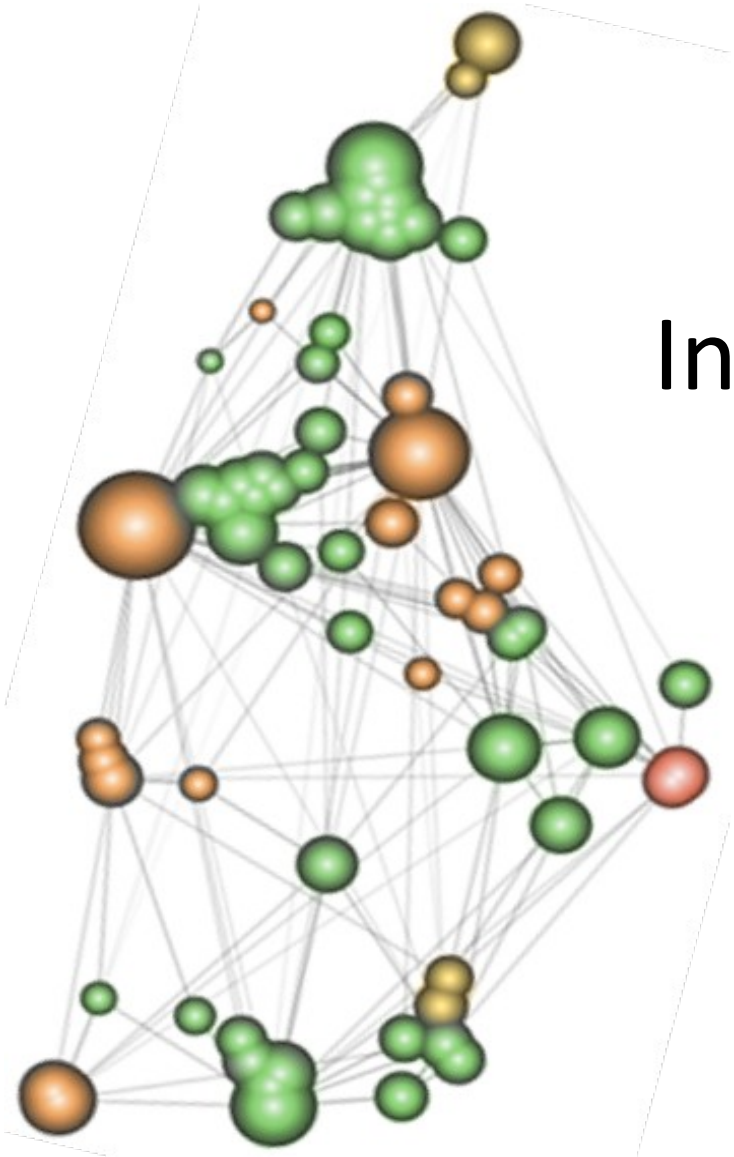

Informationsvisualisierung [WS10/11 | VO.09]

Theresia Gschwandtner
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17. 01. 2011

Social Visualization

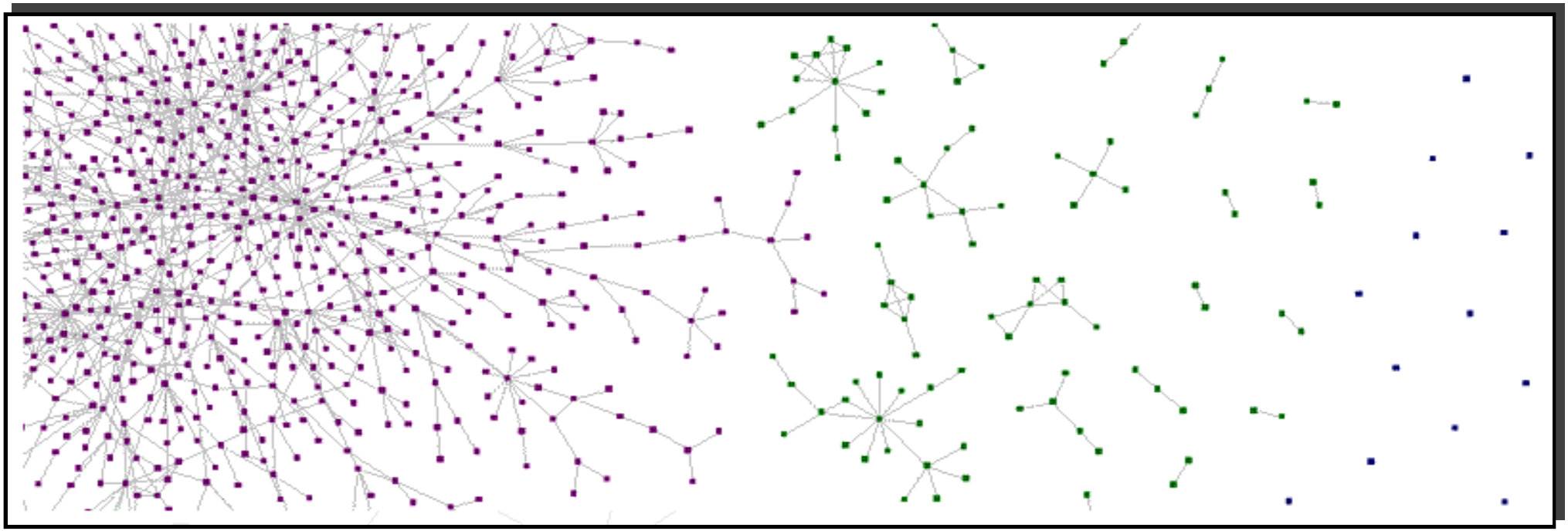
- Visualizations of text, audio, and interaction data to uncover social connections and interaction patterns in online and physical spaces.
- Social data: traces that people leave as they go about their daily routine. These data may come from different sources such as the online world (i.e. email archives, IM logs, blog postings, etc.) and the physical world (i.e. captured through sensors such as voice by microphone, movement and location data by camera, GPS, cell station, etc.).
- Visualizations of these kinds of data can be used for increasing awareness of one's social environment, highlighting cues implicit in communication, or for documenting patterns of activity over time.

[http://social.cs.uiuc.edu/soc-viz.html]

Content VO.09: Social Visualization

- Social Networks
- Conversation
- E-mails & Newsgroups
- Authoring
- Web 2.0
- Movements

Social Network Visualization

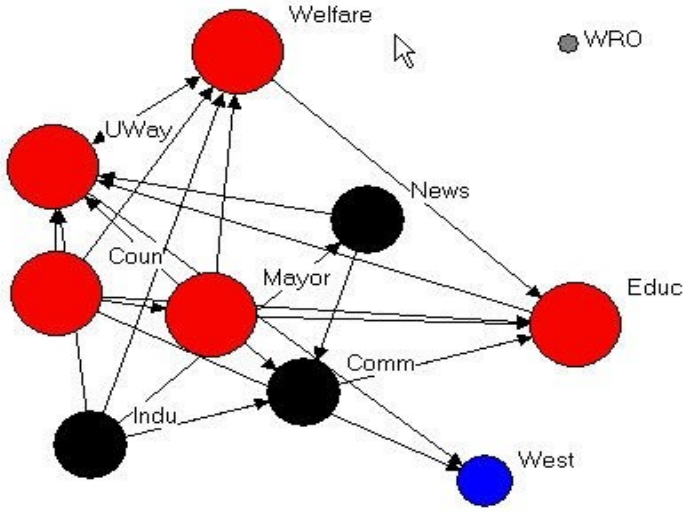


- Mapping and measuring of relationships and flows between people, groups, organizations, computers or other information/knowledge processing entities.
- Nodes in the network represent people or groups.
- The links show the relationships or flows between nodes.

[orgnet, Hanneman, et al.]

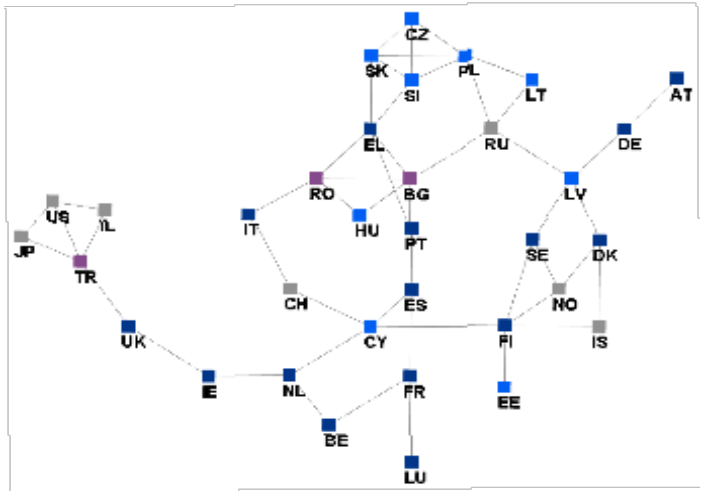
Social Network Visualization (2)

- To understand networks and their participants



- Evaluate the location of actors in the network.

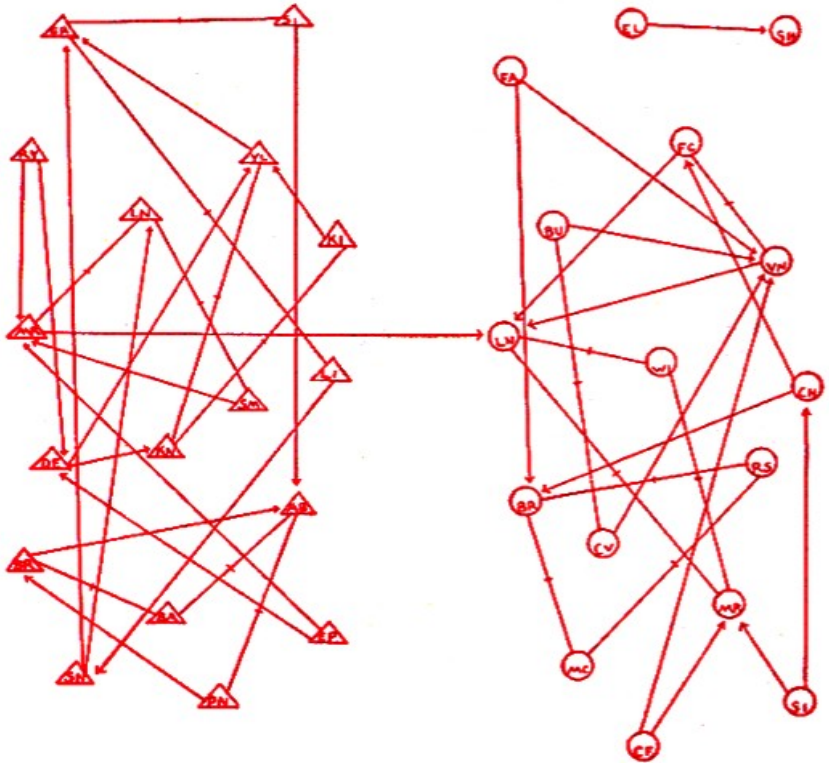
- Determine the importance, or prominence, of a node in the network.



[orgnet, Hanneman, et al.]

