PhotoMagnets: Supporting Flexible Browsing and Searching within Personal Photo Collections

Abschlussbericht Diplomarbeit

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Agenda

1. Motivation
2. Related Work
3. Concept Development
4. Interface Description and Live Demo
5. Evaluation
6. Expert Interviews
7. Discussion & Improvements

Motivation

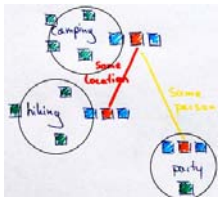
- The tremendous success of digital media has brought along a steep increase in the overall number of photos taken.
- In order to keep up with the growing amount of data, novel paradigms for archiving, organizing and retrieving digital photographs have become major challenges for research.
- A lot of existing work is task-oriented and built with well pre-defined structures.
- Few systems are designed to encourage exploratory experience and dynamic activities surrounding photos.
- Search in personal photo collections is often characterized by relatively unspecific search goals, which might change during the search process. Therefore, flexible interfaces are necessary.

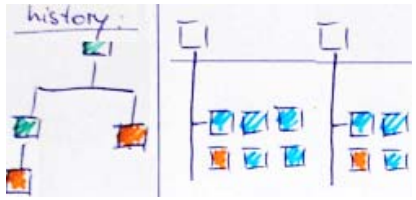
Related work

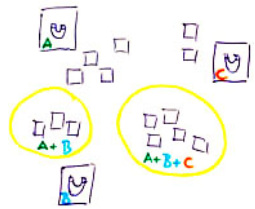
- Organization:
  - Capture time and folder structures are the main ordering principles applied. [1,2]
  - Automatic event segmentation based on capture times and/or location information. [3,4]
  - Efficient layouts: Photomesa [5], TimeQuilt [3]
  - Creating narratives: PhotoArcs [6]
- Browsing and Searching :
  - People rarely look for one specific item and browsing-like filtering is more common than searching **[**7, 8**]**.
  - Users are satisficing rather than optimizing their selection [9].
  - Sidetracking can be caused by the introduction of random elements [10].
  - People tend to interact more often with newer photographs [2, 11].
- Tagging:
  - Encouraging people to tag is a big challenge: Photofinder [11]

Concept Development

- Three concepts were developed.







- Iterative tests with sketches and paper prototypes.

- First-round-test with 8 subjects.
- Refining concepts and re-evaluation with 9 subjects.

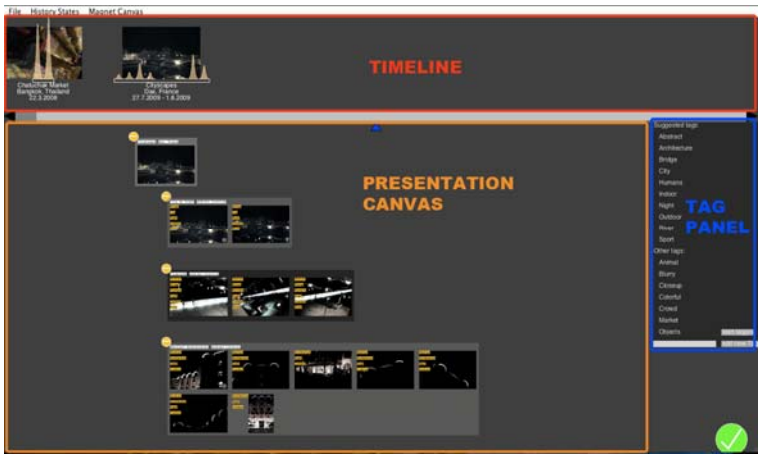
- General results:
  - PhotoBubbles: visually appealling, low perceived value with connecting lines.
  - HierarchyBrowser: clear structure, no problems detected.
  - PhotoMagnets: concept is appreciated, even though the type of interaction is unfamiliar.

