Processes of photo book production

Philipp Sandhaus
OFFIS - Institute for Information Technology
sandhaus@offis.de

Sabine Thieme
CeWe Color AG Co. OHG
thieme@cewecolor.com

Susanne Boll
University of Oldenburg
susanne.boll@informatik.uni-oldenburg.de

ABSTRACT

Personal photo books are a popular means of capturing important moments and people have ever created this kind of multimedia presentations. With the advent of digital photography it is now possible to digitally design a photo book on a home computer and let it be printed by commercial photo finishers like CeWe Color[1]. In this paper we identify the different steps that are necessary before such a photo book is ready to be printed and describe them in terms of the proposed model of canonical processes of media production. We therefore focus on the description of the CeWe Color photo book software.

Categories and Subject Descriptors

H.1 [**MODELS AND PRINCIPLES**]: General; H.1.2 [**MODELS AND PRINCIPLES**]: User/machine Systems; I.4.9 [**IMAGE PROCESSING AND COMPUTER VISION**]: Applications

General Terms

Design, Human Factors, Standardization

Keywords

Photo capture, photo annotation, photo album authoring

1. INTRODUCTION

Nowadays many photo finishers enable their customers to design digital photo books on a home PC and let them be printed in a high quality manner. CeWe Color has taken this step even further and not only provides users with a handy tool to do the actual design process but also relieves them from several tedious and time-consuming tasks like sorting and selecting of photos. These enhanced functionalities are realized with the help of outcomes of several research activities at OFFIS[3][6].

[1]CeWe Color is Europeans leading photo finisher company.

In this paper we describe the process of digital photo book production in general and especially how it is done by CeWe Color in the sense of the canonical processes model. We therefore take the canonical process model as given and relate the relevant processes to the according ones in photo book production. We structure the processes into the three phases capture, author, and print. This distinction is done as the three phases are more or less subsequent. The capture phase describes all activities done before authoring a photo book, that means before the user gets in touch with the CeWe photo book software. Although these activities are not directly part of the central system described in this paper they are briefly summarized here as their outcomes are important for subsequent processes. All activities done with the help of the CeWe photo book software are described in the author phase. The print phase describes the processes needed for turning the structural photo book description into a physical product.

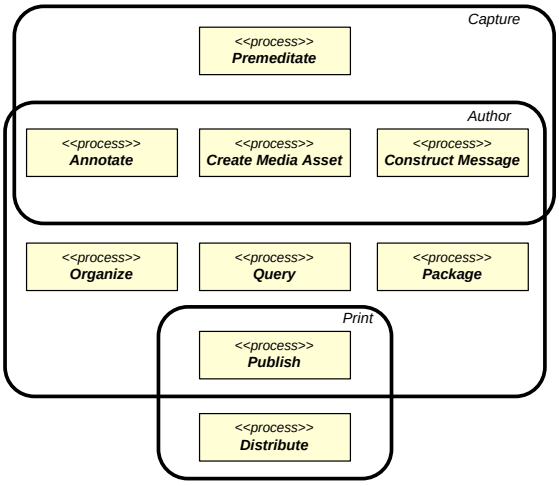

Figure 1: Overview of covered canonical processes and appearance in the phases in photo book creation

In Figure 1 one can see which canonical processes are involved in the respective phases. Several processes appear in more than one phase, but interestingly all proposed canonical processes are covered. Before describing these three phases we give a short overview over the CeWe photo book software. The paper concludes with a short summary and an overview of the canonical processes covered in this paper.

2. CEWE PHOTO BOOK APPLICATION

The photo book production process described in this paper is centered around the commercial photo book application of our project partner CeWe Color[2]. With this software it is possible to design a personal photo book on a home PC and let it be printed in a high quality manner.