Social Network Visualization: Sociogram

- Foundational work of Jacob Moreno: Use visual images to display the patterning of linkages among social actors
- The fewer number of lines crossing, the better the sociogram.
- Variations in the shape points can communicate characteristics of social actors.
- Variations in the locations of points can be used to stress important structural features of data.



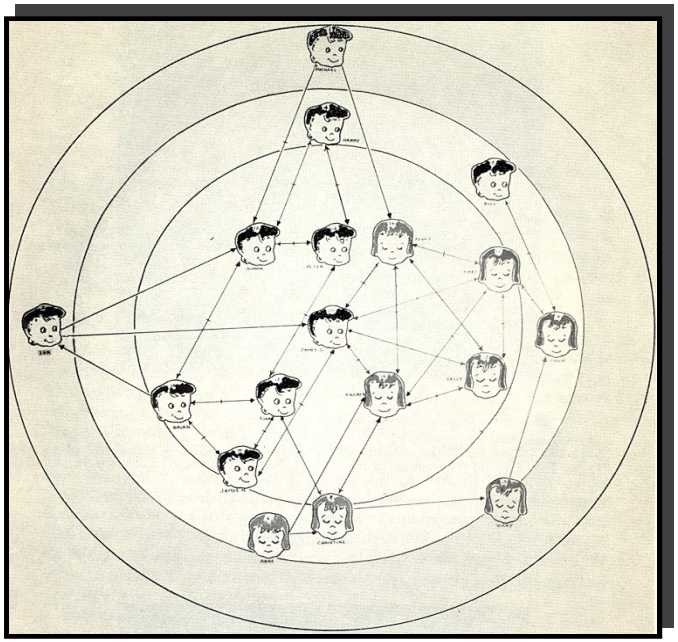
Moreno's Image of Fourth Grade Friendship Choices : Friendship choices made by fourth graders. Boys are shown with triangles and girls are circles.

[Moreno, Freeman]

Social Network Visualization: Targeted Sociogram

- Foundational work of Mary L. Northway:
  Nested series of concentric circles.

- Grant (one of Northway's students) drew this Target Sociogram of a First Grade Class
  (from Northway, 1952).

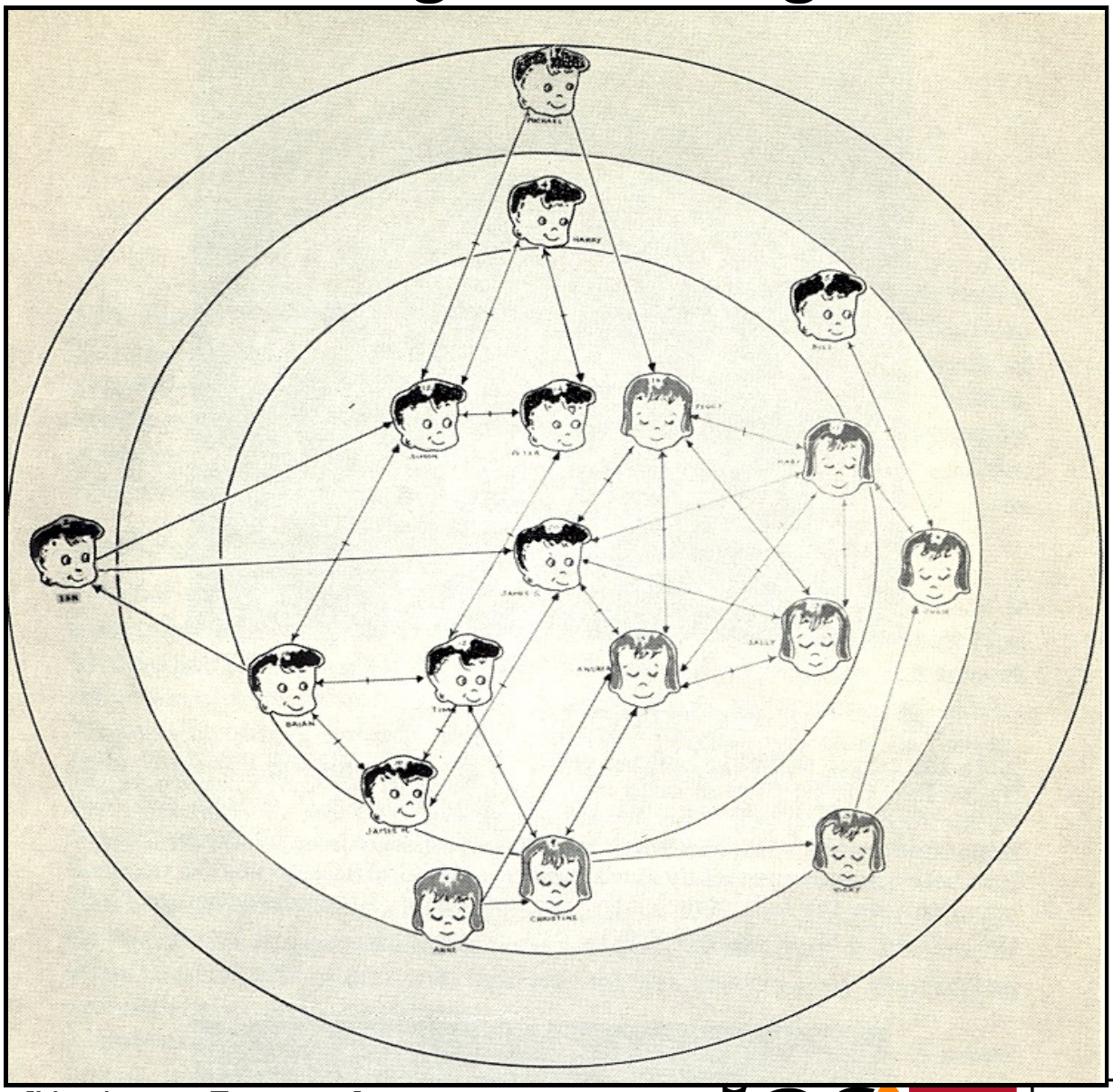


- Northway's rule:
  lines should be short. It has been widely adopted.

[Northway, Freeman]

Social Network Visualization: Targeted Sociogram

- Points in the central circles were chosen most often. Lines connecting them represent primary links between pairs.
- Points at the edge were chosen less often.
- Points are placed in the rings in such a way that the lines connecting them are relatively short.

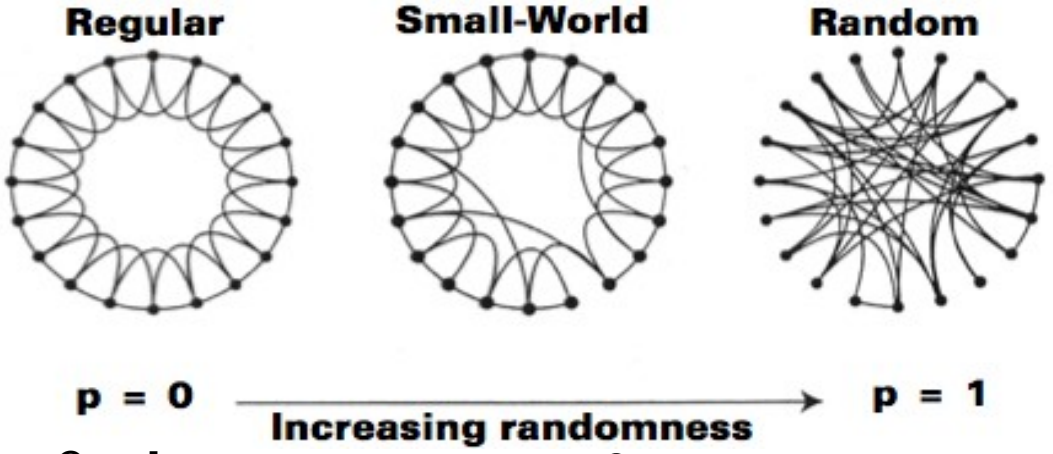


[Northway, Freeman]

Social Network Structures

- **Small-world phenomemon**: according to Stanley Milgram each actor in a social network is linked to any other with a maximum of 6 intermediaries. Experiment in 1967 suggested that two random US citizens were connected on average by a chain of six acquaintances.

- Smaller communities, such as mathematicians, are densely connected: Mathematicians use the Erdös number to describe their distance from Paul Erdös based on their shared publications.
  The Erdös Number Project:
  http://www.oakland.edu/enp/



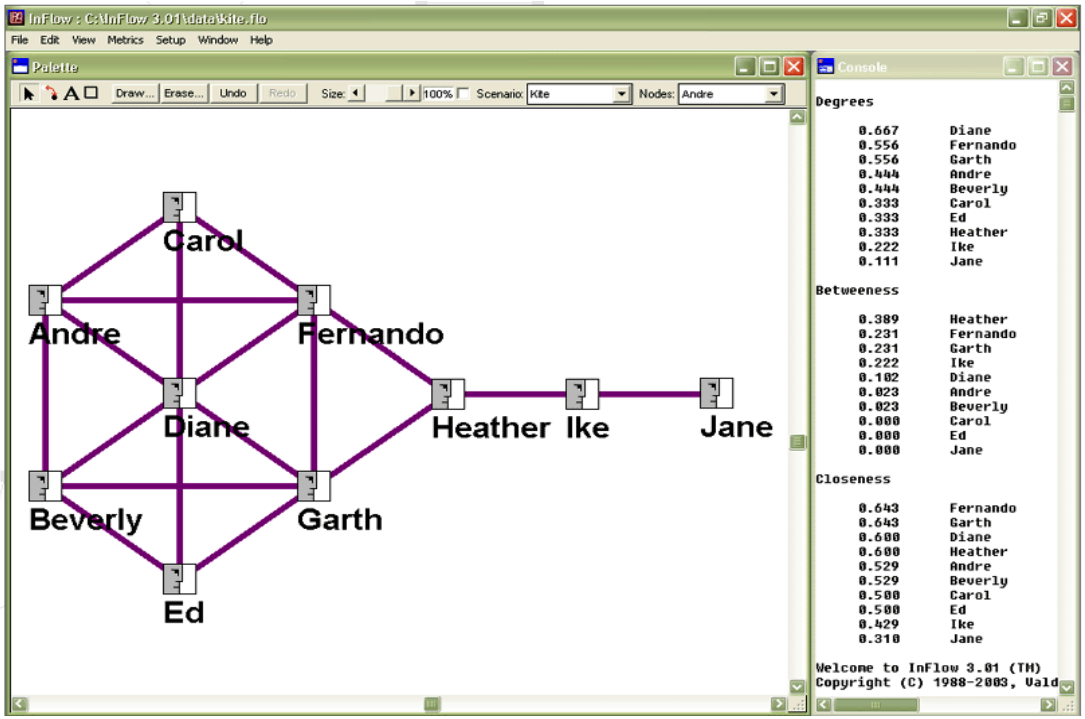
[Milgram, Case]

Social Network Analysis

Degrees: the number of direct connections a node has

Common wisdom in personal networks is "the more connections, the better."

But: What really matters is where those connections lead to – and how they connect to other connected nodes.