Concept Development

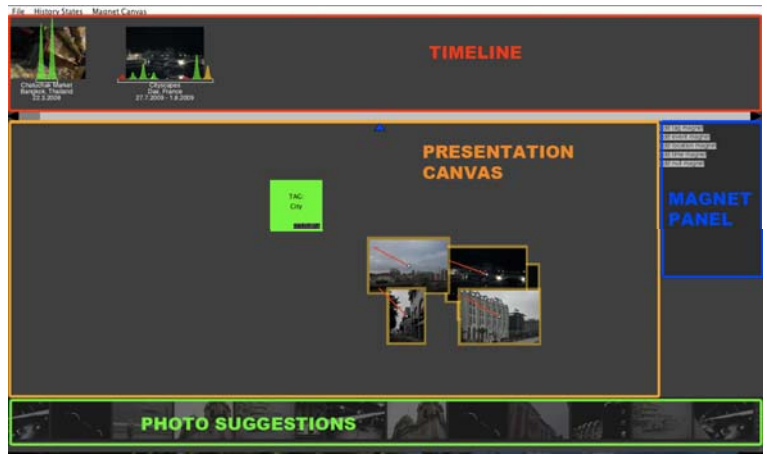
- Two views are offered:
  - HierarchyBrowser: for management tasks
  - PhotoMagnets: for search and browsing tasks
- Decision for PhotoMagnets prototype:
  - Playful way of interaction.
  - High degree of flexibility.
  - Supporting behavioral dynamics.
- Implementation:
  - Java
  - Piccolo [13]
  - Lire framework for image similarity metric [12].

Interface

- Management View
- Typical tasks:
  - Importing photos
  - Refining automatic event segmentation
  - Tagging photos



- Magnet View
- Typical tasks:
  - Browsing
  - Searching
  - Selection



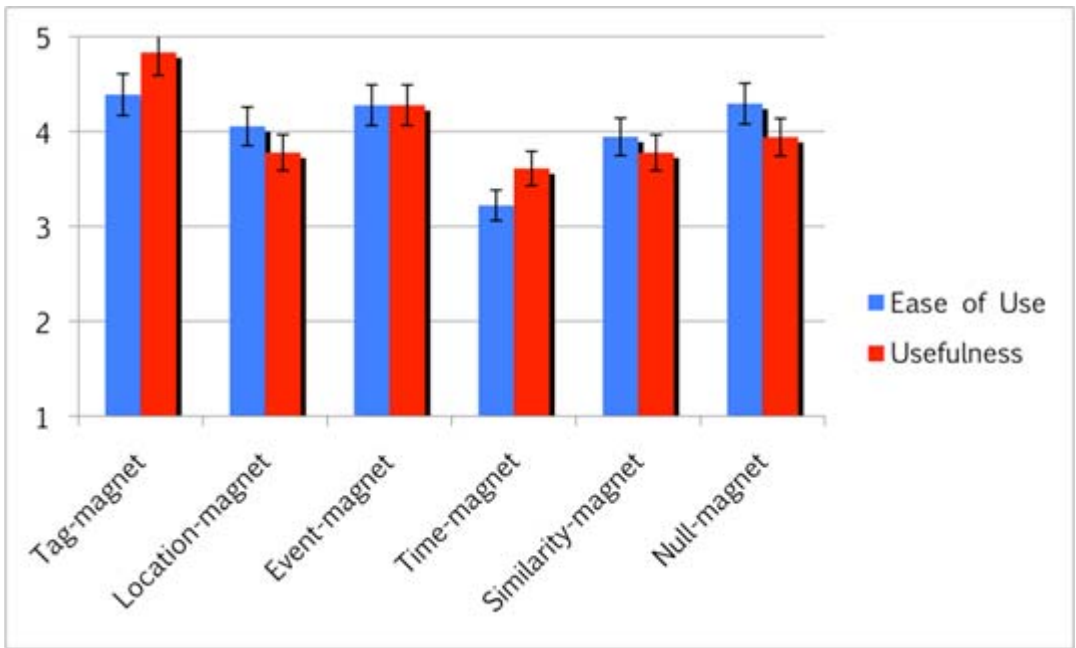
Live Demo

Evaluation

- An evaluation with 18 subjects from various backgrounds was conducted. Each subject had to bring a set of his own photos from three different events (at least 30 photos per event)
- Evaluation goals:
  - Test PhotoMagnets' general usability, by observing user behavior with pre-defined tasks.
  - Assess PhotoMagnets' suitability for storytelling and search tasks.
  - Identify user strategies for storytelling and search tasks, in order to derive suggestions for future improvements.
- Study setup:
  - Pre-study questionnaire.
  - Explanation of the prototype and its functions. 30 min learning time for each subject.
  - Completion of a set of tasks, using each functionality of PhotoMagnets' at least once. (Importing, Tagging, Clustering, Selecting, etc.)
  - Completion of a storytelling task.
  - Completion of an album creation task.
  - Post-study questionnaire.

