

Text & Documents

Thursday 29 Nov 2007
Polle Zellweger

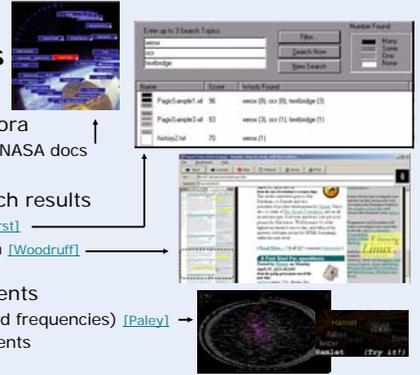
Text & Documents in InfoVis:

Examples

Document corpora
• StarTree for NASA docs

Document search results
• TileBars [Hearst]
• Popout Prism [Woodruff]

Document contents
• TextArc (word frequencies) [Paley]
• Fluid Documents

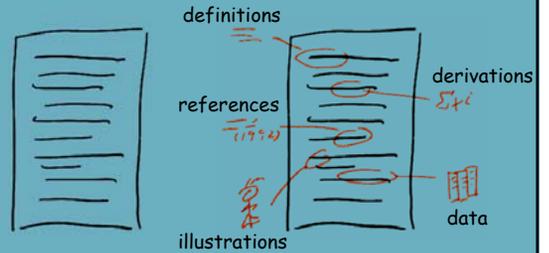


Fluid Documents: Annotation in Context

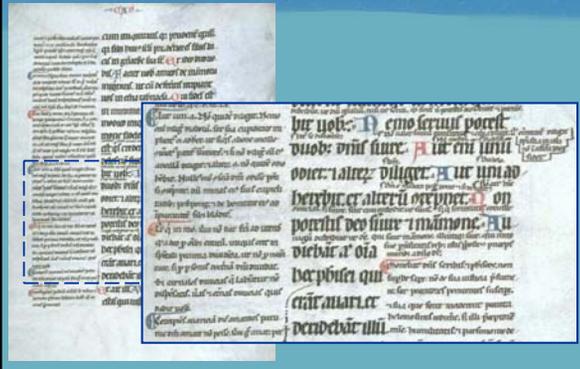
Polle T. Zellweger
Jock D. Mackinlay

Aarhus University, Denmark
Xerox PARC, USA

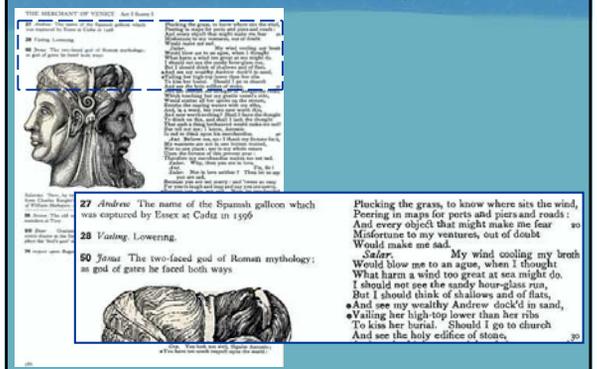
Annotations are common



12th century manuscript



Annotated Shakespeare



Hypertext documents



Problems with annotations

- ◆ Paper
 - limited number & size
 - distant from primary
 - impacts primary presentation
- ◆ Hypertext
 - removes annotation from primary context

Goal: annotation in context

Lightweight, contextual access

- ◆ fluid shift of attention from primary to annotation and back
- ◆ easy comparison of material
- ◆ reduce reader disruption

Demo: fluid documents

Talk overview

- ◆ Hypertext
 - Graphical techniques
 - Fluid links
 - Fluid links study
 - Open fluid hypermedia
- ◆ Other applications
 - Fluid spreadsheets
 - Fluid fiction
 - Fluid reading primer
- ◆ Conclusions

Graphical Techniques

showing annotations
in context

Graphical techniques

- ◆ Interline compression
- ◆ Margin callout
- ◆ Overlay

northern Italy. (5) Sauvignon Blanc is used in of Sauternes and Barsac, the dry whites of G. Sauternes are made with the semillon grape, left on the vines until they have rotted and molded. ||

wines of the Loire Valley of France. (6) Tram

Alcace-Lorraine wine grape of th northern Italy. (5) of Sauternes and wine of the Loire whites of Alcace good whites of C