The photo book software not only enables the user to manually design a photo book but also automates many of the design steps. These automatic design processes are tuned by providing a wizard which lets the user specify several parameters. The result of the automatic design process is meant as a proposal which the user is still able to alter. In Figures 2 one step of the wizard can be seen. Here the user can specify if blurred or similar images should not be selected for the photo book and whether images with bright colours should be preferred. It can also be stated if backgrounds for the photo book pages should be automatically chosen and how the overall layout of the photo book pages should look like. Basis for the automatic photo and background selection are a couple of content and context analysis methods. For example, photos are clustered according to the time stamps retrieved from their Exif[5] headers. This clustering is done to ensure that at least one photo of each cluster is selected for the photo book and to ensure that photo clusters are held together in the resulting layout. To decide if photos are unsharp, over-or underexposed or similar to other photos content analysis methods such as the extraction of color histograms or edge detection are used. On the basis of this information a decision about a selection of photos out of set of input photos is made.

Figure 3 shows how the background color for a photo book page is determined utilizing the color histograms of the photos on the respective page. In Figure 4 one can see how a particular photo is selected out of a series of similar photos. The photos are spread over the pages by the use of predefined page layouts. Which of these layouts are selected is again done on the basis of parameters which the user has defined in the wizard.

The resulting photo book layout, which has been done by the CeWe photo book software can still be altered by the user. He can delete or add images, add textual annotations or change the page backgrounds. Texts and images can be moved, resized, cropped and rotated. In addition various effects and filters like sepia, black & white or color enhancement can be applied to images. The resulting photo book layout can then be burned on a CD or transferred over the internet to be printed by CeWe Color.

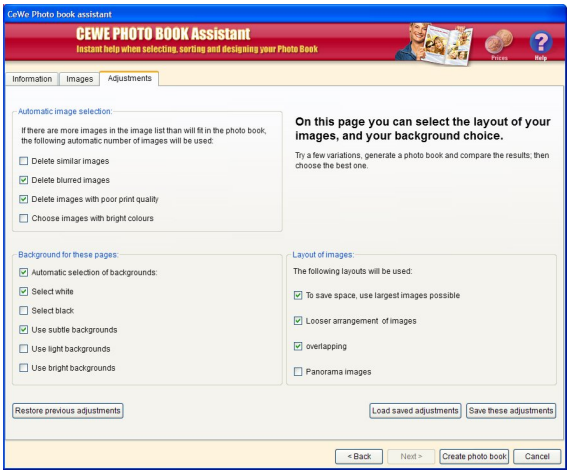

Figure 2: Preferences for the automatic selection of photos

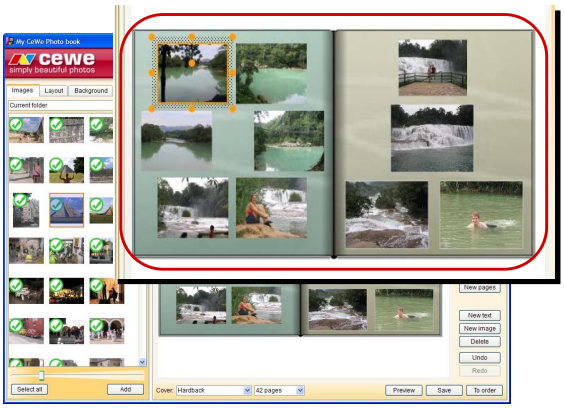

Figure 3: Automatic backgound selection according to the photo's color histograms of a page

3. PHASES OF PHOTO BOOK PRODUCTION

In the following sections we describe the three identified phases of photo book production - capture, author, and print - in more detail and link them to the canonical process model. We emphasize on the the central authoring process.

3.1 Capture

The capture phase deals with all steps that are prerequisites for authoring a photo book and happen before actually working with the CeWe photo book software. The processes are not of the photo book authoring system, but their outcomes are directly fed into the authoring process. That is why we give a brief overview here. The relevant processes are illustrated in Figure 5.

