twingle could be in accordance with the requirements of some users, making the user experience more usable and satisfactory, and providing a more pleasing result.

Even with the evolution of Twingle, people who like to create photo albums continued feeling the lack of editing features, listing several new options to change the tool and making Twingle deviate from its initial purpose. In this case, perhaps Twingle’s layout algorithm may become an add-on to programs already on the market, as an alternative capable of providing a solution for those who do not have time or patience to spend on making photo albums.

The items described in this final analysis highlight the potential of automated tools such as Twingle. While some people who enjoy all possible resources present in commercial tools, there are also those who need or prefer to design a DPA quickly and easily. Thus, it is essential to have an option to facilitate the construction of DPA while providing a pleasant result that does not require further edition. These tools should be capable of generating pages without the user having to manually select the photos, but only indicating a folder containing images he considers interesting to the album to be produced. The main intention is to reduce labor and time required to create DPAs. Therefore, through Twingle, we notice that there is room for tools for different user profiles, from those who enjoy more powerful features for editing, to those who just want to point to a folder on the computer and have their album generated.

4 Conclusions and Future Work

In this work a literature review showed that it is not uncommon for people to be discouraged to create photo albums because they consider it a costly and time consuming

task. Thus, we investigated, through a user study, if the automatic generation of DPA would reduce the effort.

The results of the study show the potential of the automatic layout generation in DPA applications. While some people enjoy controlling all possible resources of commercial tools to edit the layout of DPAs, others prefer a faster and easier alternative, producing DPAs through less options and reduced effort. Thus, it is essential to have an option to facilitate the construction of DPA while providing a pleasant result that does not require further (or too much) edition. The main aim is to reduce issues such as excessive labor and time pointed out by the people who need or are used to create photo albums.

All users were enthusiastic about the possibility of generating automatic layout, but they highlight features that a tool like this should provide: change the position of a picture while keeping the general layout; photo resizing; choose the page orientation; provide background ornament effects; allow the placement of general texts on the page; provide free control of the spacing between pictures and the possibility of inserting several photos at once.

After the user study, it was possible to verify that users were receptive to the idea of a tool for making albums in a fast and simple way. More than 71% of them who do not use similar tools began to consider the possibility of using them, especially because of the increased speed and good results given by the automatic layout.

Currently we are developing a version of Twingle for Facebook, and exploring the potential of its automatic layout generation for other applications, such as picture panels and portfolios. In addition, we intend to investigate the use of tools like Twingle in tablets, to identify alternative features made possible by the different forms of interaction available on these devices.

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