

SPEEDER READER: AN EXPERIMENT IN THE FUTURE OF READING

Speeder Reader is an interactive reading station built around two primary ideas: dynamic text, especially RSVP (rapid serial visual presentation), and driving as an interface metaphor. As words flash one at a time on a screen, the reader controls the speed of the words with a gas pedal (up to 1,850 words per minute). Text selection is performed with a steering wheel. Thus, one can “drive through a book.” Speeder Reader leverages the familiar activity of driving an automobile (or, in the case of children, operating a speed-racing video game) to allow comfortable and intuitive access to the possibly less familiar world of interactive text.

Speeder Reader was designed as part of a six-month museum exhibit at the Tech Museum of Innovation in San Jose. The exhibit, titled “XFR: Experiments in the Future of Reading,” was designed and built by the RED (Research in Experimental Documents) group at Xerox PARC. It ran from March to September, 2000 and attracted about 350,000 visitors. In 2001, XFR will begin a three-year tour to other science and technology museums.

The topic RED chose for the exhibition was reading and technology, and in particular how digital technology impacts nearly everything we read. The XFR exhibit presents a series of explorations in new ways of experiencing text, including new genres, new styles of interaction, and unusual media. Because the exhibit took place within the context of a modern technology museum, the XFR exhibits are primarily interactive and hands-on.

THE XFR EXHIBITS

The XFR exhibits fall roughly into three categories: augmented books, machine reading, and reading and the world.

In augmented books, we expanded on the idea of the personal reader and experimented with different modalities, interfaces, and designs to discover how the reader-author contract can be reinforced to add depth without distraction. Some examples of these different modalities are alternative physical relationships to text, dynamic arrangements of text and images under personal control, and exploration of how an added modality (sound or auditory illustration) might affect the reader-author relationship. The exhibits include a book that users play like an instrument, a drive-through book (Speeder Reader) and a life-size walk-through comic book.

Machine reading showed machines that did the actual reading of documents, through OCR (optical character recognition) or other visual analysis. These machines then interpreted the data they read into some other modality, such as speech or pictures. For example, an OCR-to-speech-synthesis system was installed in the form of a robotic dog, which read aloud whatever was placed in front of it. Reading and the world allows visitors to examine the history of reading, the varieties of its current proliferation, and some experimental art in the world of book arts.

ANALYZING THE AUDIENCE

The exhibits were designed primarily for teenagers 10 to 14 years old, although we tried to make sure that the exhibit language and presentation would be enjoyable and accessible for everyone,

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including younger children and adults. Though the topic of the exhibit is reading, many of the exhibits examine reading in conjunction with image or sound, so they provide some content for non-readers. The Tech Museum gets about 700,000 visitors per year. Many mixed-age family groups come through. Every morning and afternoon, waves of schoolchildren are delivered by the busload. After hours, the museum is very often rented by Silicon Valley’s high-tech companies for parties and receptions. This offers another interesting demographic: highly educated, technically savvy adults. We designed the exhibits to play on multiple levels, from the 30-second “quick take” to deeper levels for visitors who became intrigued with the ideas and exhibits.

MUSEUM VISITOR AS RESEARCHER

The design of the exhibit space aimed to reproduce the feeling of “the research center after dark,” so it looked as if scientists were gone for the evening, leaving their experiments running on their workbenches. Visitors were encouraged to take on the role of the scientist-researcher, consider unusual aspects of reading, and develop their own questions about the reading devices. The exhibits were designed to encourage a playful sense of fun and exploration about reading. Signage for each exhibit featured a provocative question and pointed out a few salient points about each reading experience. For example: “What if you had so many ideas they could fill a room?” Or: “What if you could walk right into the pages of a comic book?” For Speeder Reader, the question is: “What is it like to drive through a book?”

MESSAGES OF THE XFR EXHIBIT

Reading continually adapts to technological and cultural change. In some cultures, reading is a social act, primarily performed in public; words are written on walls or in books that are performed publicly. In other cultures, reading can also be a private, personal experience. The nature of that personal experience is always changing as well. Several companies now offer “e-books,” hand-held electronic devices with downloadable texts. Cultural observers call this idea “convergence,” where all text that one reads winds up being on one single hand-held device like a PDA, e-book, or cell phone. Our observation is that digital technologies, far from limiting the reading available in the world, make reading almost ubiquitous. In addition to books and magazines, we read walls, clothing, and electronic equipment. Even fresh fruit has labels and sometimes advertising on it. Digital technologies also enable the form of the reading device to match the content of the text. A story about falling into a world of text is told on walls that surround the visitor with words. A story about travel is told on a device that looks like a vehicle. The XFR show is both a comment on the anti-convergent nature of text in the world and an experiment in authoring form along with content.

SPEEDER READER

One major point of the entire XFR exhibit is to associate a sense of excitement, fun, and personal control with the idea of reading. So, for Speeder Reader, we built a speed-racing interface onto

speed-reading software. The exhibit, placed near the front of the gallery, attracted people (especially children) with its half-familiar, game-like interface and brightly colored dynamic text.