Betweenness: if someone is between two important constituencies

'Broker' role in the network

powerful role in the network

can be single point of failure

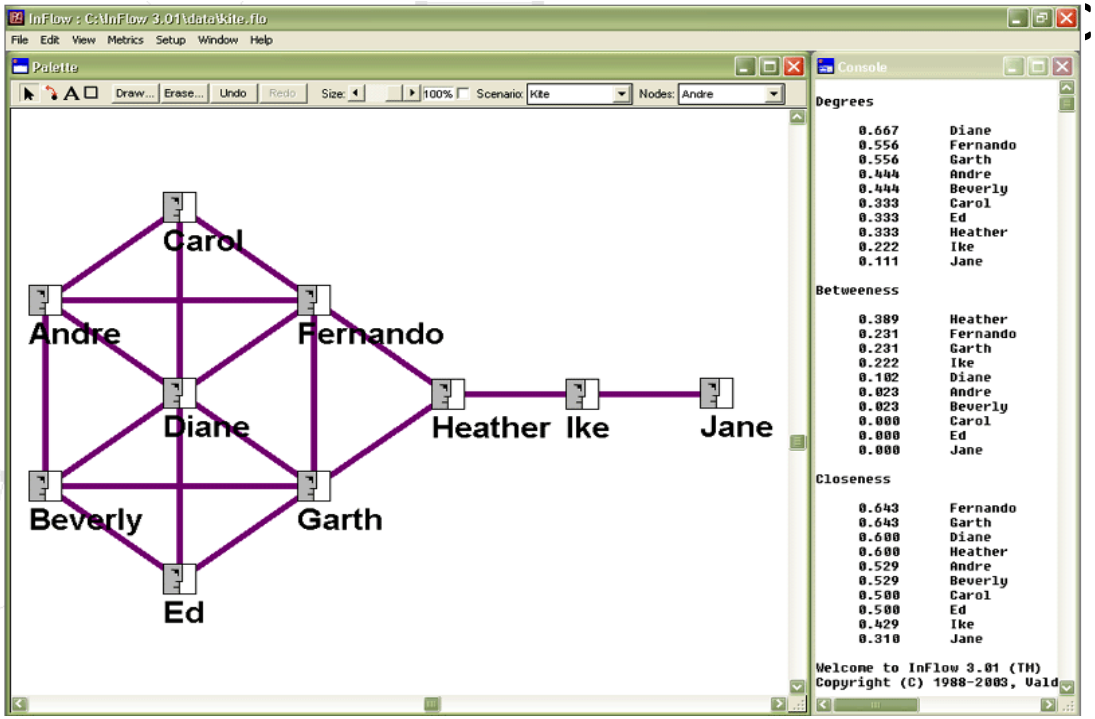
node with high betweenness has great influence over what flows in the network

[orgnet]

Social Network Analysis

Closeness: the pattern of direct and indirect ties that allow access all the nodes in the network more quickly than anyone else:

- A node with high closeness is an excellent position to monitor the information flow in the network and has the best visibility into what is happening in the network.



Social groups: collections of actors who are closely linked to each other

S

Social positions: sets of actors who are linked into the total social system in similar ways

[orgnet]

Social Network Visualization

Two distinct forms:

- **Graphs**:
  points represent social actors and lines represent relations among the actors.

- **Matrices**:
  the rows and columns both represent social actors and numbers or symbols in the cells show the social connections linking those actors.

NetVis - Dynamic Visualization of Social Networks

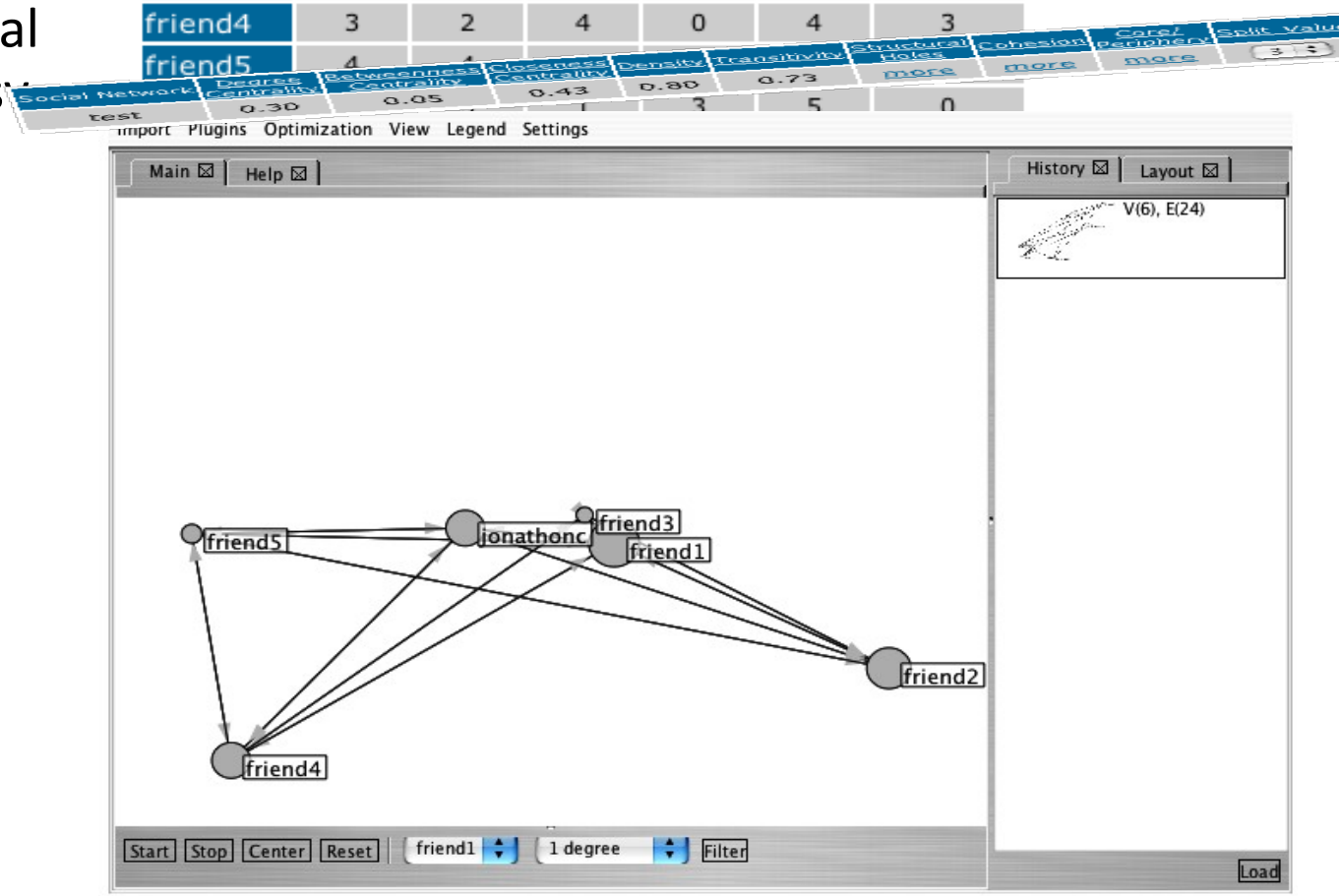
T

The NetVis Module is a free open source web-based tool to analyze and visualize social networks using data from csv files, online surveys, and dispersed teams.

f you had communication frequency data on a 5-point scale:
1 = Not at all
2 = Monthly
3 = Bi-weekly
4 = Weekly
5 = Daily

Data Matrix - test

	friend1	friend2	friend3	friend4	friend5	jonathonc
friend1	0	3	5	3	4	3
friend2	3	0	3	2	4	3
friend3	5	3	0	4	2	1
friend4	3	2	4	0	4	3
friend5	4					

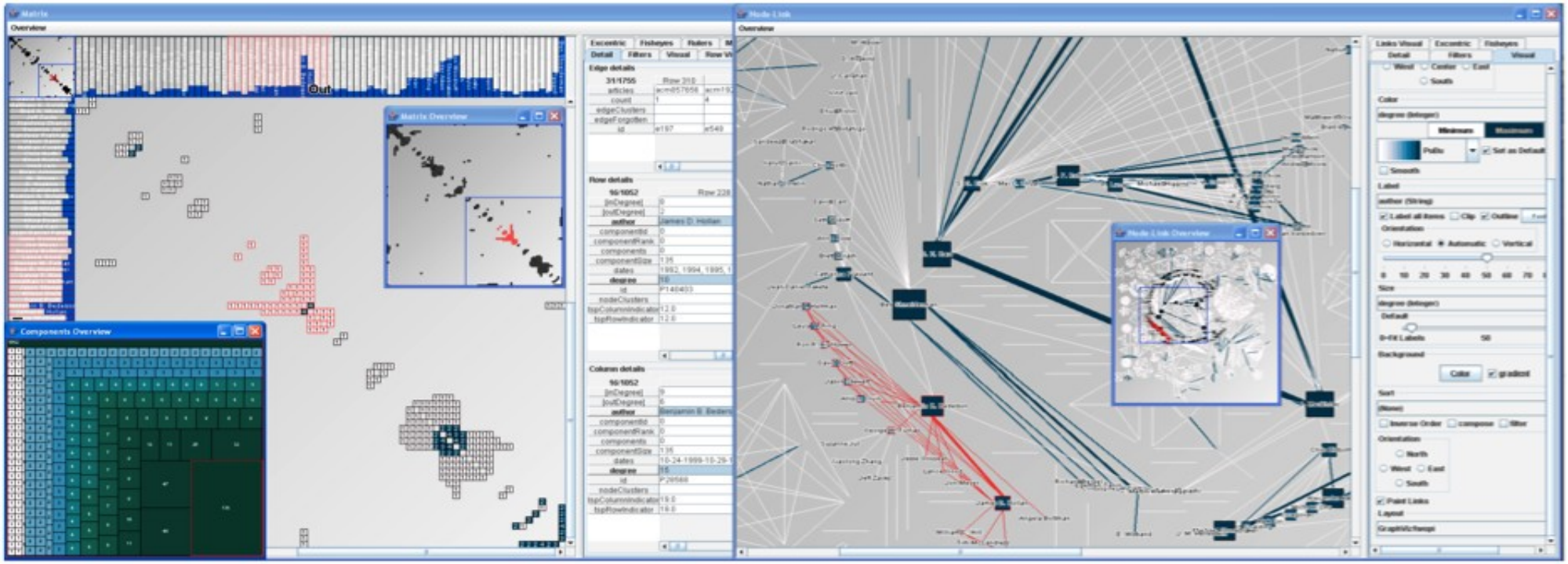


[netvis]

