

Lives: A System for Creating Families of Multimedia Stories

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Lives: A System For Creating Families of Multimedia Stories

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Abstract

Lives is a system to author and visualize stories based on a collection of biographical and historical multimedia content enhanced with *event* objects. Stories are constructed as hyperlinked slide-shows, which may also be visualized in a timeline. Besides manually created hyperlinks, Lives also supports the discovery of stories and media that intersect the time period of a story element. Authoring is simplified by dragging and dropping from query results or the timeline, enabling re-use of events, media, and parts of other stories. The key feature of the design of Lives is the use of a three-tiered model with media, events, and stories.

Lives has been used to narrate several aspects of Charles Babbage's life and contributions that cover a period of 200 years. Other stories created with Lives include "The Advancement of Computer Technology", and "The Early History of Programming". Lives allows a user to view these stories within their historical context, including other technological innovations and events from the period, enabling deeper and broader investigation for the curious.

Introduction

The Computer History Museum[1] in Mountain View, CA, archives artifacts and historical information from over 2000 years pertaining to computer technology. Their goal is to "keep computer history alive". They have collected media pertaining to pre-computing artifacts, historic calculators from the 1800s and early 1900s, as well as old computers and software. Often, the media corresponds to physical artifacts in their world-class collection. This media consists of photos of a device and its inventors, documents like the device's operations manual, and videos to help visitors experience the operation of the device. Oral histories have been recorded and are often transcribed. The curators, staff and numerous expert volunteers of the museum have also created mini-charts and timelines to educate visitors about the evolution of various computer technologies. The Gates Timeline Exhibit opened on 10 January 2011 and holds and exhibits a portion of these artifacts and stories.

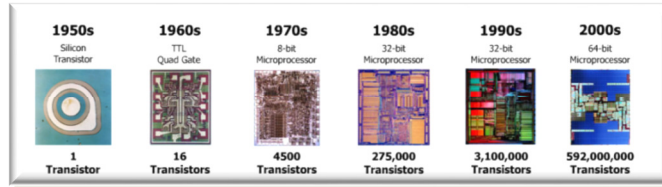
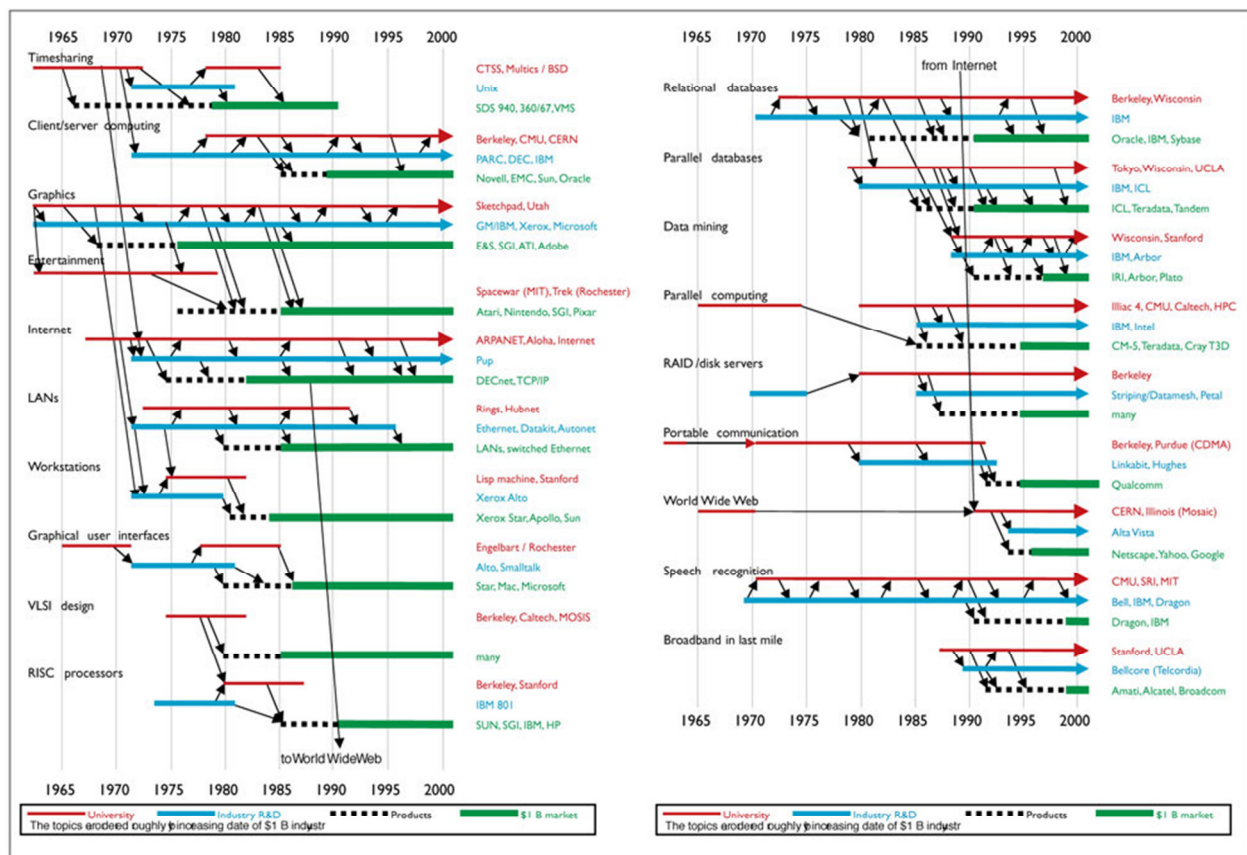