RAPID SERIAL VISUAL PRESENTATION (RSVP)

People read printed words on a page in “saccadic jumps,” a series of somewhat erratic eye motions around a page. RSVP is a kind of dynamic typography wherein words or short phrases appear in sequence in one spot on a screen. As the words continually flash in one spot, readers do not have to move their eyes, so they avoid the saccadic jumps and eliminate the time used in moving and refocusing the eyes. With this protocol people have been known to increase their reading speed up to 2000 words per minutes (an average fast reader can read about 400-600 words per minute). RSVP was investigated in the 1980s as a presentation protocol for text⁴. It has been used in several products as a speed reading technology, and is sometimes used as a research tool by neurologists and perceptual psychologists. Other affordances of dynamic typography have been explored by a number of people^{3,5,6,7}. In the final design of Speeder Reader, we were primarily interested in enabling the reader’s words-per-minute speed. However, we did experiment with some more expressive mappings early on, with the idea that the reader could choose more or less graphically expressive typefaces. This is a promising path, but requires a longer learning period than most museum visitors will have.

THE DRIVING METAPHOR: NAVIGATION

One problem with RSVP text is how to browse it. How does one find different sections of content, play them at an appropriate speed, and replay them at will? Speeder Reader’s interface allows personal control over all these parameters. The RSVP text is visible through a rectangular window in a specially designed monitor bezel (Figures 1, 2). Users navigate to different streams (“lanes”) of text by turning the steering wheel, which moves the window to a different lane. A foot pedal (“gas” pedal) gives users control over the speed of the text being displayed, up to 1,850 words per minute. These two primary controllers allow users to choose text and control its speed. Several secondary controls allow a finer resolution of control. The stick shift can switch between different sections in the lane of text. A Cue button allows users to skip backward to set points in the text (beginning of last sentence: one button punch; beginning of last paragraph: two punches; preceding paragraphs: any additional punches beyond two). An accompanying Reset button starts the text over from the beginning.

VISUAL AND PHYSICAL DESIGN

Speeder Reader was built in 80/20, a type of aluminum framing often described as “an industrial-strength Erector set.” Since we anticipated heavy use from enthusiastic pre-teens for six months straight, Speeder Reader was designed for ruggedness. We gave it a strong, four-legged “workbench” table, with the computer stored in a built-in box underneath and the signage attached along one corner. The game controller hardware was bolted onto one-inch particle board covered with formica and cornered with soft black plastic.

Speeder Reader’s visual presentation was multi-layered, in a deliberate attempt to blur the lines between the screen-based graphics and their physical surroundings. The graphics shown in Figure 2 were embedded behind four layers of thin materials with offset edges, to give a sense of depth similar to that in a dashboard.

AUTHORING FOR SPEEDER READER

Authoring Speeder Reader raised several points besides navigation:

- Rhythm as punctuation: Content-appropriate rhythms can greatly increase both speed and comprehension in RSVP and other dynamic text. For example, titles or subheadings may be given greater temporal weight than normal text.
- Type design: Appropriate typographical choices also aid in comprehension and speed. Characters may possess particular typographical characteristics. For example, sans serif fonts are more readily recognizable as they flash past. Serifs seem to confuse the eye at high rates of speed. Or some words and phrases may be given more size or greater color contrast. Proper nouns, unusual words, and numbers are more difficult to recognize at high rates of speed; type differentiation and timing differentiation can address this problem.
- Narrative structure: We tried several different structures for the content. We settled on five lanes of text, with four subchapters in each lane (the four states defined by the gear shift). Each state in this content matrix contained approximately 1,000 words, since we wanted people to be able to remain in each state long enough to get a feel for really reading in RSVP. So the authoring task required a minimum of 20,000 words.

We made a test model that featured dynamic rhythms, fonts, and colors in presentations of several Lewis Carroll poems (Jabberwocky, Father William, The Walrus and the Carpenter, Turtle Soup). We wanted to tie the content of each of the XFR exhibits at least loosely to the physical form of the reading device. Speeder Reader’s current content is a fictional account of a young girl’s travels throughout the Solar System. As she visits each of five planets, she records salient facts and personal observations about it in her travel journal. Each lane features a different planet; each gear position is a new daily entry in her journal about that planet.

SYSTEM DESIGN

All the devices, steering wheel, pedal, gearshift, and buttons are connected to an A/D converter, which communicates with the host computer via serial line. A Java 2.0 program reads the serial information and converts it to actions in the program, thus affecting the text in response to user input. We use XML to specify not only the text, but also its size, color, font, and background color.

FUTURE WORK

Speeder Reader runs robustly and is popular with museum visitors. We are continuing our exploration of alternative content and iterations of the interface design. A Web-reader version of Speeder Reader is in development, as are some experiments with smaller, hand-held or embedded-RSVP readers, and RSVP readers as assistive devices.

CONCLUSION

Several of the XFR exhibits attracted groups of people as often as they did single individuals. It was not uncommon to find several children piled into one of the Listen Reader armchairs, for example, or to find clusters of children around Listen Reader,^{1,2,8} Fluid Fiction,^{2,8} or the Reading Eye Dog.^{2,8}

All 11 of the XFR reading experiences were designed with the idea that form affects meaning, and in fact is inextricable from it. We found that by authoring the form as conscientiously as the content, we were able to achieve some unusual goals: getting people to read deeply in a museum setting, for example, and getting people to read socially, in groups, often aloud to each other. Interviews with visitors indicate that the exhibit succeeded in its primary mission: causing people to consider the origins of the text they read every day, and to ask themselves how it might be read differently.

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Figure 1. Speeder Reader, at the San Jose Tech Museum of Innovation, was one of eleven innovative reading experiences in "XFR: Experiments in the Future of Reading."



Figure 2. Presentation graphics and physical overlay for Speeder Reader. Blue indicates the side-lit laser-cut Lexan overlay; red and black, and the background to the text, are all screen display areas; white shows where physical layers of felt and black plastic (under the top-layer Lexan) block the rest of the computer monitor from view.

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