NetVis - Dynamic Visualization of Social Networks

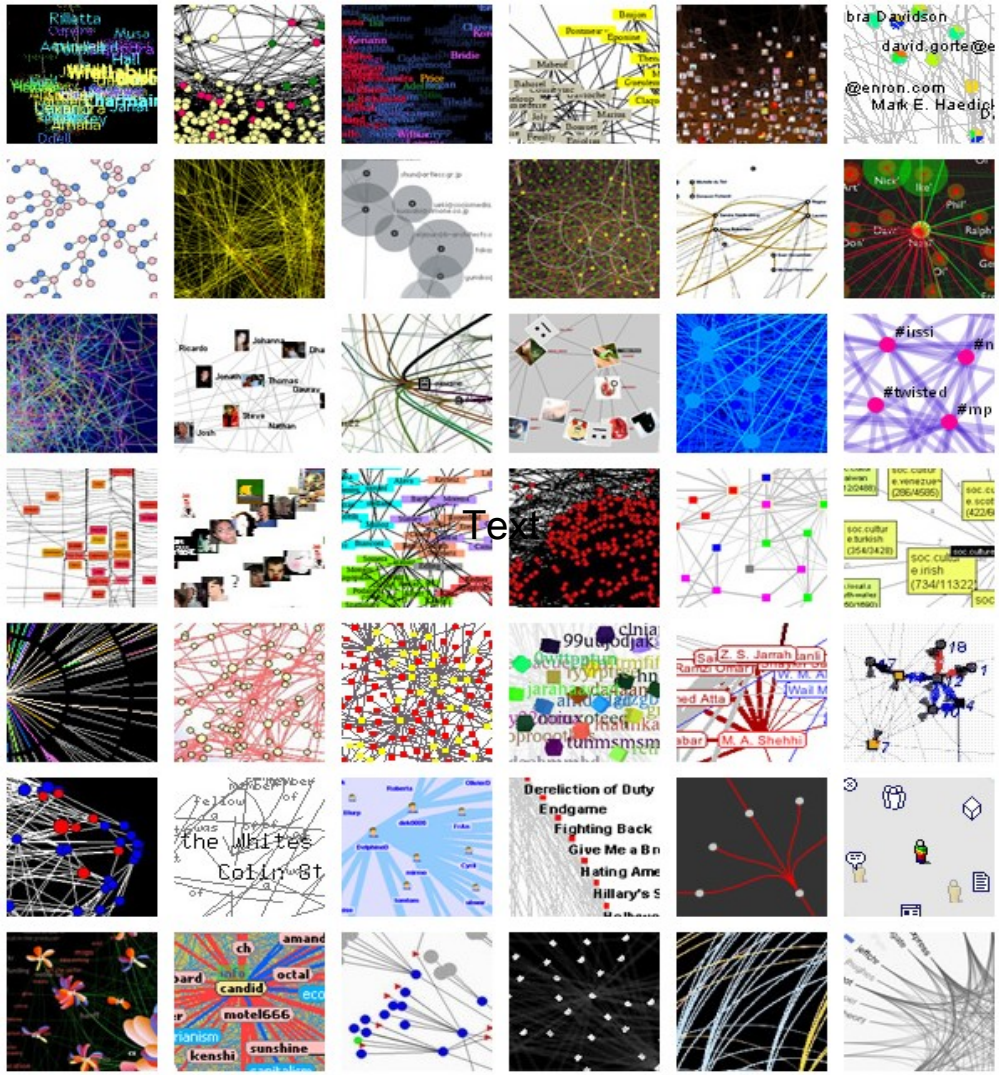
- **Degree centrality:** centrality based on degree, or the ties into and out from actors.
- **Betweenness centrality:** centrality based on betweenness, or the bridges among actors.
- **Closeness centrality:** centrality based on closeness, or the shortest path among actors.
- **Density:** sum of actor ties divided by the number of possible actor ties.
- **Transitivity:** fraction of triads which are transitive, that is, if a -> b and b -> c, does a -> c.
- **Structural holes:** redundancy and constraint of the social network.
- **Cohesion:** distance between all nodes in a social network.
- **Core periphery:** identifies a dense/connected core and a sparse/unconnected periphery.

MatrixExplorer



- MatrixExplorer, Nathalie Henry,
- http://insitu.lri.fr/~nhenry/PhD.html

More Social Network Visualization Tools



[http://www.visualcomplexity.com/vc/index.cfm?domain=Social%20Networks]

Content VO.04: Social Visualization

- Social Networks
- Conversation
- E-mails & Newsgroups
- Authoring
- Web 2.0
- Movements

Online Conversation

Text-only chat environments – problems:

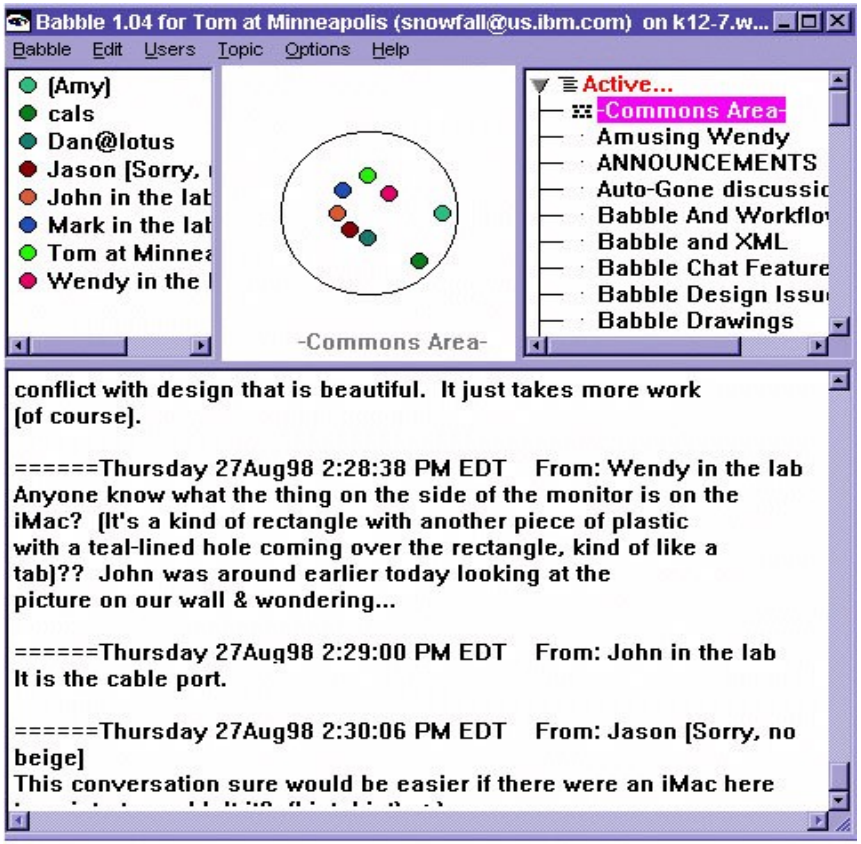
- Ephemeral presence – hard to determine who is participating.
- Everyone looks the same – “usernames in text” are all visually similar.
- Interactions among users not well represented.
- Turn-taking, timing information not well represented.

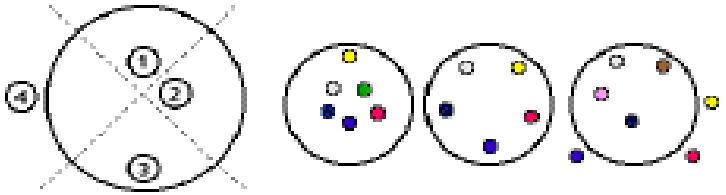
Avatar-based systems:

- Solves the problem of presence – but usually only in a binary way.
- People look different – but avatars can distort emotions if they provide only a small range of broadly-drawn expressions.
- The screen can get cluttered – less history can be on screen at once.
- Turn-taking rhythms still difficult to convey.

Online Conversation Tools: Babble / Loops

- Communication among small to medium-sized groups that is deep, Coherent and productive
- Making participants and their activities visible to one another; this allows people to draw on their social knowledge (e.g., if there's a crowd, it must be interesting).
- Collaborate synchronously and asynchronously.
- Large circles representing topics areas.
- Small dots show where people are.
- Loops is Web-based successor.



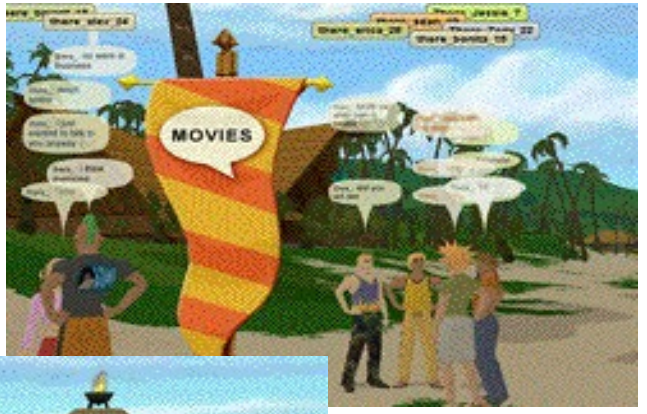


[Erickson, Smith]

Online Conversation Tools: There.com

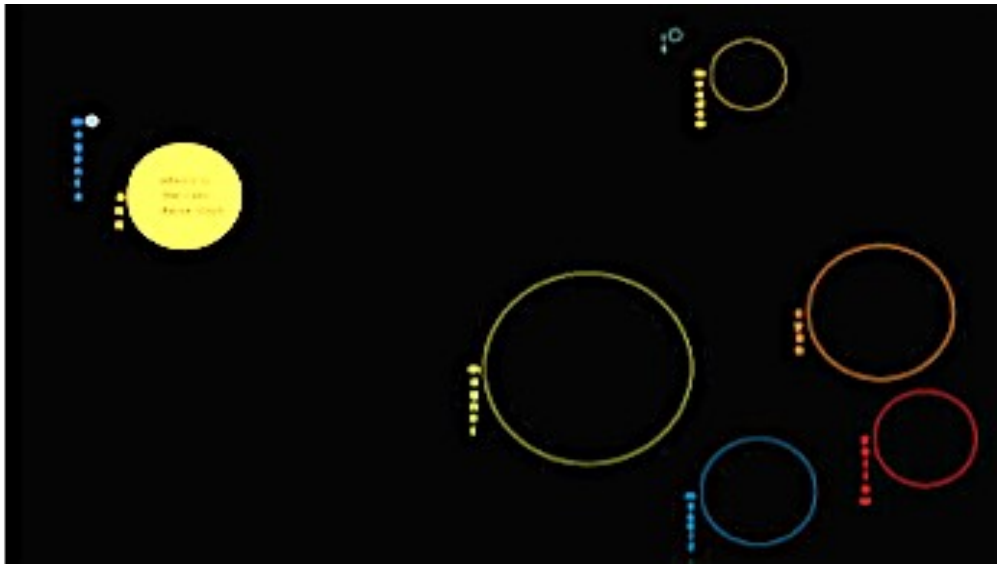
Avatar-based chat program:

- Real-time 3D experience – Video-Game like
- The environment provides scenarios for interaction
- “Selecting an outfit” and “exploring the world” are as important as talking
- Emphasis on interactivity, no history or archiving
- " Comic chat" plus " The Sims"