Figure 1: Sample Timeline from Computer History Museum.

The following diagram from a 2003 National Academies Report nicely illustrates the flow of ideas that have contributed to computer technology. This collection of events, together with oral histories, papers, and video demonstrations can form the basis telling the various stories e.g. the origin of GUIs, parallel computing, and the internet and World Wide Web.



Source: From [6], reprinted with permission from the National Academy of Sciences, courtesy of the National Academies Press, Washington D.C. © 2003.

Figure 2: The flow of ideas that led to the emergence of computer technology

History is often told through tales. Storytelling is a powerful mechanism to communicate the historical situation in computer industry, and to understand why things were the way they were, and how those events led to our current day situation. In order to tell good stories with history, it is imperative that we understand the tightly knit nature of historical events (as seen in the above figure). A historical event can be of importance to multiple stories (for example, the invention of Internet influenced many

technologies like WWW, Personal Computing). This fact motivates the need for *re-using events for creating historical stories*.

The *Lives* program is a tool for creating families of multi-modal stories for situations where the underlying events involved might have many interconnections. Two events can said to be connected when one is believed to have influenced the other. We make the following contributions in this report: First, we define a three-tier model involving stories, events and media for storytelling in the historical context. Second, the *Lives* tool is developed using the model to create the various stories pertaining to computer history like “The History of Computer Programming”, “Biography of Charles Babbage” or “The Evolution of Computers”. Third, we provide an interactive timeline based visualization technique to visualize all these events together. Furthermore, the stories can be used to filter content on the timeline so the user of the system can analyze only what is relevant to them.

We start by describing a use scenario that includes gathering of media content for the timeline database, authoring of stories by selecting media to compose specific events, and aggregating the events into stories; and finally viewing the created stories. This is followed by the *Lives* story model the uses the three-tiered model. Finally we describe *lives* tool for story creation together with its use.

Use Scenario

Consider a visitor to the Computer History Museum website who is interested in learning the history of computers. The museum site includes a wide variety of computers, such as The Difference Engine, the Hollerith Tabulator, the IBM 1401, and so on. But this information is scattered all over the website making it difficult for the visitor to understand the actual progression of computing hardware as marked by these devices. Consider an alternate scenario where the artifacts of the museum were organized as following three-tiered architecture. At the top of the stack is a set of stories:

1. History of Computing
 - a. Early computational devices
 - b. Computers
 - c. Processors
 - d. Software
 - e. Storage
 - f.
2. Entrepreneurs/Companies
 - a. HP
 - b. IBM
 - c. Intel
3. Networking
 - a. ARPAnet
 - b. The Internet
 - c. WWW
4. Important People
 - a. Charles Babbage
 - b. Herman Hollerith

- c. Marvin Minsky
- d. Alan Turing
- e.

In order to understand how computers evolved, the visitor can simply read the “History of Computing” stories, and for deeper insight, can align the memory/processor story along with this to see how improvement in processor/memory technology fueled the growth of faster and more powerful computers. The content managers have merely to index their media with the story in order for visitors to easily experience the true development of all these artifacts with the complete historical context.

