mailVis: Visualizing Emailbox for Re-finding Emails

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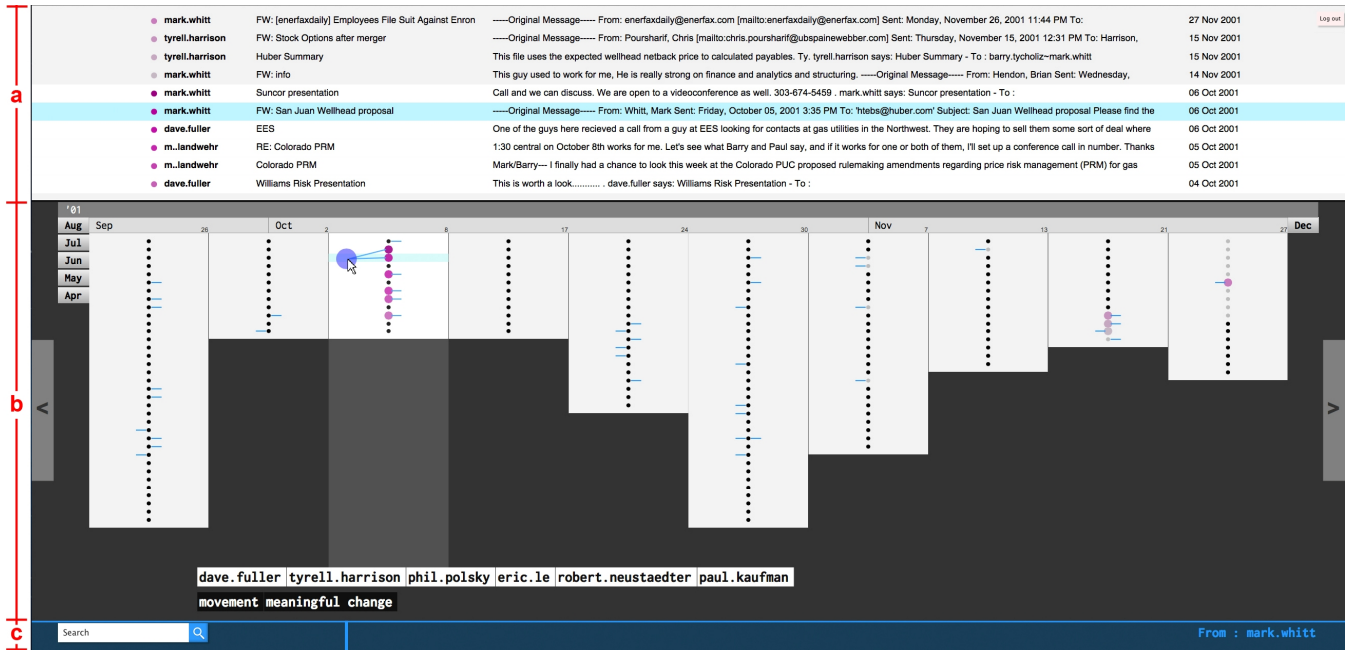
Figure 1: Overview of the mailVis interface showing (a) email display, (b) timeline visualization with 200 emails and (c) query field areas. Figure also shows *filter swipe* in action; a tag (indicated at the right bottom) is dragged onto visualization for conditionally selecting the emails from "mark.whitt". Data from the publicly available Enron email corpus is used for demonstration.

ABSTRACT

We present the design and implementation of *mailVis*, an interactive visual interface for email boxes that facilitates re-finding of emails. Email re-finding tasks can be challenging, involving scanning of many emails and modifying the query as the search progresses. We designed mailVis for such tasks in which the user would benefit from having memory clues and multiple options to direct the search. During the design process, we devised a novel interaction technique, *filter swipe*, that combines filtering and selection into one action for rapidly skimming individual items in a data set.

Keywords: Email, Interactive Visualization, Input Techniques, Selection, Faceted Search.

1 INTRODUCTION

Emails often function as repositories of personal information, beyond their conception as an asynchronous communication channel [10]. The use of email collections as personal archives implies that past emails often need to be re-found to access previously seen information. However, retrieval of older emails can be difficult and time-consuming, especially since particular details of an email needed to perform a successful search are

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forgotten over time [3]. Elsweiler et al. [4] report that certain email re-finding tasks involve a long chain of actions and looking into many emails. They also note that in most cases users orient themselves by searching for emails in multiple steps, narrowing their search after the initial query. These observations point to the need of tools that enable quick navigation and display of emails, aid memory and orient the user. mailVis is designed to address these needs through interactive visualization and search suggestions.