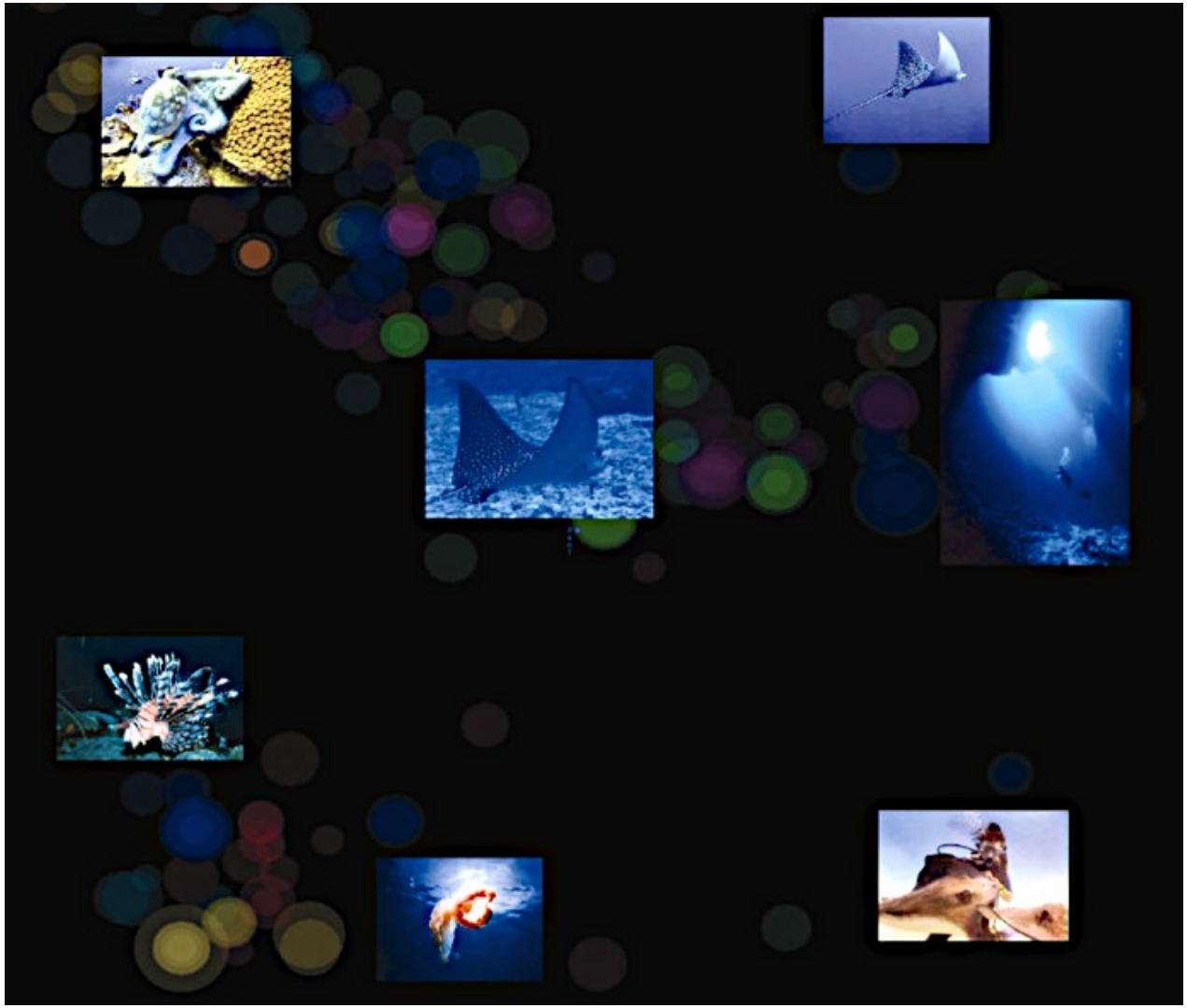
Online Conversation Tools: Chat Circles

- Images in the background (topics), action traces (participants), and a map of the entire space (social environment).
- Users are represented by a colored circle.
- Circle size indicates how much the user is talking:
  - Lurkers shrink to a dot, dominant speakers grow
  - Presence always visible
- Groups with "Hearing Range":
  - User only sees the words of those near her/him.
  - User can move her or his circle to other groups.
- History view
- Text and audio



[Donath and Viegas]

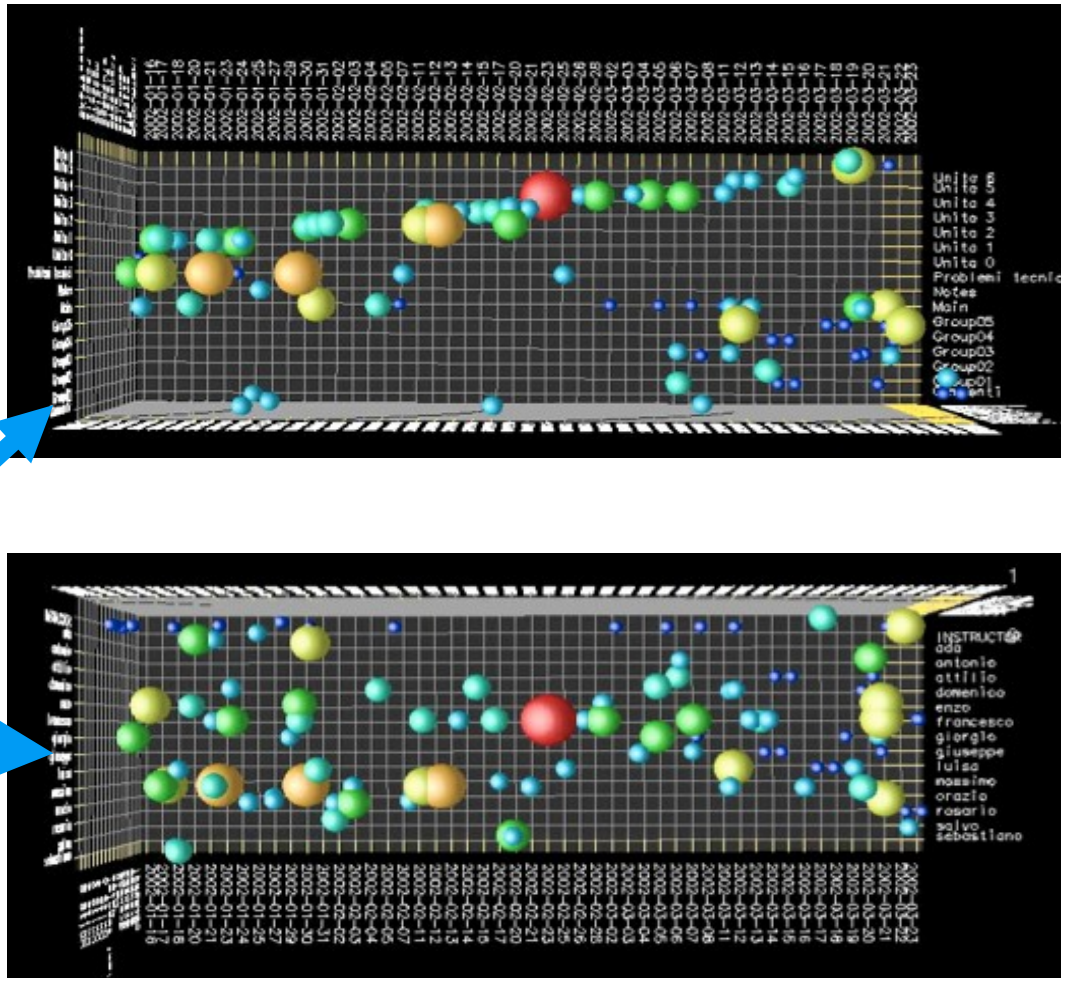
Online Conversation Tools: Chat Circles (2)



[Donath and Viegas]

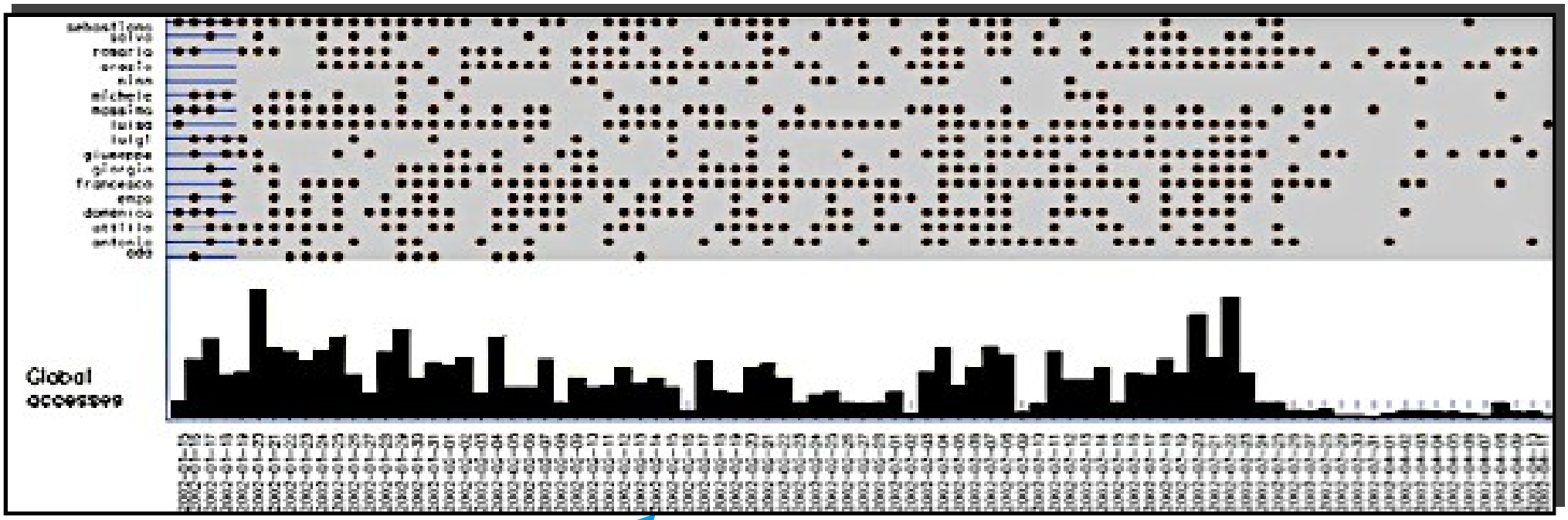
Conversation & Observation: CourseVis

- Graphical representations of Student tracking data collected by a Course Management Systems to gain an understanding of what is happening in distance learning classes.