The Lives Story Model

The figure below shows the model of the Lives system. At the center of figure 3. lies the three tier data model containing media (Images, Videos, PDF etc.) at the bottom of the stack. Events are created on top of this material to mark the important events of Computing History. Story creators can use the event/media layers to compose slideshow-like hyperlinked stories. These stories, events and media are collectively visualized on the timeline based visualization. Also note that all our data is stored in a single SQL Server database. This three tier model is similar to the the concept of “autobiographical memories” that psychologists have developed to explain how people think about their own lives [3].

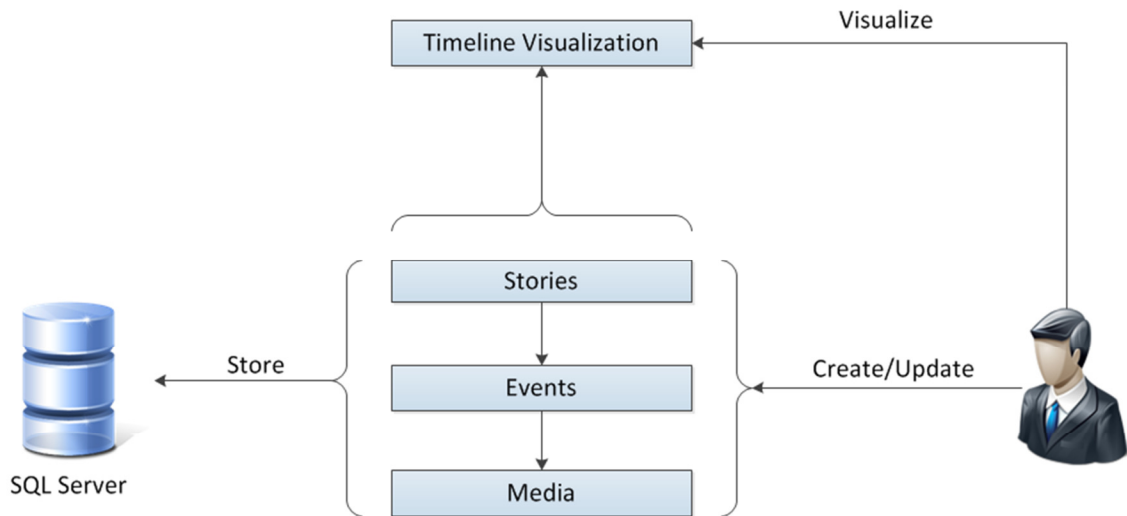


Figure 3: Overall Model of the Lives System

In order to categorize this information, we create a set of real world events on top of the media. These events are real-world events like “The Demonstration of The Difference Engine”, “The Publication of a paper” and so on. Events, besides referring to media, can directly contain spatial, temporal details of its occurrence. Also information like “Who were the participants”, “What were the actions that were taken by these” is recorded along with this event. Figure 4 below shows an example of event.

Id: 2000
Time: 1832
Location: London, U.K.
Participants: Babbage; Darwin;
Activities: Demonstration
MediaReference: http://ip/media.jpg
Information
General.Title: Demonstration of the DE 1 Prototype.
General.Description: Babbage demonstrates a prototype of the Difference Engine. Many personalities like John Herschel, Charles Darwin were present.

Figure 4: An event illustrating the demonstration of a prototype of the difference engine in 1832.

At the top of the stack are stories, which is essentially a stack of multimedia segments. A segment is a collection of media from the media collection, and some additional media provided to glue together these segments to make meaningful stories. This could include text, music (soundtracks etc.). These items are part of the story, and the event itself is not altered in any way to support this additional media. The story maintains a set of references to the event layer. Figure 5. below describes media segments, and their inter-relationship with events.

... Babbage starts construction of the first Difference Engine with Joseph Clement.

In 1832, a small prototype of the DE is demonstrated in Babbage's living room....

Later, Babbage started designing the analytical engine.

Figure 5: A segment with references to an appropriate event.