Usually photos are not taken out of the blue, but are related to various preliminary decisions and circumstances, which are input to some kind kind of planning process, for example the planning of a holiday trip, which is done by one or more persons. The outcomes of this process, which can be modeled as an instance of the premeditate process, is some kind of plan or schedule, e.g. a travel schedule or the agenda for a conference. These information can be important for the later authoring process as the person authoring the photo book can use this as a hint for textual annotations or the placement of photos in the photo book. The process of taking a photo itself is an instance of a capturing process. Input are one or more of preliminary plans, in our example the trip schedule. Output is, of course, the photo itself and bundled capture metadata like time, aperture, ISO or even place, which are stored by the camera in the Exif header of the photo. The process of actually deciding if a particular scene is captured with a camera can be modeled as an instance of the construct message process. The resulting message is the decision of the photographer to press the releaser button which is input to the photo capturing process.

[2]`http:\\www.my-cewe-photobook.com`

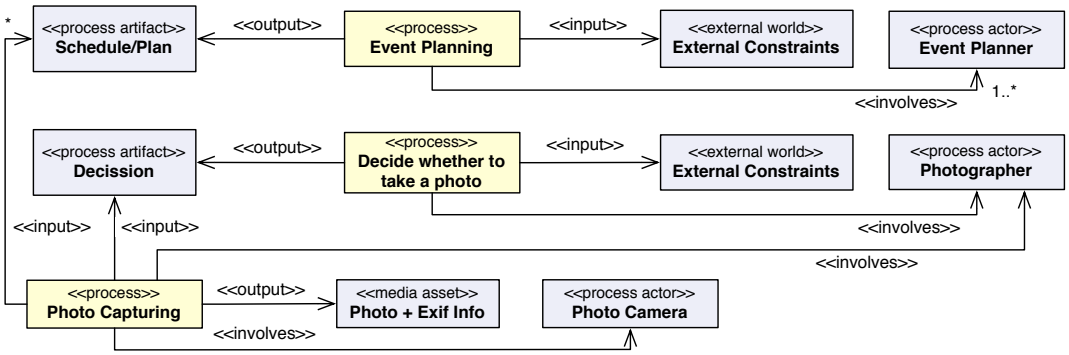

Figure 5: Relevant processes of the capture phase

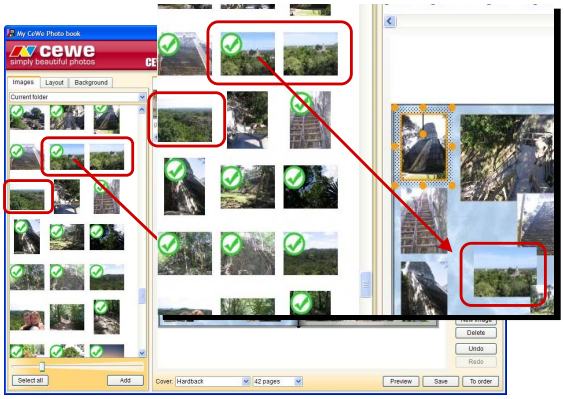

Figure 4: Automatic photo selection from a series of three similar photos

These decisions can again be caused by various external constraints, perhaps how the photographer is attracted by the view of a nice sunset. We mention these constraints here, as they not only lead to the decision of taking a photo, but also affect the design of a photo book in the author phase.

3.2 Author

In this Section we describe the use of the CeWe photo book software in the sense of the canonical processes of media production. The author phase can be divided into two parts, one in which an automatic proposal for a photo is automatically determined and one in which the user can alter and fine tune this proposal. We focus on the automatic authoring part which is briefly illustrated in Figure 6 and take a quick look at the part which involves user interaction. We conclude with a description how a finished photo book layout can be ordered at CeWe Color.

In section 2 we mentioned that input to the authoring phase are a number of photos which are selected in two subsequent steps. First the user selects in a wizard which photos should be taken as input for the photo book. These photos are input to the selection of a subset which are subject to appear in the photo book.

Feature Extraction.