- Different views:
  - Discussion Plot
  - Student Accesses plot
  - Cognitive Matrix

Conversation & Observation: CourseVis (2)

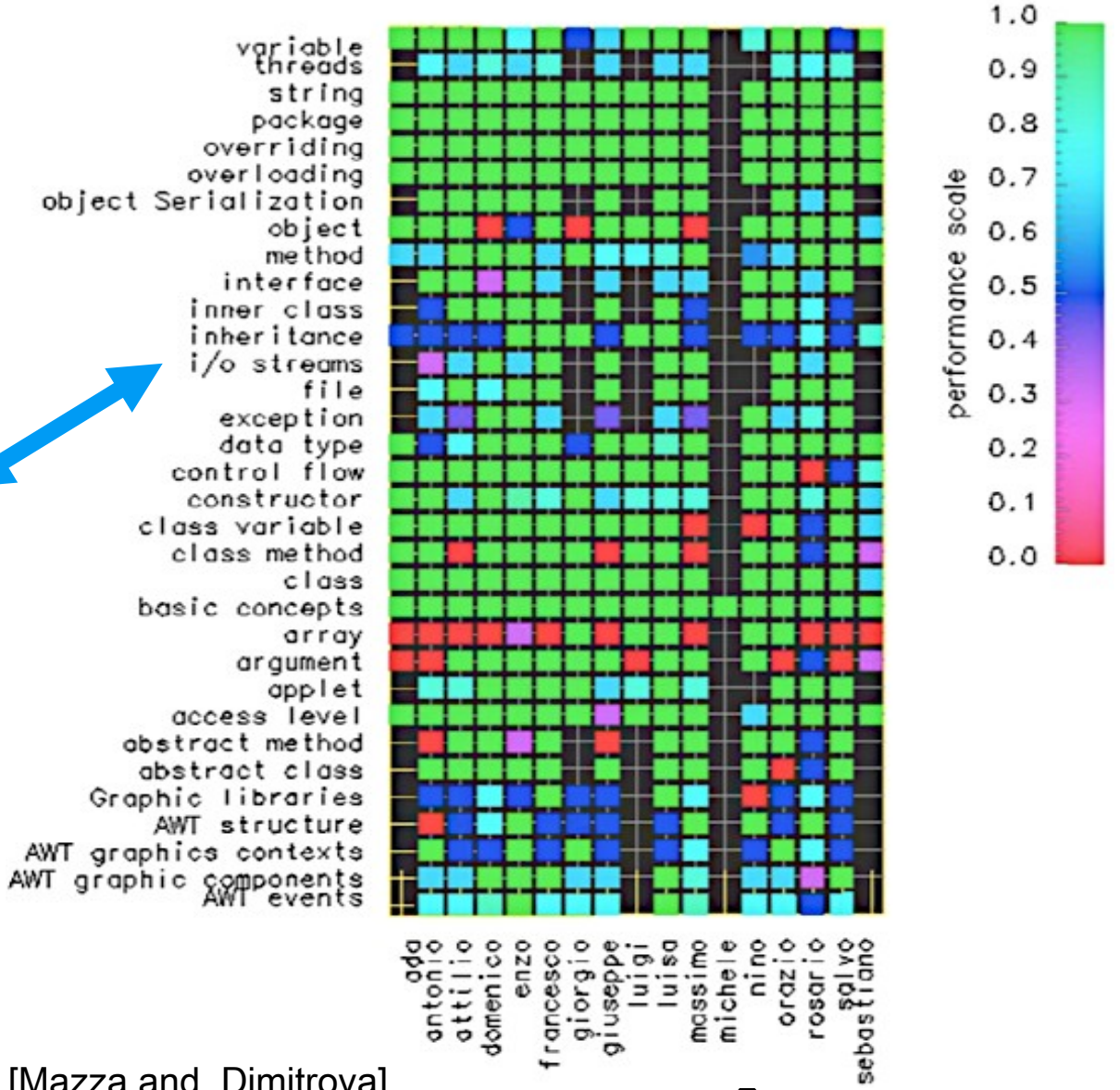


- Different views:
  - Discussion Plot
  - Student Accesses plot: showing access of students over time
  - Cognitive Matrix

[Mazza and Dimitrova]

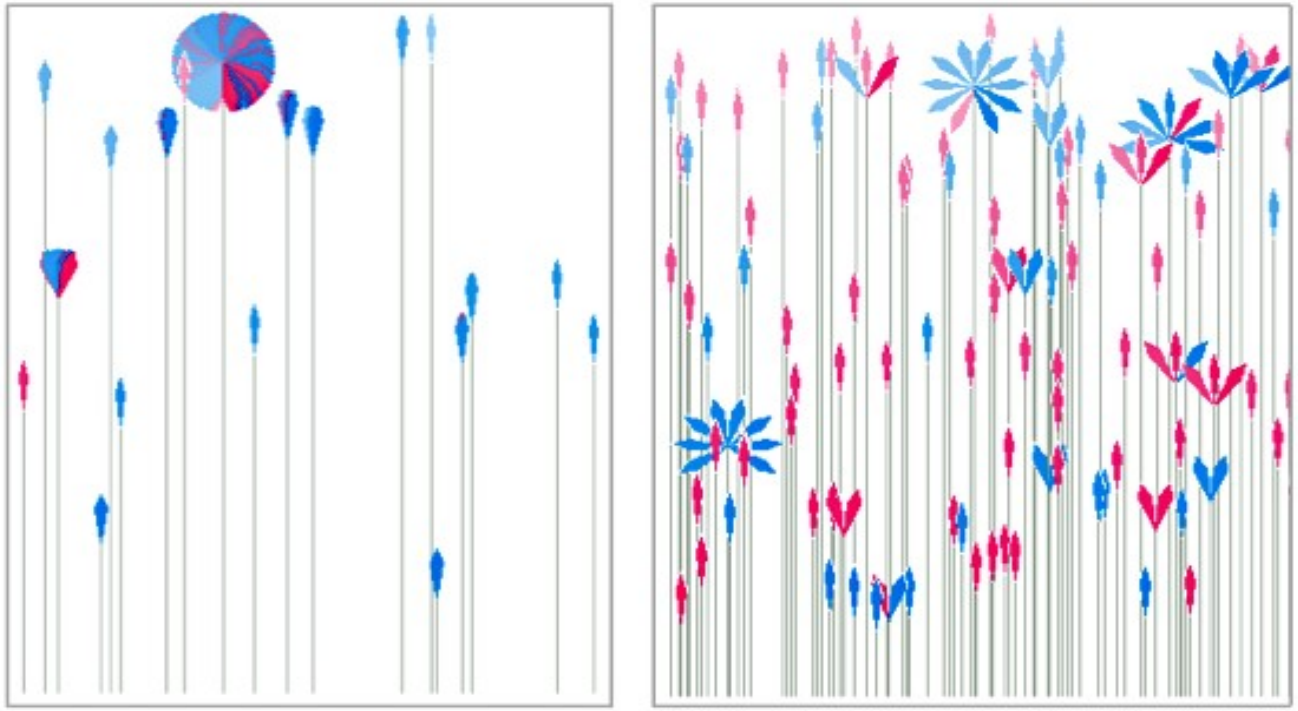
Conversation & Observation: CourseVis (3)

- Different views:
  - Discussion Plot
  - Student Accesses plot
  - Cognitive Matrix: showing students' knowledge on course topics



[Mazza and Dimitrova]

Online Conversation Tools: PeopleGarden

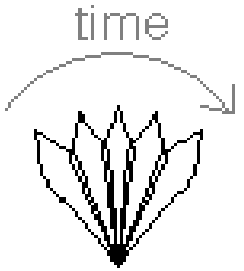


- Flower metaphor for creating individual data portraits, and a garden metaphor for combining these portraits to represent an on-line environment (Web-based message boards, chat rooms, and Usenet newsgroups).
- A group with a dominating voice vs. a more democratic group.

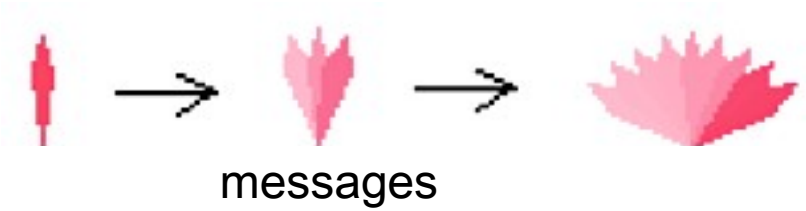
[Xiong and Donath]

Online Conversation Tools: PeopleGarden (2)

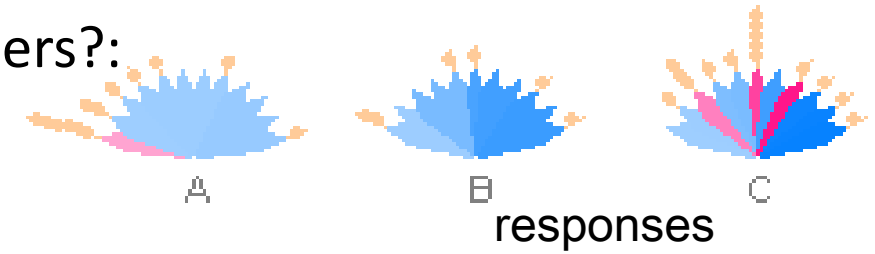
- Do participants here really get involved?:
  Post frequently or only once in a while?



- How much interaction is there?:
  Do people respond to each other?



- Do participants here welcome newcomers?:
  Do newcomers get many replies?



- Who are the experts?:
  Who has been here for some time or posted many messages?

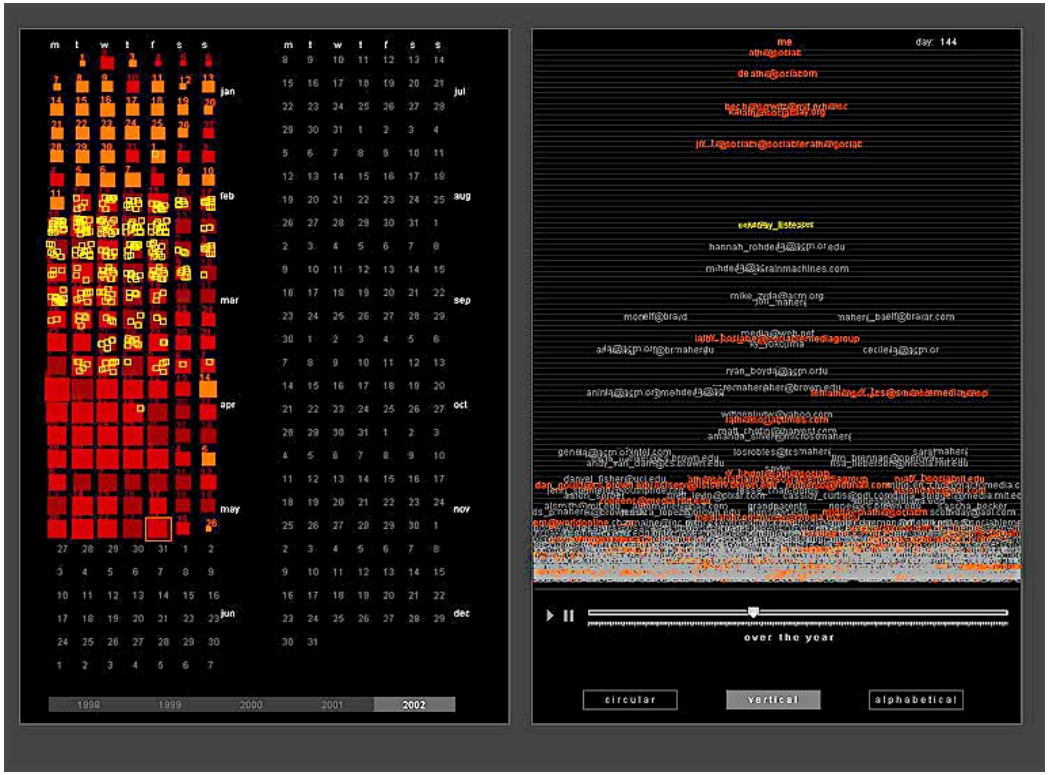
[Xiong and Donath]

Content VO.04: Social Visualization

- Social Networks
- Conversation
- E-mails & Newsgroups
- Authoring
- Web 2.0
- Movements

E-Mail Visualization: PostHistory

- Visualization of e-mail landscape and personal e-mail social network.
- Goal: create visualizations that allow us to look back at our actions in the digital world in order to grasp the scale, intensity and forms that our interactions take in this medium.
- Changes over time: main visual metaphor is the calendar.