Lives

Lives allows its users to store all their media items. Later, the user can create a set of events over these media, where the events reference these media items. Currently, we allow a single media item to be mapped to an event. An event can reference multiple events, which leads to creation of event structures. For example, an event like “construction of the difference engine” can have fundamentally different parts to it. This can be easily divided into multiple parts like “design of the engine”, “interaction with craftsmen” and “demonstration of engine to government officials” and so on. Finally, a story is a sequence of segments, which refer to an assortment of media and events. Stories, events and media may all be browsed and viewed by user.

We find that a timeline is an appropriate tool for browsing a large number of events. Hence, a timeline is employed in the system to visualize all the events with their media together. The Lives timeline is based on the Timecard timeline¹. Stories are also visualized on the timeline. One of the key components of this project is to be able to view stories in an environment which helps us better understand their conditions surrounding the events in the story. This immerses the user in the story providing him a better insight into the world and the situation surrounding the story. In order to see the story with the rest of the contextual events, the tool is provided with filtering capabilities as shown in the figure below.

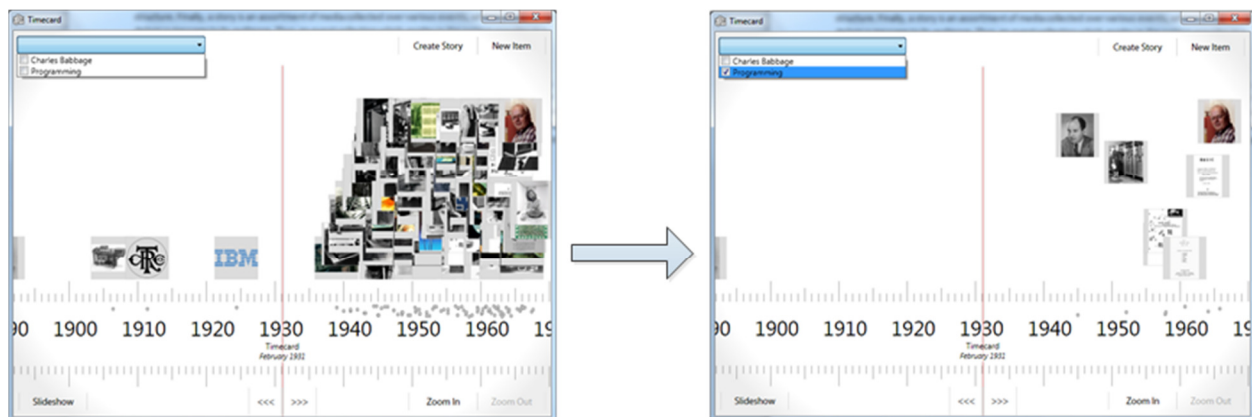


Figure 6: Timeline Visualization

The figure on the left shows all the events in the system, along with an option to select the two stories (Charles Babbage and Programming). When a story is selected, all the non-relevant events disappear making the visualization coherent. Additional stories can be selected, so the viewer can get a better understanding of the whole picture.

Story Construction in Lives

The following figure illustrates how we can construct stories from a large event/media collection. In Lives, a story is not simply a collection of media items. The figure below shows our storyboarding interface. A story is divided into a set of segments. A segment can contain multiple media items from the event/media repository (shown in the left) or can contain additional text/audio segments which

¹ Thanks to Richard Banks (Microsoft Research, Cambridge, UK) for his work on Timecard.

form the story specific media components (this can be seen at the bottom left of the screenshot). Media is dragged from the event panel to the story panel. On doing so, a story segment obtains the media as well as makes a reference to the event from which this media came from.