Sauternes are made with the semillon grape, left on the vines until they have rotted and molded. ||

northern Italy. (5) Sauvignon Blanc is used of Sauternes and Barsac, the dry whites of Sauternes are made with the semillon grape, left on the vines until they have rotted and molded. ||

Demo: graphical techniques

Fluid documents approach

Four steps:

- ◆ visual cue to annotation
- ◆ reader indicates interest (lightweight)
- ◆ primary and annotation negotiate for space and salience
- ◆ animated transition

Fluid Links

informed and incremental
hypertext browsing

Problem with hypertext

- ◆ *Problem:* Choosing whether to follow links
- ◆ Fluid Links help users get a preview of the destination while still in the source context manage when to follow a link

KING MAKES IT THREE
By Doug O'Hara and Craig Medred
NOME, AK -- Wednesday, March 18, 1998

Pounded by fierce coastal winds, Jeff King of Denali Park saw his chance for a record Iditarod Trail Sled Dog Race blow away on Tuesday, but his team persevered to claim a third victory in 9 days, 5 hours, and 52 minutes. Only miles away from the Nome finish line, King and his dogs were caught in a ground blizzard that cut visibility to almost nothing. He later said the weather was the worst he'd witnessed in six Iditarod races.

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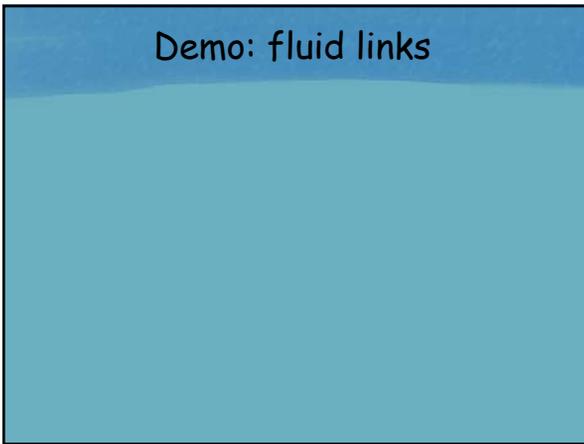
Pounded by fierce coastal winds, Jeff King of Denali Park saw his chance for a record Iditarod Trail Sled Dog Race blow away on Tuesday, but his team persevered to claim a third victory in 9 days, 5 hours, and 52 minutes. [Compare with Doug Spitznagel's record set in 1996. 8 days, 2 hours, and 42 minutes.](#)
[Click to see all yearly statistics.](#)

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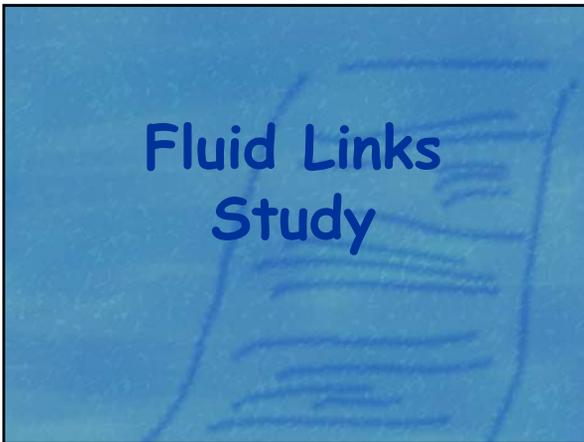
Zellweger, Chang, Mackinlay. Fluid Links for informed and incremental link transitions. *Hypertext '98*.

Fluid links

- ◆ *Glosses:* lightweight, contextual info near anchor without obscuring source supports comparison
- ◆ Use animation smooth experience of viewing glosses
- ◆ Enable augmented features improved gloss content enhanced hypertext navigation



- ### Fluid links summary
- ◆ Lightweight, contextual, animated access to additional info
 - ◆ Increase engagement with source help reader choose links reduce disruption of following links
 - ◆ Blur boundary between source & dest computed glosses multi-way links, nested glosses



- ### Fluid Links user study
- ◆ Research questions
 - Is text animation disruptive to eye behavior or reading?
 - How do different techniques affect the way readers use glosses?
 - ◆ Method
 - Answer questions in two hypertext corpora
 - 6 conditions: *Inline, Margin, Overlay* (animated) *Footnote, Popup, No Gloss* (not animated)
 - Use eyetracker to focus on gloss manipulations
- Zellweger, Regli, Mackinlay, Chang. *Reading and browsing in Fluid Documents*. CHI 2000.