But before the actual photo selection takes place, the photos undergo a sequence of annotation steps, which, e.g., perform edge detection or color histogram extraction on the photos. In the sense of the canonical processes these are several annotation processes involving the CeWe software as a computing actor and each output one or more annotation artifacts (metadata) which describe the photo. Input to these annotation processes are on the one the photos itself together with the Exif header as creation metadata and on the other side metadata which has been extracted by other annotation processes. An example for this is a process which decides if a photo is under-, over-, or well exposed which employs information from photo's brightness histogram which has been extracted in another annotation process.

Clustering and Selection.

Following the annotation processes time clustering is performed on the photo set. The canonical process model defines complex processes which are combinations of basic or again complex processes. In this sense time clustering is a complex process which consists of several instances of a logical package process, which each output a set of photos. Input to these processes are the photos themselves together with their associated annotations from the feature extraction. For the clustering process the creation time annotation is employed. The photo clusters are the basis for the selection process which determines the photos to be included in the photo book. The selection process itself is an instance of the canonical query process. As this step does not directly involve the user, the query user is actually the CeWe software itself. Input are the clusters of annotated photos. The user query input is actually a number of constraints. Some constraints are set by the user in the first part of the settings dialog of the wizard which can be seen in Figure 2. Here he can state if similar or blurred images or images with poor print quality should not be selected and if images with bright colors should be preferred. The other constraint is the amount of images which should appear in the photo book. For this the user can state the approximate number of photos per page and how many pages the photo book should consist of. With these constraints as a query input, a subset of photos from the input photo set is selected. This subset can be identical to the input photo set if the number of requested photos is greater than the number of input photos. The cluster information is used in this query process to ensure that every cluster event of the input photo set is represented in the photo book by at least one photo. Output of the query process are a number of photo clusters, each consisting of one or more photos. These photo clusters

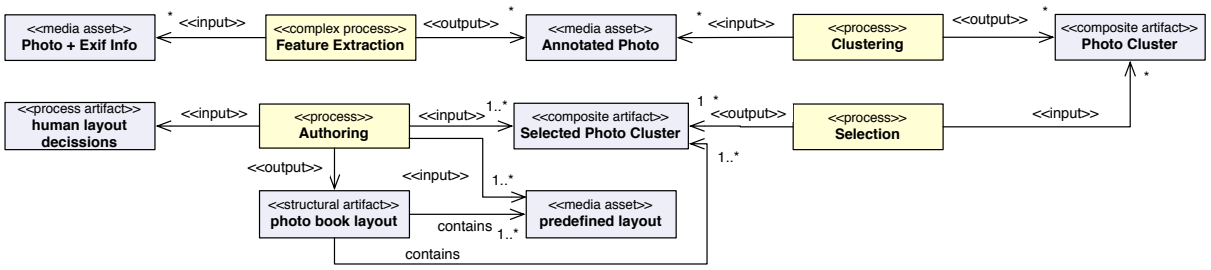

Figure 6: Automatic part of the author phase

are input to the central layout process.

Photo Book Layout.

The layout process is an instance of the canonical organise process. This process automatically arranges the photos over the pages and choses appropriate background for the photo book pages. Besides the photo clusters input to the layout process are also several parameters and additional, predefined page layouts and page backgrounds. The parameters are user preferences which are asked from the user within the wizard process described in Section 2. Some of these parameters, like the the style of page layouts or which kind of backgrounds should be chosen, can be seen in Figure 2. The cluster information is used to ensure that temporal related photos are kept together, preferably on one photo book page. Where on the photo book page the photos are actually placed is defined by several page layouts which are provided by the CeWe photo book software. Which of these layouts are used for a specific page depends on the number of photos that are placed on a page and the kind of layout the user has chosen in the wizard. According to the color histogram annotations of the photos on a page and again the background settings the user has chosen, a matching page background is generated for each page (see Figure 3). The result of this process is a preliminary photo book layout which the user is able to alter.

Manual Authoring.