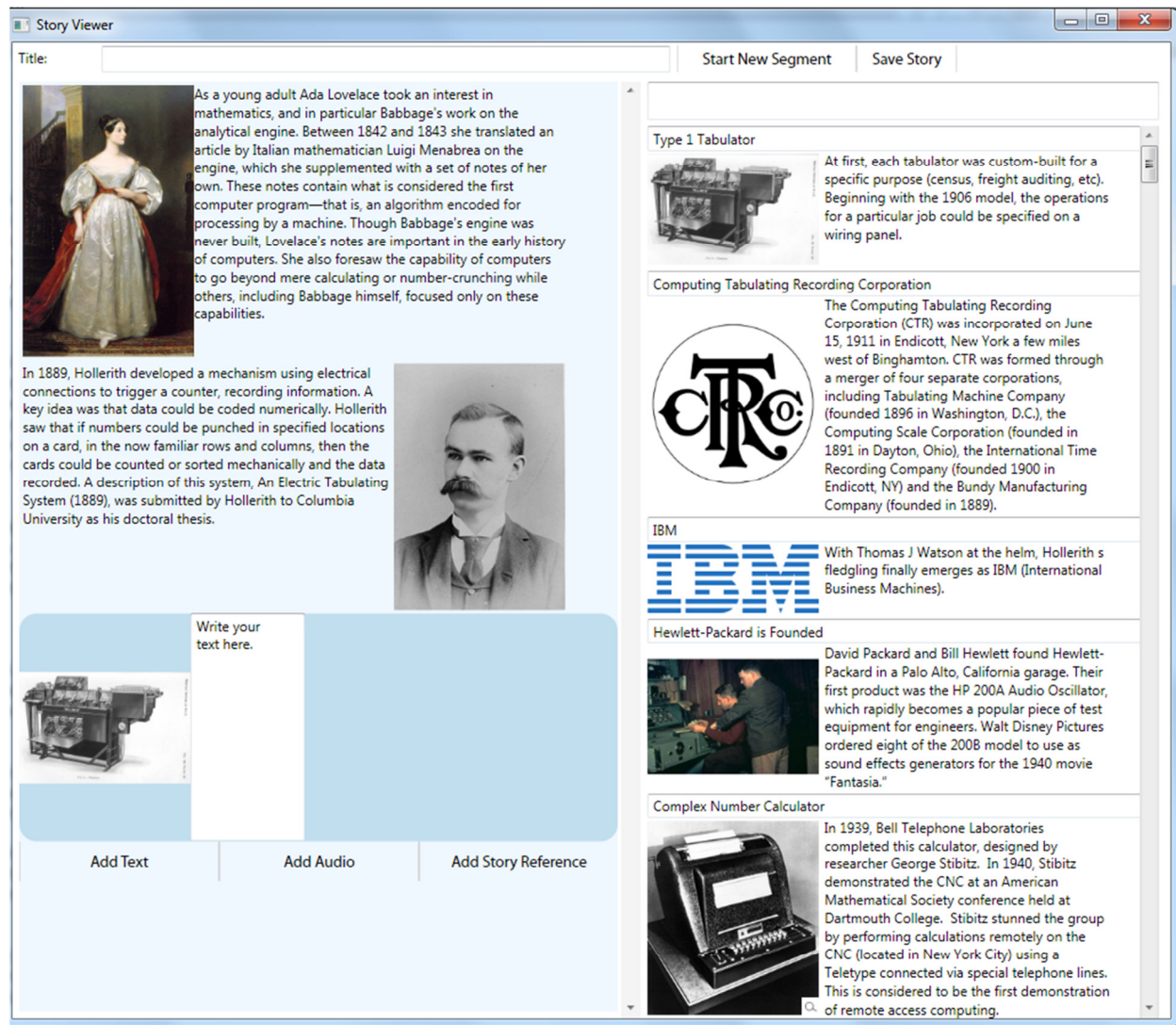


Figure 3: Story Authoring Environment in Lives.

Filtering Heuristics to Aid Story Authoring

Generally, a lot of events are found in any collection. In order to assist the storyteller to find the relevant events better, we provide filtering facilities based on keywords so that the storyteller can find relevant events to add to the story. We also prune away all the old events which happened before the ones in the story. We also allow filtering by time. For example, the collection panel can be instructed to “hide all events which happened after 1940”.

