

## **A Time-Based Interface for Electronic Mail and Task Management**

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Email overload is a growing problem for many users in the workplace [1]. Users often have trouble retrieving messages for use later or in remembering to reply or to act on a particular message. There are two causes. The first is due to the problems associated with maintenance and retrieval in a semantic hierarchical structure. The second is due to current email systems are designed around the assumption that messages are informational and are read upon arrival, and that important messages are filed.

The use of a semantic hierarchy for filing presents many problems for dealing with a large volume of data. Filing and maintenance is very time consuming and cognitively intensive. Since there can be hundreds of new messages arriving each day, it is difficult to file and maintain a reasonable hierarchy that facilitates efficient retrieval. Moreover, categories can become obsolete over time, and messages in different categories may become semantically related. Therefore, the user must spend time periodically to reorganize their mail hierarchy.

People use email for more than communication. On the surface, email is a form of asynchronous communication. In reality, email are actually used for purposes such as document delivery and archiving, work task delegation, storing personal names and addresses, and scheduling appointments [1]. Also people need better tools to remind them of their tasks [2, 3] and current email systems lack such support.

### **1. THE TIMESTORE PROJECT**

TimeStore is an email system that uses the time of arrival as the principal arrangement to display electronic mail. We designed and built TimeStore around the philosophy that the user should not have to do any filing. Time-based visualization can complement or replace the traditional semantic based email by using an aspect of human memory that most existing email systems ignore: temporal organization in autobiographical memory [4].

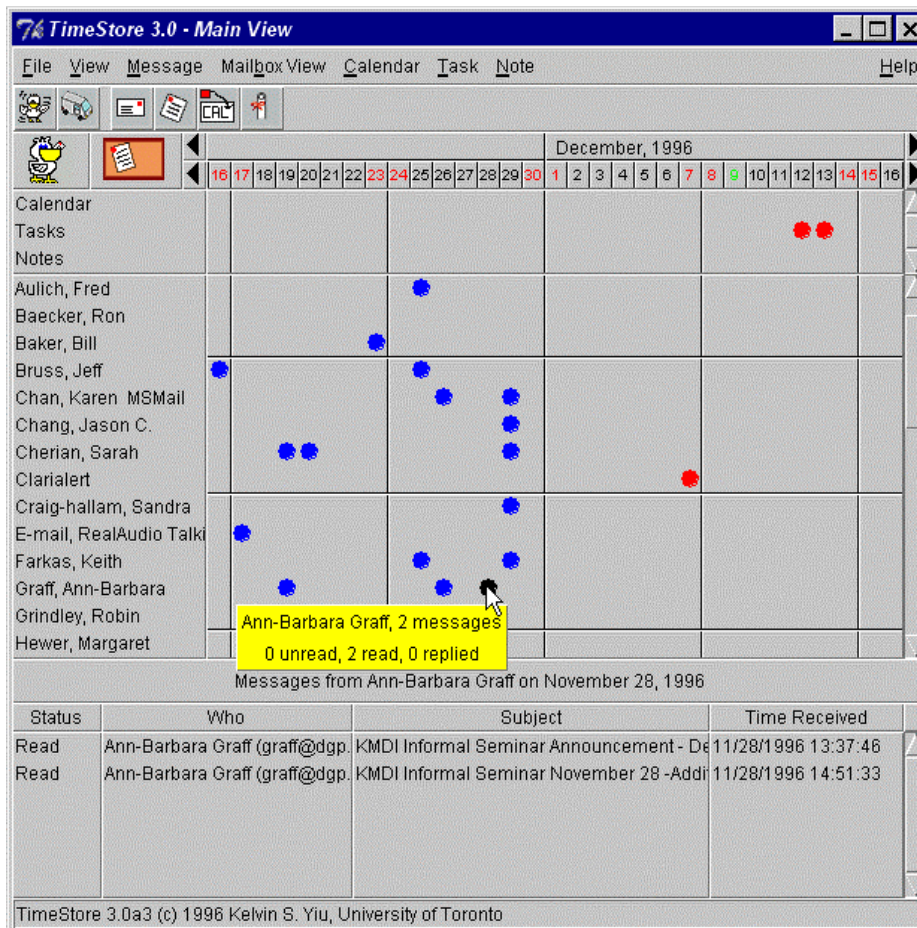
Our project started with a study on how users organize their computer environment [5]. The 14 subjects (Mac, DOS, UNIX, VMS) all used a semantic organization for their filing. File organization was strongly influenced by the visual display of the system. Subjects did use time stamps and date notations were used in naming files and folders. This finding led to the first TimeStore prototype.