The automatically generated photo book layout can undergo various modifications and additions by the user. Alterations on the photos itself can be made by the use of filters (sepia, black & white, sharpen, ...) which are instances of the canonical process transforming (which is an instance of create media asset). Other modifications are cropping, resizing, moving or rotating of photos in the photo book which do not modify the photo itself but are in fact modifications of the predefined layouts. The user is also able to delete components from the photo book or to add additional photos or text annotations. Text annotations are media assets which are created in an additional creation process and the outcome is then added to the photo book layout. The result of the authoring process is the final photo book layout which is an instance of a generic document structure.

While the user is designing the photo book, he is always able to switch to a preview mode where he can see what the photo book will look like when it is produced and browse through the different pages. This preview process can be seen as a complex process consisting of publishing and distributing.

Store and Order.

When the user is satisfied with the photo book layout, he is able to store this layout with links to the photos in a physical file on his hard disk, which is an instance of the physical packaging process. This file is given an identifier which is the filename in the filesystem. This also consists of the textual annotations the user has added to the photo book. When the photo book is finished it is possible to order a physical copy of it at CeWe Color. This order can be placed by sending all required information over the internet or by burning them onto a CD which then can be put into an ordinary photo bag like one would use when ordering prints from an analogue film. But before this can be done additional information like a shipping address or credit card information have to be added. These information are publication annotations of a publish process which takes as input the photo album layout and the associated photos. Within this process the required resolution of the photos for the printing process is determined and the photos are scaled down to save bandwidth or space on a CD. The result of this process is a set of image files and a file describing the layout with additional shipping and billing information.

3.3 Print

Once the photo book order has reached CeWe Color via the internet or a burned CD, the photo book is ready to be printed. The printing process itself is an instance of a publish process in which the abstract photo book layout information is transformed into a physical product, the printed photo book. Input are the transformed photos from the final package process in the CeWe software and the order file which describes the layout and kind of the photo book. Physically attached to the photo book are, on an envelope, the shipping address and costs for the photo book. The packaged photo book is then sent to the customer in a final distribution process. An overview is shown in Figure 7.

4. CONCLUSION

In this paper we applied the canonical process model to the digital photo book production process as centered around the CeWe photo book software. Our goal was to give an overview of all relevant processes ranging from planning an event where a photo is taken up to the final distribution of the printed photo book to the customer. We therefore had to exclude some details, e.g., how annotations of a photo are actually represented by the CeWe software. Presently the CeWe photo book software does not interact with external services besides ordering a photo book over the internet. In the future it is planned to embed external sources from the

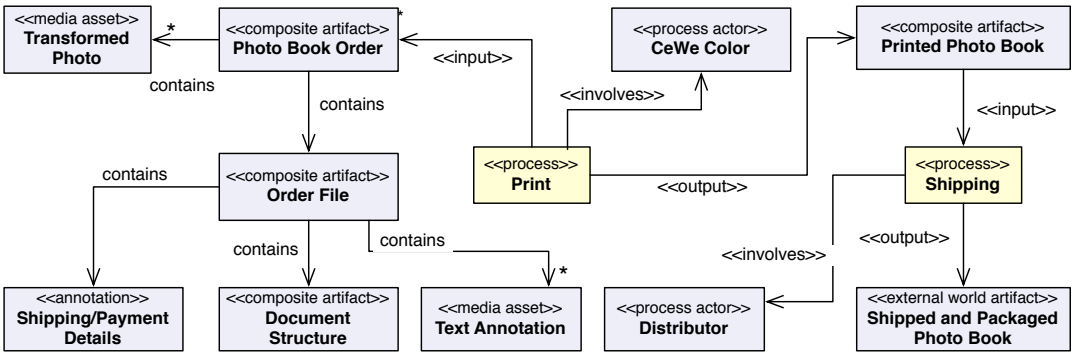

Figure 7: Overview of the print phase

internet, e.g. from community sites like Flickr, Wikipedia or commercial content providers. We have presented some ideas of how this could be done in a separate paper[4]. The process of authoring a photo book at CeWe Color could also very well be integrated into existing Web 2.0 applications for example for the automatic generation of a photo book from an event web site like Seraja EventWeb[3]. For this a clear and structured description of the CeWe Color authoring system is useful to enable the definition of adequate interfaces and data structures. The description presented in this paper is meant as a first step for achieving this goal.