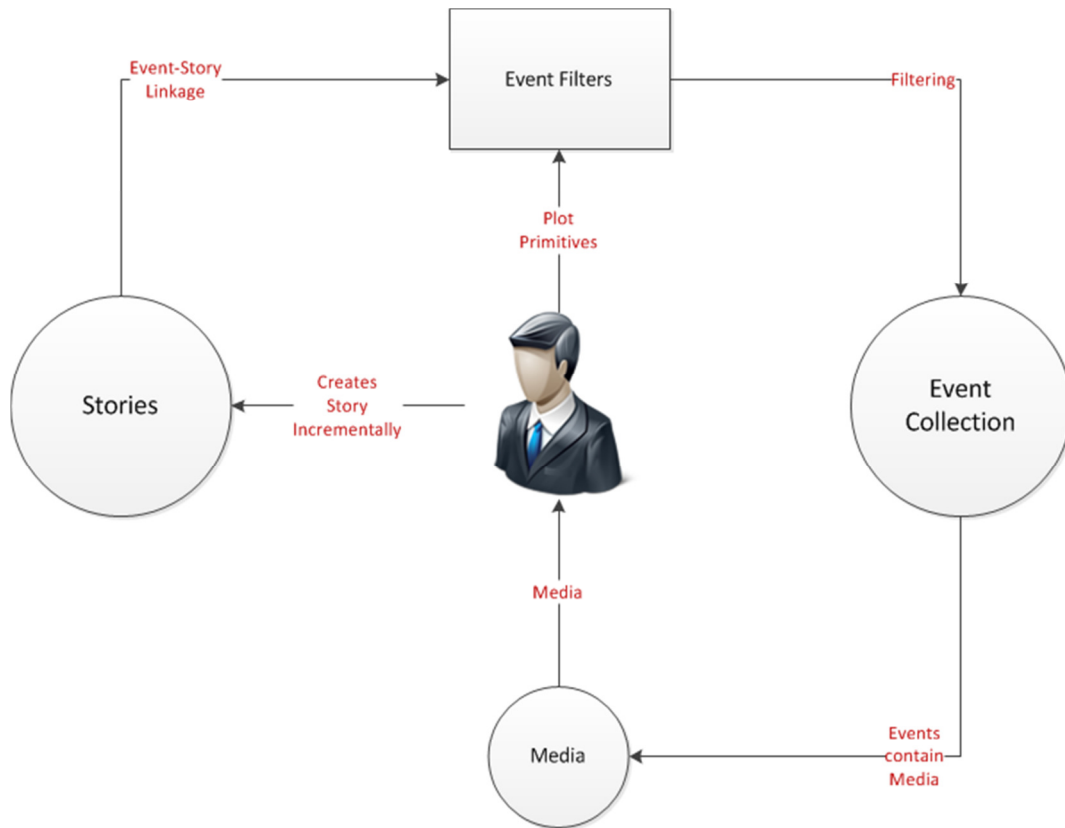


Figure 4: Story Authoring with Filters.

Viewing the Stories in Live

Stories are viewed using a slideshow like mechanism. The timeline UI allows people to initiate a slideshow dialog. Here the user selects from the list of available stories to see what she wants.

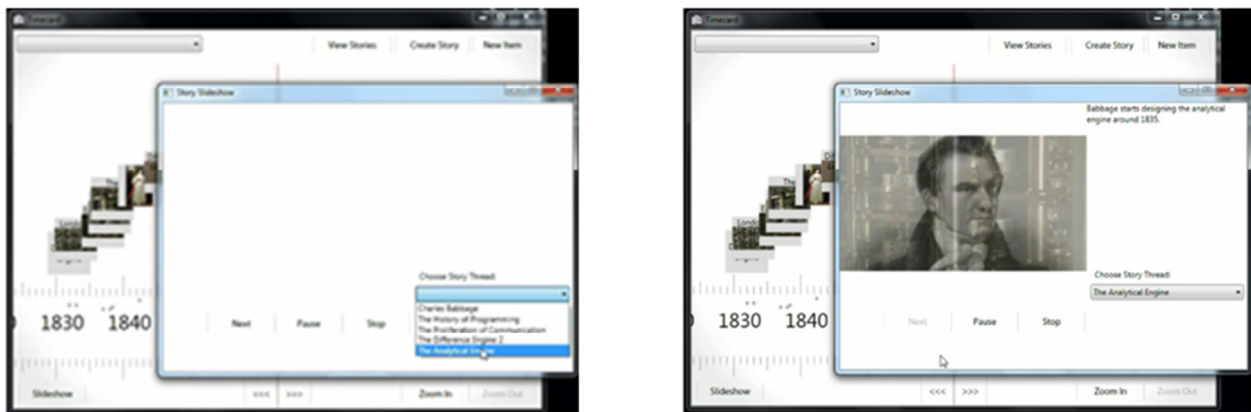


Figure 5: Left: Selecting “The Analytical Engine” story. Right: A video segment being played.

The above figure shows the story viewer. On the left, you can see how a story is selected from the list. Once the story is selected, the slideshow plays it back one segment at time. If the segment contains videos, these are played backed automatically. The user is allowed to go to the next segment only once the video playback is finished. If the segment contains text/images, these are displayed with immediate access to the next segment.