Study conditions

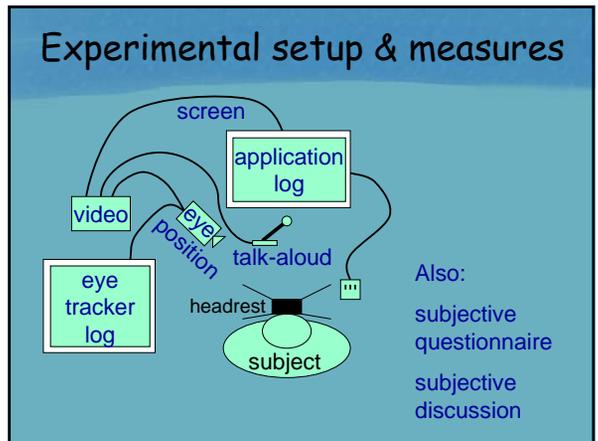
(a) Fluid Inline

(b) Fluid Margin

(c) Fluid Overlay

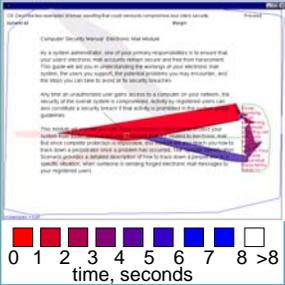
(d) Popup

(e) Footnote



Eye movement visualization

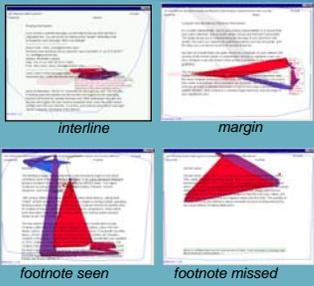
- ♦ Custom *eye gaze visualization* encloses eye movement from the time the gloss begins to open
- ♦ Helped us code thousands of gloss events quickly



The screenshot shows a document window with a red heatmap overlay indicating eye movement. Below the document is a legend with color-coded boxes for time intervals: 0 (red), 1 (orange), 2 (yellow), 3 (light green), 4 (green), 5 (teal), 6 (blue), 7 (dark blue), 8 (purple), and >8 (white).

Results: effects of animation

- ♦ Animated glosses drew the users' eyes
- ♦ Margins hard to read
- ♦ Distant glosses without animation (footnotes) were sometimes missed
- ♦ Glosses that opened near the anchor were used significantly more quickly than distant ones



The four screenshots show heatmaps of eye movement on text. The top-left is labeled 'interline', the top-right 'margin', the bottom-left 'footnote seen', and the bottom-right 'footnote missed'. The 'footnote missed' heatmap shows significantly less activity compared to the 'footnote seen' heatmap.

More results

- ♦ Mouseover gloss activation is *too* lightweight almost 1/3 of detected gloss events were inadvertent dwell while following link reading-related mouse motions
- ♦ User preferences were highly varied and strong although glosses generally valued suggests need for care in animated designs
- ♦ "Browsing without glosses is like surfing blind."

Open Fluid Hypermedia

Fluid Open Hypermedia

- ♦ *Problem:* Adding personal information to third-party material, and sharing it if desired.
- ♦ Fluid Open Hypermedia helps users
 - add glosses that readers can open and close as desired
 - add glosses that can contain links and glosses



The screenshot shows a web browser window with a car advertisement. A gloss overlay is visible on the advertisement, containing text and a link.

Bouvin, Zellweger, Grønbeek, Mackinlay. *Open Fluid Annotations: Using and extending emerging Web standards.* WWW 2002.

Improvements

- ♦ Streamline & re-use
 - Augment existing Web pages directly
 - no changes to work practice
 - Can begin annotations from IE right-click context menu
 - Can re-use appearance definitions
- ♦ Exploit visual perception
 - CSS provides rich annotator control of salience of anchor and gloss
 - "Push down" gloss animation permits reading while gloss is opening

Controlling salience

- ◆ Allow control of salience of annotations anchors & glosses: blend in or be visually distinct
- use CSS to specify anchor, gloss appearance
- cascade inherits easily from context if desired, and allows link/annotation anchors to compose



"Pushdown" animation

- ◆ Allow readers to view glosses in context ideally: near anchor with minimal occlusion
- animated opening/closing clarifies page changes

glosses typically hidden, reader can interactively open "push down" technique gradually reveals the gloss below the anchor, while the following lines are pushed down the page to make room