Evaluation

- General Usability:
  - Importing photos and refining the event segmentation: no issues were detected.
  - Tagging photos:
    - the flexibility in choosing the most appropriate interface for the current tagging process was appreciated.
    - Both interfaces were considered useful and easy to use.
    - Unexpectedly high fun factor for tagging of 4.2 on average.
  - Magnet types:



Evaluation

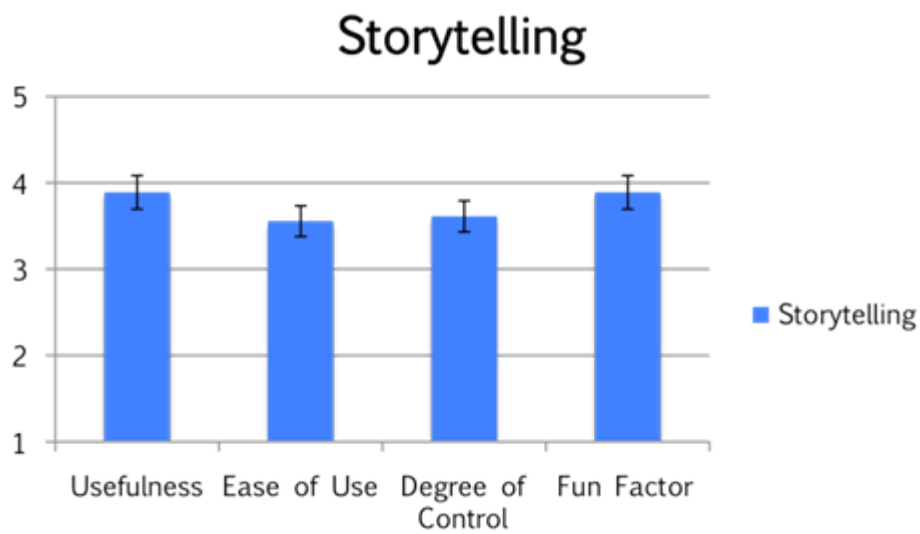
- Storytelling behavior:
  - Subjects were asked to choose an event and show the photos to the interviewer, while telling a story about the photos.
  - Subjects were encouraged to complete the task in the magnet view, but were allowed to use the management view.

Task abandoned	Management View	Magnet View
2	5	11

  - No issues could be detected for storytelling in the management view. Stories were fluid with a clear structure.
  - Main reason for switching views and abandoning the task: lack of chronological order in magnet view.

Evaluation

- User ratings for the magnet views suitability for storytelling tasks:



Evaluation

- Search Behavior:
  - Subjects were asked to select photos for an album to give to a friend who moves to a foreign country. The magnet view had to be used for this task.
  - All subjects succeeded in completing the task.
  - Two different loading strategies could be observed:
    - Event-driven loading strategy: photos were loaded by events or sub-events.
    - Tag-driven loading strategy: only qualified photos were loaded onto the presentation canvas, using magnets.
  - Two different selection strategies could be observed:
    - Rejecting selection strategy: photos not fulfilling the search criteria were removed using the selection mode.
    - Accepting selection strategy: accepted photos were selected in selection mode.