Previous works on email visualization scan user's email collections to reflect on episodes of life and relationships with different people over years [5, 9]. Other work follow a more granular visualization approach, showing individual emails within a single [6] or multiple [7] threads. Since mailVis is specifically oriented for re-finding a specific email, we have chosen the latter approach and present each individual email as opposed to aggregates.

2 MAILVIS

The interface of mailVis comprises of a) email display, b) timeline visualization and c) query field areas (Figure 1). Email display area shows the textual contents of the selected emails in chronological order. Timeline visualization represents emails as circles, placed within different time periods that are visualized as grey rectangles. The active email selection is coordinated between these two views by indicating the selected emails in shades of purple, with the most saturated colors representing the most recent selection. To facilitate email re-finding, mailVis provides the following features:

Search suggestions—Non-hierarchical metadata such as tags and facets have been used in personal information systems to leverage user memory and provide entry points for search [1, 5]. Similarly, mailVis features tags, namely keyword and contact suggestions that can be used as memory clues and for exploring and selecting emails. The tags are generated by processing the corresponding fields of emails using term frequency inverse document frequency (tf-idf). Natural language processing is used for extracting keywords from the body and title fields of emails. Tag set is recalculated after the user modifies the query or navigates using the timeline. Also, the system responds to the user's time period selection and tag pointing events by showing tags that are more specifically related to the selected time period or tag.

Chronological layout—Informed by the time-based structure of human memory, a number of studies aim to improve people's access to past information by presenting episodic information [2, 5, 8]. Chronological layout in mailVis aims to orient users in time by visualizing the emails under timeline for overview and comparison. Emails are grouped under time periods that yield keyword and contact tags as episodic clues when pointed.

Using email structure for visualization—Emails are structured documents with designated fields such as title, body, sender, to and cc. For mailVis we designed a visual notation to indicate whether the tag that the user interacts with is the sender, co-recipient or the keyword of an email (Figure 2).

Figure 2: The orientation of sender and co-recipient bars adheres to the general chronological orientation in mailVis.

2.1 Interaction Techniques

Data and view specification—mailVis enables navigation in time by pointing to months or the 'newer' and 'older' buttons (Figure 1, on the right and left edges). Suggested keywords and contacts can be used as query items by dragging them into and out of the query field (Figure 3). Querying with an item within a specific time period can be realized in a single action by placing the keyword or contact tag on a month (Figure 3).
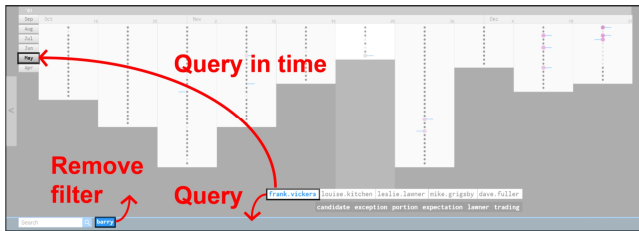

Figure 3: Tags can be dragged to modify the query.

Email selection—Most email searches rely heavily on scrolling and querying to display emails onscreen with limited use of sorting and folder/tag access [11]. mailVis retains querying and scrolling. Additionally, emails can be selected from the timeline visualization through one of the following interactions:

Direct selection: Individual emails can be displayed by directly selecting them from the timeline visualization by pointing.

Pointing to keyword and contact tags: When a tag is pointed to (i.e. clicked or tapped) the most recent emails related to the tag are selected for display. A limited number of emails can be

displayed at once (8-12 emails depending on the screen size), thus *filter swipe* is used for the selection of additonal emails related to the pointed tag.

3 FILTER SWIPE

Interactive visualization applications typically require filtering in advance for the conditional selection of items. Our novel interaction technique filter swipe combines filtering and selection into a single action, by enabling the use of filtering criteria as a spatial selection object. The action is achieved by dragging the filtering criteria, such as a tag, on the visualized data set. Unlike direct selection by pointing, only related items are selected, avoiding the multistep first-filter-then-select process. The filtering condition is removed the moment the user releases the tag, yet the selection persists.

mailVis provides a suitable application case (Figure 1), since only a limited amount of emails can be textually displayed and the particular details of an email might not be well remembered. In this case, filter swipe allows rapid switching between different filtering criteria.

4 CONCLUSIONS AND FUTURE WORK

We believe that combining email box visualization with search suggestions can decrease our reliance on typed queries and facilitate challenging email re-finding tasks, particularly when touchscreens are used. Currently we are conducting user evaluations to understand the utilization of mailVis in realistic re-finding tasks. We expect the interaction techniques developed for mailVis to be useful in other search scenarios where contextual clues can help direct the search.

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