Fluid Spreadsheets

Problem with spreadsheets

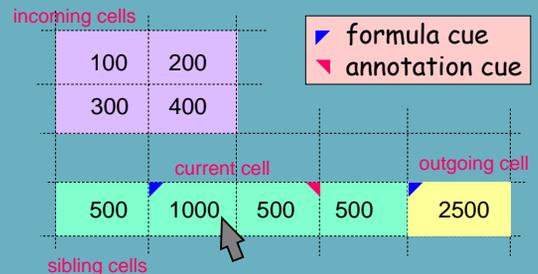
You see table & numbers but not formulas
Example: editing the layout of a table

	A	B	C	D	E	F	G
1	100						
2							
3	25	25	50		100	200	
4	25	25	50		100	400	
5	25	25	50		100	800	
6	25	25	50		100	1000	
7							
8	100		100	200			
9							
10	25	25	50		100	600	
11							

Solution: annotation in context

- ◆ Cell relationships
- ◆ Formula text
- ◆ Annotations

Cell relationships



Formula text

Interline compression

Annotations

Επισημειώσεις

Demo: fluid spreadsheets

Fluid spreadsheets summary

- ◆ Cell relationships
lightweight interaction (static & animated)
filled regions and table are visually distinct
- ◆ Formula text
use interline compression of free space
- ◆ Annotation
placed fluidly

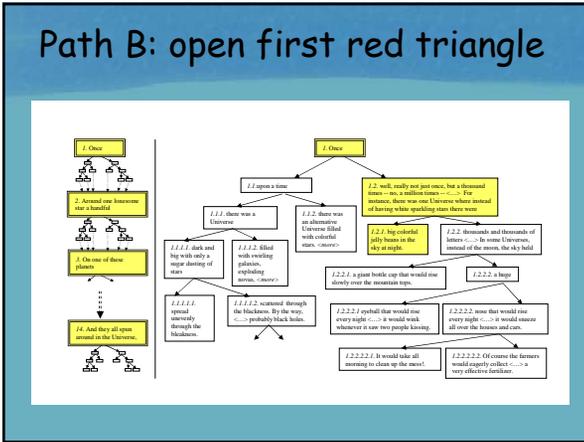
Fluid Fiction

The Fluid Reader

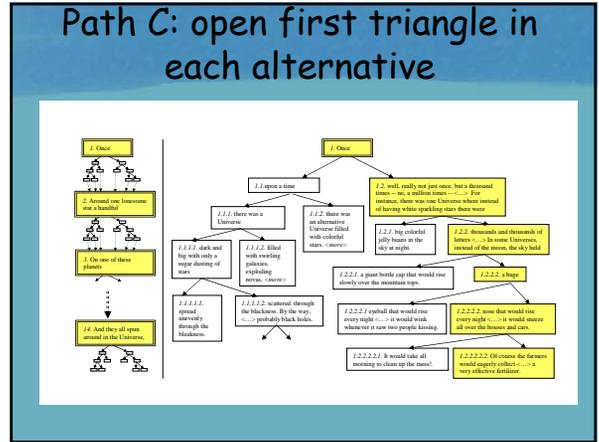
- ◆ *Problem:* Making sense of hypertext narratives
- ◆ The Fluid Reader provides continuously-visible context
supports fine-grained hypertexts
uses interactive animation to adjust content

Zellweger, Mangen, Newman. Reading and writing Fluid hypertext narratives. *Hypertext 2002*.

Path B: open first red triangle



Path C: open first triangle in each alternative



The Fluid Writer

Early authoring: MS Word outline mode

- ◆ Better for some paths



Early authoring: MS Word outline mode

- ◆ ... than for others



Authoring requirements

- ◆ Basic editing functions add, remove content at any point
- ◆ Ensure that ideas flow sensibly and sentence mechanics are properly observed across multiple fine-grained nodes
- ◆ View entire narrative and its structure
- ◆ Compare two or more paths in detail

The Fluid Writer: Interactive Treetable

The screenshot shows a software window titled "The Fluid Writer: Interactive Treetable". On the left side, there is a text editor with three paragraphs of text, each starting with a red letter 'Q'. On the right side, a tree table is displayed, where each node in the tree corresponds to a paragraph in the text. The tree table has a hierarchical structure with nodes connected by lines, and some nodes are highlighted in yellow.