[Viegas]

E-Mail Visualization: PostHistory (2)

- Analysis of message headers differentiates between the following headers: **from, to, cc, bcc**

- In order to visualize usage patterns in a simple manner, PostHistory interprets these headers in terms of social network constructs.

- A set of heuristics was developed to figure out things such as:
  - what determines a "direct" email message and how do we differentiate that kind of message from a less direct one;
  - who knows whom in a persons email network;
  - what determines (and how do we measure) contact strength in a persons email network.
  - how responsive is the user in relation to different people on his/her email social network?

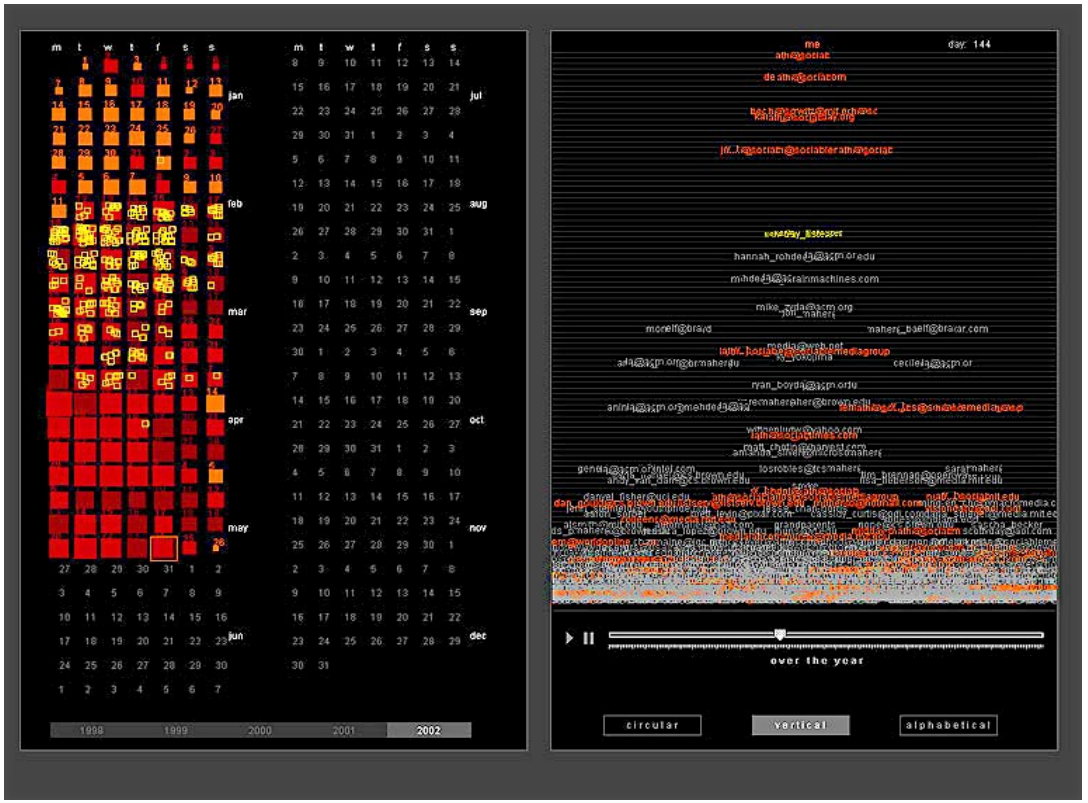
E-Mail Visualization: PostHistory (3)

Calendar (left):

- Size of square = quantity of e-mails received
- Brighter square = more directed e-mails

Contacts (right):

- Higher up = more messages sent to you
- Colored name = e-mail sent on that day



[Viegas]

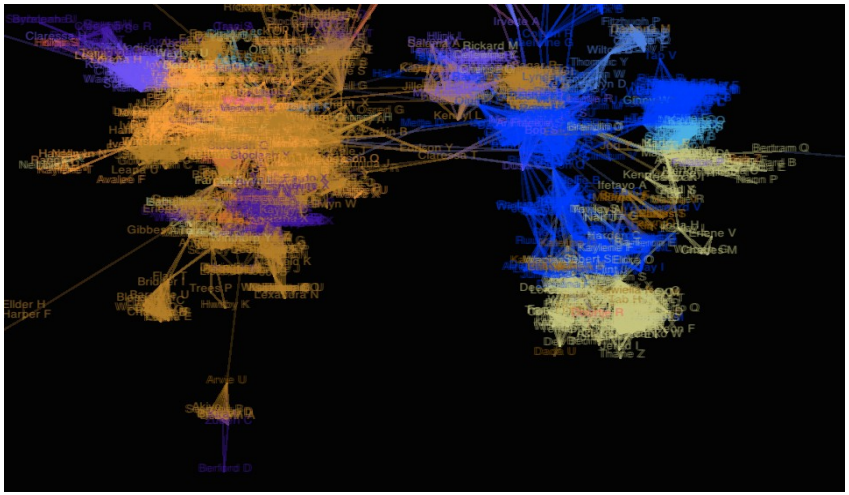
E-Mail Visualization: Social Network Fragments

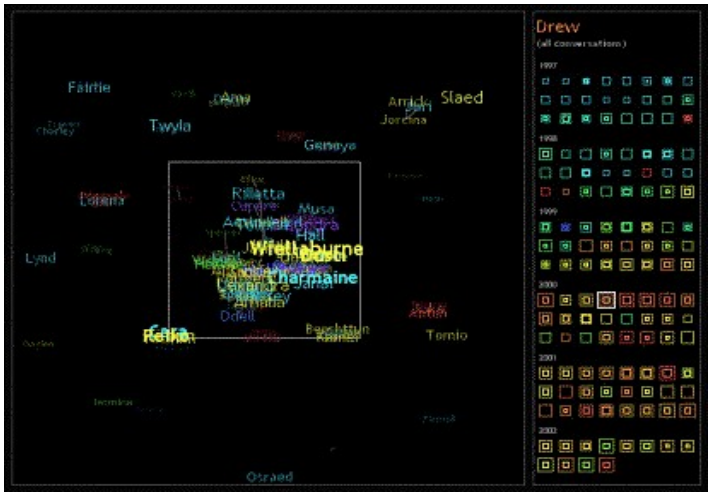
Revealing the social networks patterns that emerge in email:

- **Knowledge ties:** A sends a message to B → A 'knows' B (except listserv mails)
- **Awareness ties:** B receives a message from A → B is 'aware' of A
- **Weak awareness ties:** B and C both receive a message from A → B and C are 'weakly aware' of each other
- **List awareness ties:** B receives a message from A through a listserv → we assume that B is 'listserv aware' of A
- **Trusted ties:** A sends a message to B and blind carbon copies (BCC's) D → A 'knows' and 'trusts' D because D has the ability to respond and reveal that A included people without B's awareness

[Boyd and Potter]

E-Mail Visualization: Social Network Fragments (2)

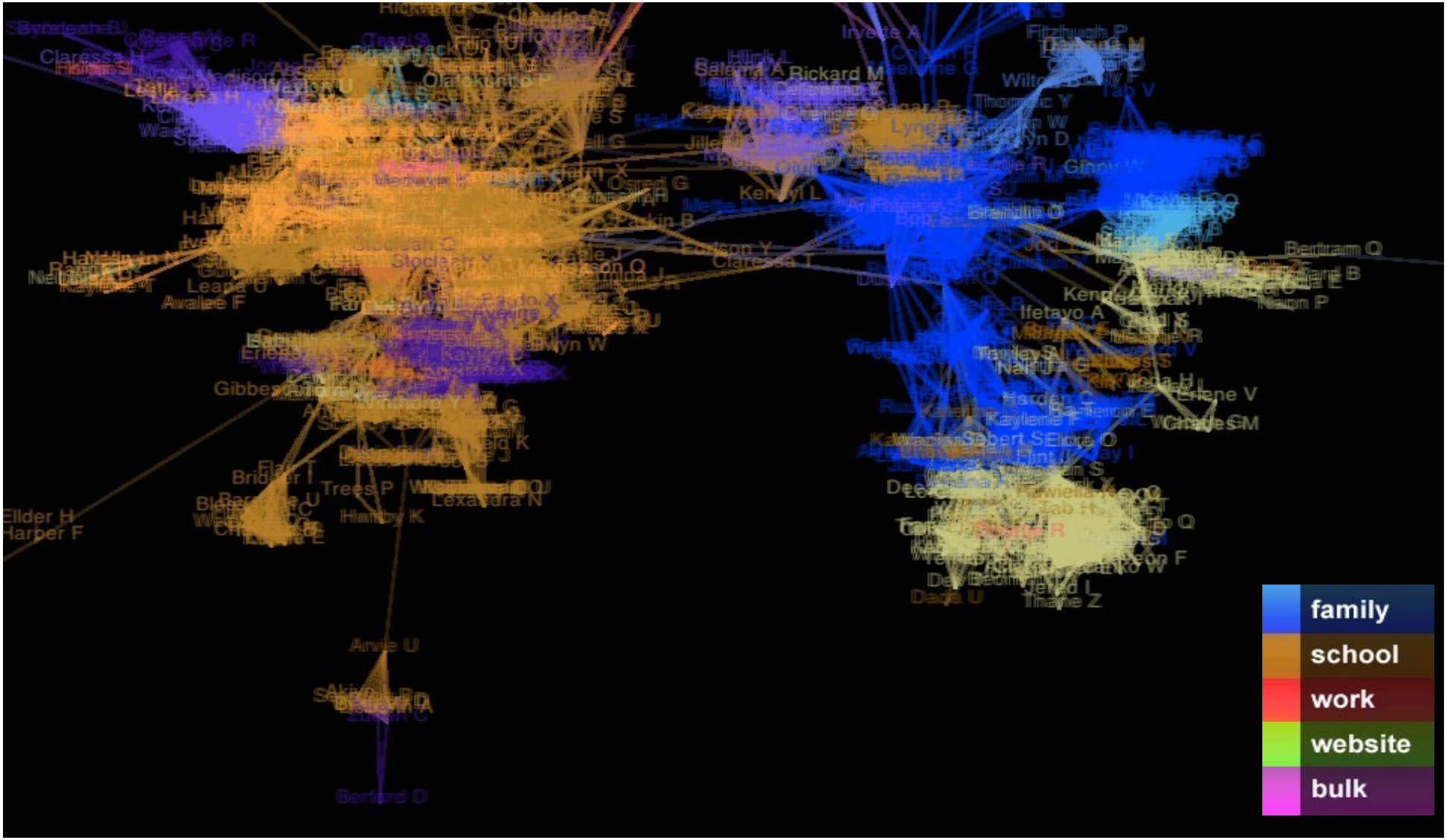




- Basic spring/node algorithm used to place nodes in optimal location (ties act as springs, pulling connected nodes closer together; nodes act like magnets and repel each other).
- Colors are used to indicate the relationship to the person (based on which email address of the person is used).
- Goal: quickly see how the network is connected and view structural holes.
- Data Set: 80.941 messages, 1,03 average recipients per msg, 15.537 unique people, 662.078 ties between all respondents (using only messages with <50 recipients; otherwise, 11,7 million).