Another important goal for future versions of the CeWe photo book software is to reuse metadata which has been generated by other systems and in return to share generated metadata. As presented in Section 3.2, several annotation processes extract metadata from the photos which can potentially be interesting for other applications. On the other hand several photo managing tools like [1] or [2] already enrich photos with additional metadata and attach them to the photos either by using their own proprietary formats or by the use of standards such as Exif, IPTC[4] or XMP[5]. This can for example be ratings, tags or textual descriptions attached to a photo. There even exist services like Riya[6] which determine the persons shown on the photo. A real benefit for the photo book author would be, if these kind of information would be considered in the automatic layout process, e.g. one would expect that textual annotations attached to the photos would also appear in the photo book or that ratings attached to the photos would affect the automatic selection process. Likewise, information that has been extracted from the photo or semantics that have derived from the interaction of the user within the CeWe photo book software, such as textual annotations placed under a photo, can be very valuable for other systems. What is needed is a way to store and exchange these kind of metadata in a standardized manner. Very promising seems to be the use of XMP, but not all kind of information can be expressed this way. We hope that in the future a standard will be available that enables different applications to share metadata about photos in a standardized manner and we see the description of systems like the CeWe photo book software with the help of the canonical processes of media production as a first step towards this.

[3] http://www.seraja.com
[4] http://www.iptc.org/IIM/
[5] http://www.adobe.com/products/xmp/in-depth.html
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Canonical processes	
Premeditate	**Capture** Planning an event (e.g. a holiday trip) which is subject to be documented in the photo book, potentially influenced by external decisions. *Input* Thoughts of author(s) / external decisions *Output* Schedule / Plan
Media Asset Creation	**Capture** Taking a photo. *Input* Spontaneous decision of the photographer, Schedule/Plan *Output* Photo equipped with Exif header (Creation Metatdata) **Author** Altering a photo (cropping, resizing, filtering, rotating) *Input* Photo in the photo book *Output* Altered Photo Creation of text annotations *Input* Editor, Photo book software, Schedule / Plan of event *Output* Text annotation
Annotate	**Author** Feature extraction on photos (color histograms, edge detection, ...). *Input* Photos from the input photo set *Output* Generated metadata
Package	**Capture** Organizing photos in a separate folder. *Input* Photos, schedule/plan from premeditate *Output* Folder with photos, identifier is the folder name **Author** Automatic time clustering of photos. *Input* Photos, time metadata *Output* Photo clusters Storing the photo book layout on a hard disc *Input* Photo book description *Output* Physical file with layout information
Query	**Author** Selecting a subset of images from the clustered input photo set. *input* Photo Clusters, User parameters for photo selection *output* Altered photo clusters (subset)
Construct Message	**Capture** Spontaneous decision to take a photo. *input* Photographer and his ideas and thoughts *output* Decision to take a photo **Author** Author's layout decisions for the photo book *input* Photographer and his ideas / thoughts / creativity *output* Human layout decisions
Organize	**Author** Actual Author Process: Organizing photos and text over the pages. It is split into two steps steps: The first is automatically done by the CeWe software, the second (refinements) manually by the CeWe software user *input* Photos (altered, cropped, filtered, ...) text annotations, human layout decisions *output* Structured description of the photo book layout Preparing a photo book order which includes additional annotations like shipping/payment information *input* Photo book layout *output* Photo book order (CD image or internet order)
Publish	**Author** Internal Preview of the photo in the photo book software. *input* Photo book layout *output* Rendered images of photo book pages **Print** Turning the structural photo book description into a physical product *input* Photo book order *output* Manufactured photo book
Distribute	**Author** Presenting the user the rendered preview images of the photo book *input* Rendered images of photo book pages *output* Screen presentation **Print** Shipping the photo book to the customer *input* Manufactured photo book

Table 1: Canonical processes and their relation to photo book production