Long [6] implemented this prototype to study time-based visualization as an alternative to folders for organizing and retrieving email messages. The original version was an add-on for the Macintosh version of Eudora. Time was represented along the x-axis of a two-dimensional graph and the message senders were listed along the y-axis and sorted in various ways.

Subsequently an Eudora user study and a TimeStore user study [7] found that the addition of a time-based system did aid in retrieval. Users were able to see patterns of correspondence activity and the lack of dots acted as a reminder to contact a specific. Since users were reluctant to give up semantic hierarchies, support for Eudora mail folders was added.

## 2. THE CURRENT TIMESTORE PROTOTYPE

The new version of TimeStore manages email but also has an additional objective: to provide integral support for task management as well as other personal information where time is the primary method for access. [8]



**Figure 1. TimeStore's main window.**

TimeStore plots information as dots on a two-dimensional graph (Figure 1) where the x-axis displays time and the y-axis displays a list of names. The display is divided into three areas. The top portion displays a calendar, a task list organized by due date, and a note list organized by date of creation. The purpose of this section is to remind the user of tasks and to provide a context for the messages displayed below. The middle section plots messages as dots with the sender names listed along the y-axis. Messages are plotted using the time that the message was downloaded.

In place of the traditional folders, TimeStore provides mailbox views for creating dynamic mail folders. Similar to the substream concept found in the Lifestreams project [9], users can specify keywords to search for in certain fields in the message. The result is displayed in the

same form as the main view. New messages that satisfy the specified criteria will be included automatically. Moreover, messages can appear in multiple views, which eliminate the problem that a message can only appear in one folder.

The inbox is one view into the mailbox where only unread and recent messages are listed. This provides a single location for the user to get new and unread messages. TimeStore also provides integrated task management by allowing the user to create tasks from within the message window. Tasks created this manner are associated with a message and the user can record additional notes about the task that were not in the message itself. The User can click on the “View Mail” button to read the associated message.

The interaction is simple and consistent for all data. The user moves the pointer over a dot to see the number of messages (or tasks, etc) and a breakdown showing the number of messages that have been unread, read and replied. A single click will cause TimeStore to list the message at the bottom section of the main window, and a double click will open the messages in a new window.

### **3. USER EVALUATION**

Our objective in the usability testing was to understand whether time-based visualization is useful. Moreover, we also wanted to know if the integration of other personal information into an email system is useful.

#### **3.1 Methodology**

Usability data was gathered using a combination of interviews and think-aloud sessions with screen and audio capture by the user’s computer using Microsoft Camcorder [Microsoft 97]. Five users were recruited and asked to use TimeStore as their primary email system while keeping their original email system as a backup and for features not implemented. During a three-week test period, users used Camcorder to record their TimeStore sessions. A microphone was provided to record the user’s thoughts expressed aloud. The resulting AVI movie files can be played back on any Windows PC using the standard MediaPlayer.

#### **3.2 Results and Discussions**

User responses were positive. Four out of five users liked the time-based visualization for email messages. They liked the ability to see trends in correspondences with their friends and associates. However, TimeStore used the receive time in the display rather than the send time and this caused some confusion along the users. A very important discovery was that users were often unable to remember exactly when a message arrived. They often had to click on a succession dots in order the find the desired message.

Most users thought that the ability to associate a message with a task was useful. A problem with the tasks is that TimeStore requires them to be associated with due dates. However, users had are tasks that “they just have to do” but did not have a particular due date.

Only one user used mailbox views consistently because TimeStore already categorize messages by name. Mailbox views were used to help him find messages from mailing lists that interests him. He also used mailbox views to help track a conversation with his friends.

The inbox was a source of confusion for one user. The user expected the inbox to only contain new messages. One user did not use the inbox because he did not read all of his

incoming messages. This problem became more apparent when a user subscribed to mailing lists because TimeStore's mailbox view was able to let him filter out messages of interest.

An interesting insight occurred during a final interview session. The user commented that TimeStore has made him view his email more like a database than messages in folders. Therefore, the user's expectations of TimeStore grew and TimeStore's inability to provide other statistics to answer questions such as "Why cannot I view by how much time I spent on a person?" became apparent.

#### 4. CONCLUSION

TimeStore in its current state is not good enough for everyday use. Users disliked the fact that TimeStore provided no way to organize names. However, they did find the ability to associate messages with tasks useful, but they also wanted to have tasks that do not have due dates.

On the positive side, the majority of the users believed the time-based concept is useful. They especially like the fact that messages are automatically arranged by sender. They also like the ability to see patterns and trends, which can remind them to contact people. However, users cannot remember the exact date for a number of messages and therefore future versions TimeStore must provide a better compensation for such.

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