Comparing two paths

This screenshot shows the same Fluid Writer interface as the previous one. Two different paths through the tree table are highlighted in yellow. The paths start from the root node and branch out to different sub-nodes, illustrating how the software compares two different ways of navigating through the hierarchical data.

Editing the treetable

The screenshot shows the Fluid Writer interface with several red circles highlighting specific nodes in the tree table. These circles are placed around nodes that represent different levels of the hierarchy, indicating the user's focus on editing or interacting with those specific parts of the data structure.

Editing the treetable #2

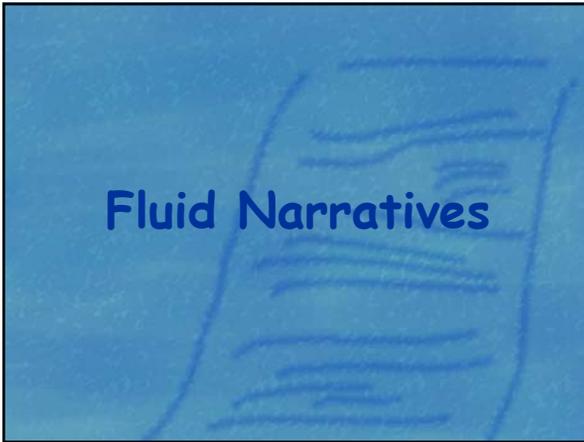
This screenshot shows the Fluid Writer interface with an orange circle highlighting a specific node in the tree table. The circle is centered on a node, suggesting a more detailed view or a specific action being performed on that node.

Editing the treetable #3

The screenshot shows the Fluid Writer interface with two red circles highlighting nodes in the tree table. One circle is around a node in the middle of the hierarchy, and the other is around a node at a lower level, showing the user's movement through the tree.

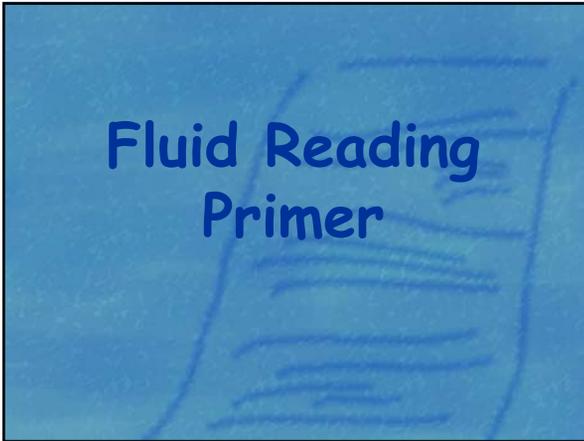
Editing the treetable #4

This screenshot shows the Fluid Writer interface with an orange circle highlighting a node in the tree table. The circle is around a node, similar to the previous editing steps, showing the user's continued interaction with the hierarchical data.



Fluid Reader / Writer

- ◆ The Fluid Reader
 - provides continuously-visible context
 - supports fine-grained hypertexts
 - uses interactive animation to adjust content
- ◆ The Fluid Writer
 - unaligned treeable visualization supports reading along multiple paths, comparing, focusing, editing
- ◆ Fluid Narratives
 - (mystery story writing in progress)
 - reducing cognitive load may permit more enjoyment, more attention to detail -- for reader *and* author
 - use alternatives for character, plot development



Problem with reading

- ◆ Humans are wired for spoken language
- ◆ Reading and writing are artificial systems that must be taught
 - Writing uses symbols to show sounds
 - We reverse this process to read
 - Readers decode symbols into sounds
- ◆ Learning to read is difficult
 - ~ 20% of American adults are functionally illiterate

The basic decoding process

- ◆ Visual segmentation
 - separate written word into groups of letters such that each group shows a single sound
- ◆ Sound assignment
 - choose a sound for each group
- ◆ Sound blending
 - sequence sounds to form spoken word (English: left-to-right)
- ◆ Check and possibly try again
 - word that makes sense in context

cat

c a t

/k/ /a/ /t/

/kat/

Why decoding English is hard

- ◆ 43 sounds (approx) > 26 letters
 - letters "th" show sound /th/, unrelated to /t/ or /h/
- ◆ Many-many mappings between sounds & letters
 - /ow/: cow out bough
 - "ou": /ow/ out, /oo/ soup, /u/ touch, /oe/ soul
- ◆ Other complications
 - some letters can "act at a distance"
 - vowel + e: pin - pine cut - cite hop - hope
 - "silent" letters
 - know ptarmigan dumb debt rhino