Interactivity can be added to the visualization. In the following screenshot, a segment is shown containing a series of frequently asked questions. On the right hand side of the slideshow panel, one can see the different questions. Upon clicking them, the media on the left side changes showing a docent, Tim Robinson, answering the question (which was recorded during a tour of the DE2 guided by Tim).

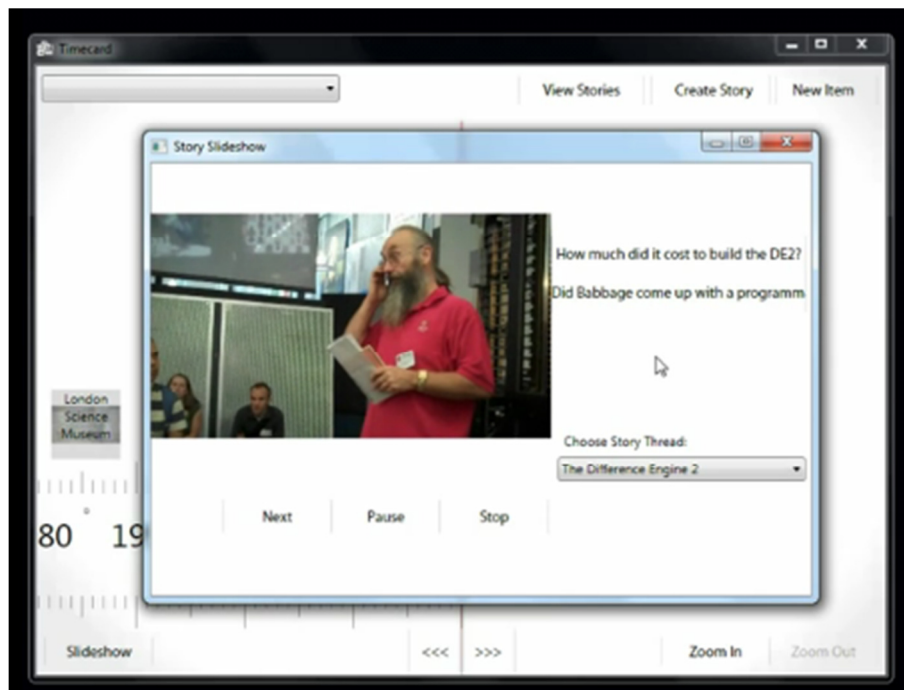


Figure 6: Interactivity in Stories. In this, different "questions" can be explored obtain information regarding the "Difference Engine 2".

Conclusion

Lives eases the creation and viewing of historic stories from large collections of media artifacts. The key to its operation is its three-tiered model of media, events, and stories.

There are many aspects of Lives which raise interesting questions for further research:

1. Find more searchable attributes in a story. These could come from the events or provided by the storyteller while creating the story. These attributes could be used to provide better filters in the story construction process.
2. Stories can share common media/events. This relationship could be used to create a list of "similar stories" for any given stories, which would eventually allow users to discover stories as he traverses.

3. The possibility of creating stories dynamically to meet a viewer's level and areas of interest or understanding, time constraints, etc.

Lives has been demonstrated by creating various stories about the Charles Babbage Second Difference Engine construction as told by docents at the Computer History Museum. Such stories include: Babbage's Life, Babbage's Difference Engines, The Analytical Engine, and The Reconstruction and Operation of the Difference Engine, etc. This first version of Lives has already attracted interest from historians in using such a system, which we hope will lead to further work.

Acknowledgements

We thank the staff of Computer History Museum to for their support during this project including much content that was used to demonstrate Lives. Docent Tim Robinson's detailed walkthrough of the history of the Difference Engine provided details on the operation of the engine that was invaluable. Richard Banks, MSR Cambridge, provided us with the Timecard [2] program, whose timeline helped us get started on the visualization efforts for Lives.

References

[1] Computer History Museum: <http://www.computerhistory.org/revolution> is the URL for the online version of the timeline.

[2] Timecard: <http://www.psfk.com/2010/04/richard-banks-an-introduction-to-technology-heirlooms.html>.

[3] Martin A. Conway, Christopher W. Pleydell-Pearce: The Construction of Autobiographical Memories in the Self-Memory System