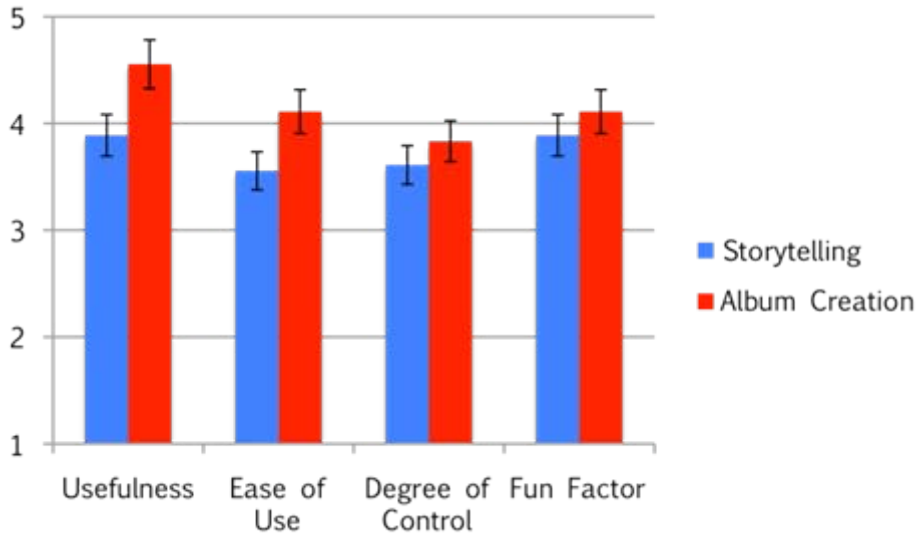
Event-driven loading strategy (n = 6)		**Tag-driven loading strategy (n = 13)**	
Rejecting selection strategy (n = 4)	**Accepting selection strategy (n = 2)**	**Rejecting selection strategy (n = 9)**	**Accepting selection strategy (n = 3)**

Evaluation

- The tag-driven loading strategy resulted in a more structures initial layout. Users employing this strategy were more successful in retaining structure throughout the task.
- Subjects using the rejecting selection strategy frequently positioned selected photos in a user-generated selection area.
- The selection area was used to keep track of the current selection and to create a rough album layout.
- The accepting selection strategy generally resulted in a less clear cut layout of photos on the screen. No repositioning of photos in a dedicated selection area could be observed with subjects using this strategy.

Evaluation

- The Magnet View's suitability for search tasks was rated high, with 4.6 on average for usefulness and 4.1 for ease of use and fun factor. The degree of control was rated at 3.8.



Expert Interviews

- Four domain experts were interviewed to assess PhotoMagnets' suitability to support a professional photo workflow.
- Experts' backgrounds:
  - A freelance digital media designer
  - A cooking-book illustrator
  - A professional photographer
  - The chief of the photo-production department of SportScheck
- The experts agreed that PhotoMagnets had potential for searches with an unspecific search goal, such as selecting photos for draft-layouts.
- The flexibility provided by the search approach was appreciated.
- The Timeline and event segmentation were not considered to be useful tools for a professional workflow (except for the photographer)

Discussion & Improvements

- Automatic event segmentation was appreciated by all users.
- Both tagging interfaces were considered useful. The flexibility to choose the most appropriate tagging interface was valued by all users.
- Tag magnets were the most widely used magnet type. → support for hierarchical tag structures might further increase search performance.
- Time magnets were not appreciated. Initialization should be done by selecting a seed photo and specifying a time range.
- Adjusting magnet magnitude was mainly done in order to speed up attraction. → the attraction speed should automatically increase with the duration of attraction.

Discussion & Improvements

- To increase initial structure, loading whole events should result in photos being positioned in separate sub-event piles automatically.
- The current magnet creation interface might become a bottleneck in working with large collections.
  → a tag cloud should be introduced.
- Storytelling in the HierarchyBrowser was satisfactory. The magnet view‘s lack of chronological order is inhibiting storytelling performance. A chronological layout of photos in the magnet view should be introduced.
- The magnet view was shown to be suitable for search tasks. To further improve performance, a selection area should be introduced. Photos inside this area should not be affected by magnet attraction.

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Questions ?

Evaluation

- Storytelling behavior in the magnet view:

Storytelling in management view (n = 5)	Storytelling in magnet view (n = 13)			
	Manual repositioning strategy (n = 4)		Magnet separation strategy (n = 9)	
	Structured initial layout (n = 4)	Unstructured initial layout (n = 0)	Structured initial layout (n = 2)	Unstructured initial layout (n = 7)

  - The manual repositioning strategy and the structured variation of the magnet separation strategy resulted in more fluid storytelling with a clearly observable structure.