The Phono-Graphix™ approach

- ◆ Developed recently by McGuinnesses, based on reading remediation experience
analysis of English for spelling patterns, frequency
- ◆ Start with sounds, teach corresponding letters
- ◆ Use every letter in the word, left-to-right
- ◆ Show the results of visual segmentation

A **c**ow**o**y's job is to **t**ake **c**are of cattle. A **c**ow**o**y's biggest helper is his horse. Together a **c**ow**o**y and his horse can **l**ook after hundreds of **c**ow**o**s. McGuinness, C & G. *Reading Reflex*, 1998, p 275.

The Fluid Reading Primer

- ◆ Extend and improve upon Phono-Graphix™
use animated typography from Fluid Documents
- ◆ Animate the decoding process on demand
visual segmentation
sound assignment, with audio
sound blending, with audio
incremental help to promote attempts by reader
- ◆ Careful animation design
address common faulty reading strategies
- ◆ Coded form is even closer to ordinary text
no bold characters or underlines to distract readers

- Then Snow White awoke and saw seven little dwarves.
- Then Snow White awoke and saw seven little dwarves.
- Then Snow White awoke and saw seven little dwarves.
- Then Snow White awoke and saw seven little dwarves.
- Then Snow White awoke and saw seven little dwarves.

Step 1. Visual segmentation

Then Snow White awoke and saw seven little dwarves.

Step 3. Sound blending, with audio

- Then Snow White awoke and saw seven little dwarves.
- Then Snow White awoke and saw seven little dwarves.
- Then Snow White awoke and saw seven little dwarves.
- Then Snow White awoke and saw seven little dwarves.

Step 2. Sound assignment, with audio

Then Snow White awoke and saw seven little dwarves.

Step 2 for a discontinuous e

Demo: fluid primer

Fluid primer infrastructure

- ◆ Stories written in plain text
- ◆ Dictionary of words

word	segments	sounds	audio file
thought	th ough t	th/ aw/ t/	others.wav
snow	s n ow	s/ n/ oe/	snow.wav
white	wh i- t -e	w/ ie/ t/ -/	white.wav

includes inflected forms: run, runs, ran, running...

- ◆ Audio files of all 43 English sounds
- ◆ Audio files of words

Discussion

Summary: fluid hypertext

- ♦ **Fluid documents**
show annotations in context via lightweight animation of graphical characteristics
- ♦ **Fluid links**
provide hypertext link information
- ♦ **Fluid links study**
encouraging observations, individual differences
- ♦ **Open fluid hypermedia**
reader-created annos on existing Web pages

Summary: fluid applications

- ♦ **Fluid spreadsheets**
expose underlying structure
- ♦ **Fluid fiction**
reader: explore effects on reading stories
writer: show multiple alternatives together
narratives: explore effects on authoring
- ♦ **Fluid reading primer**
show internal structure of words, use audio

Implementations

- ♦ **Fluid links & Fluid spreadsheets**
Java (JDK 1.1)
XML markup
- ♦ **Fluid fiction**
Java (JDK 1.2)
outline-based authoring format
- ♦ **Fluid reading primer**
Java (Jazz zoomable UI toolkit & JDK 1.3)
- ♦ **Open fluid hypermedia**
Internet Explorer plug-in: C++, COM, DOM
HTML, Cascading Style Sheets

More information

- ♦ Fluid Links for informed and incremental link transitions, Hypertext'98
- ♦ The impact of Fluid Documents on reading and browsing: an observational study, CHI 2000
- ♦ Fluid annotations in an open world, Hypertext'01
- ♦ Fluid visualization of spreadsheet structures, Visual Languages'98
- ♦ The Fluid Reading Primer, ED-MEDIA 2001
- ♦ Reading and writing fluid hypertext narratives, Hypertext'02

Collaborators

- ♦ **Xerox PARC**
Bay-Wei Chang
Ken Fishkin
Takeo Igarashi, U of Tokyo
Gregory Niemeyer, Stanford U
Susan Harkness Regli, CMU
Rich Gold
Anne Mangen, Volda Univ College, Norway
Paula Newman
- ♦ **University of Aarhus**
Niels Olof Bouvin
Henning Jehaj
Kaj Grønbæk
Morten Breinbjerg