[Boyd and Potter]

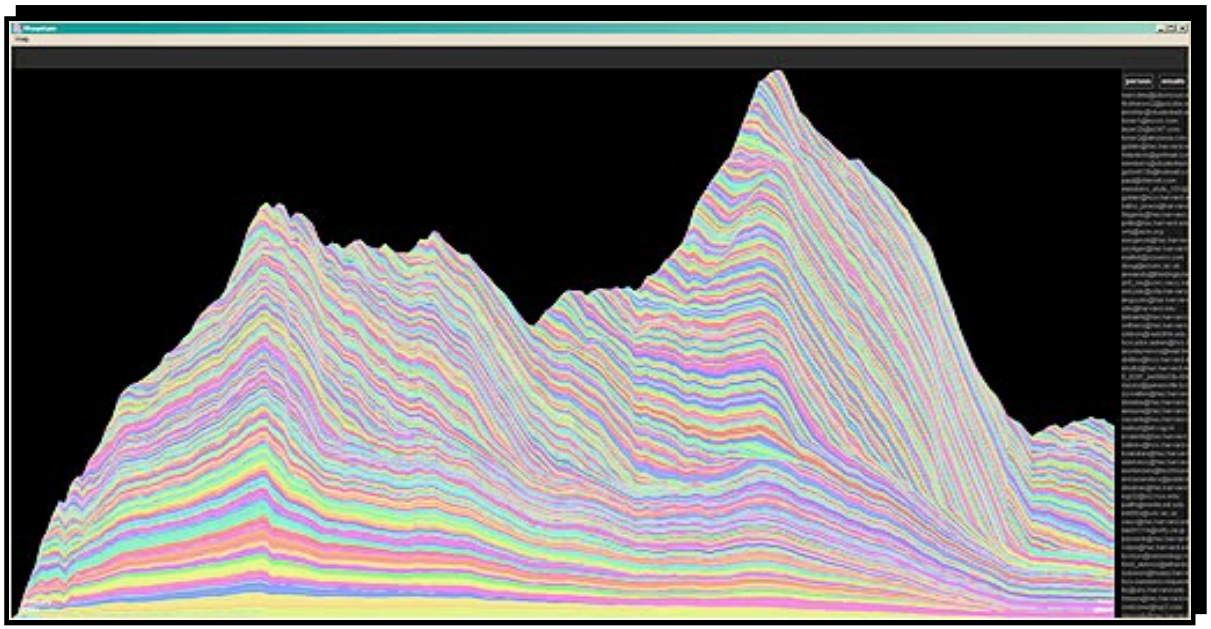
E-Mail Visualization: Social Network Fragments (3)



[Boyd and Potter]

E-Mail Visualization: Mountain

- Reflect the massive nature of these archives by visualizing them as a growing mountain over time.
- Each layer in the Mountain represents a different person
- Layers are ordered by time, with the first people in the email archive at the bottom and the most recent people in the archive at the top right portion.
- The thickness of each layer refers to how recently the person has been in contact with ego (the owner of the email archive).
- Users can highlight specific layers in the Mountain causing the first words of every email exchanged with this person to appear on the screen.

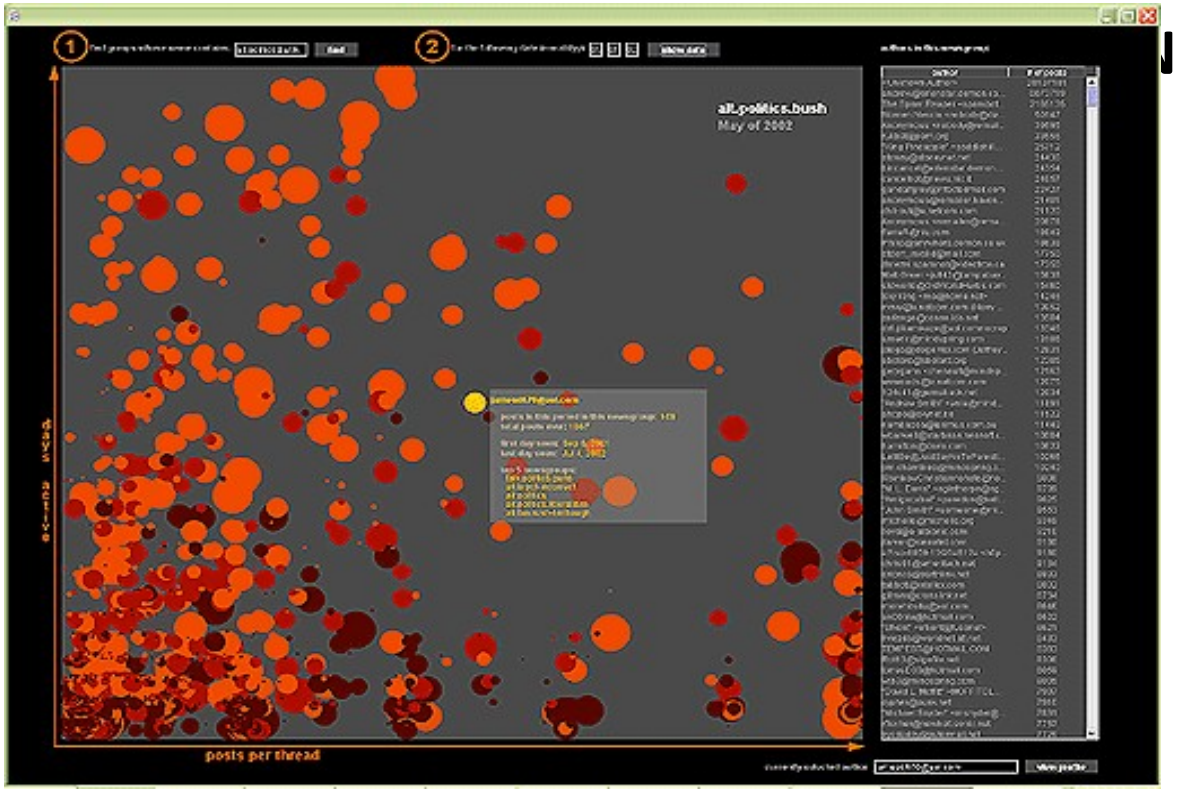


[Viegas_Mountain]

Newsgroup Crowds & AuthorLines

Newsgroup Crowds: visualizing authors' activities and population of authors in a particular Usenet newsgroup by illustrating and contrasting the interaction patterns of participants within the community

Color: how recently the author has been active



- Size: amount of posts the author has contributed to Usenet as a whole
- X-Axis: the author's average number of posts per thread
- Y-Axis: number of days an author has been active during the chosen month

[Viegas and Smith]

Newsgroup Crowds & AuthorLines (2)

A

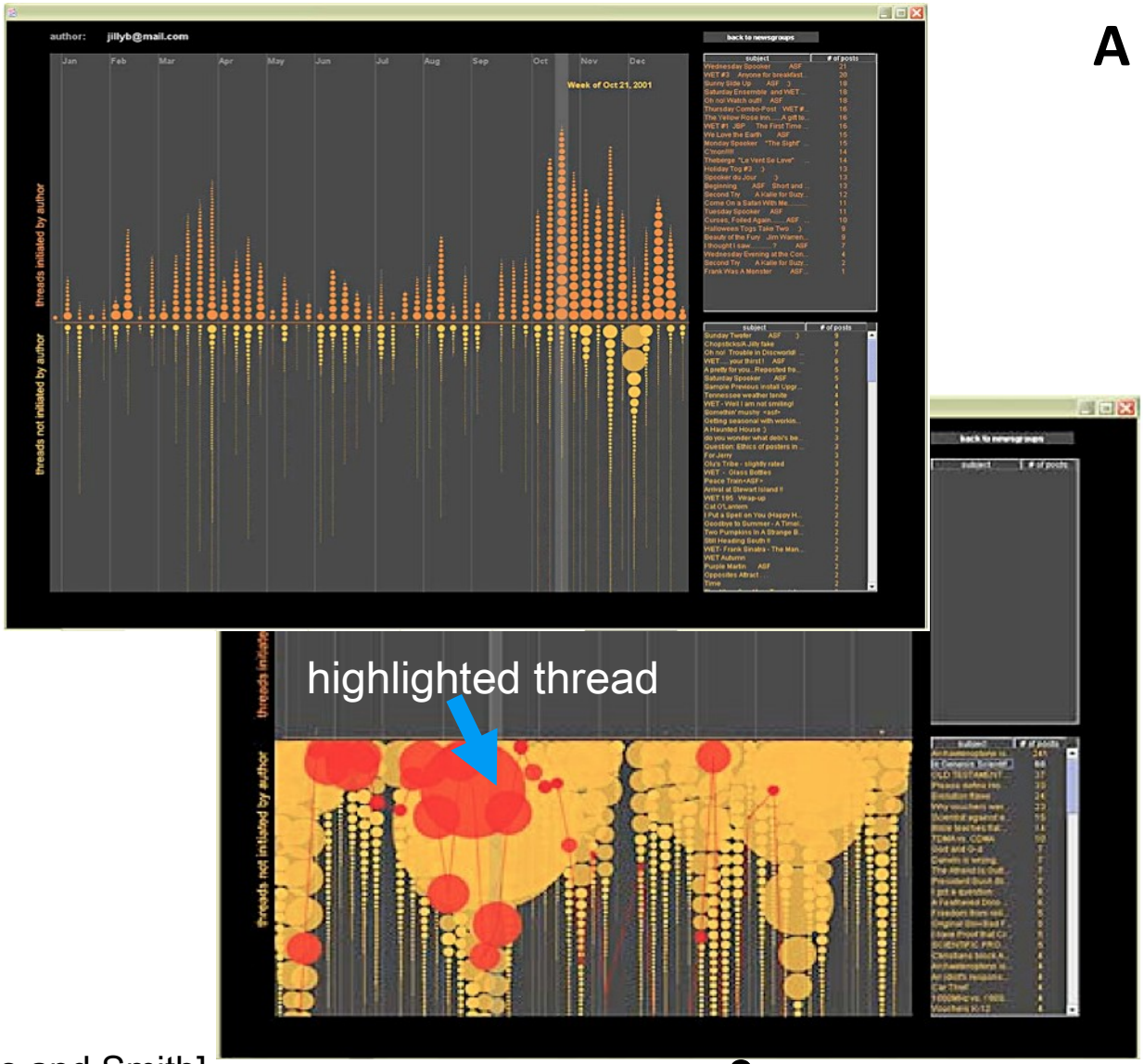
AuthorLines: A particular author's posting activity across all newsgroups over a period of one year revealing temporal patterns of thread initiation and reply.

Color: threads initiated by the author – not initiated by the author

Size: number of messages contributed to that thread

X-Axis: timeline (weeks)

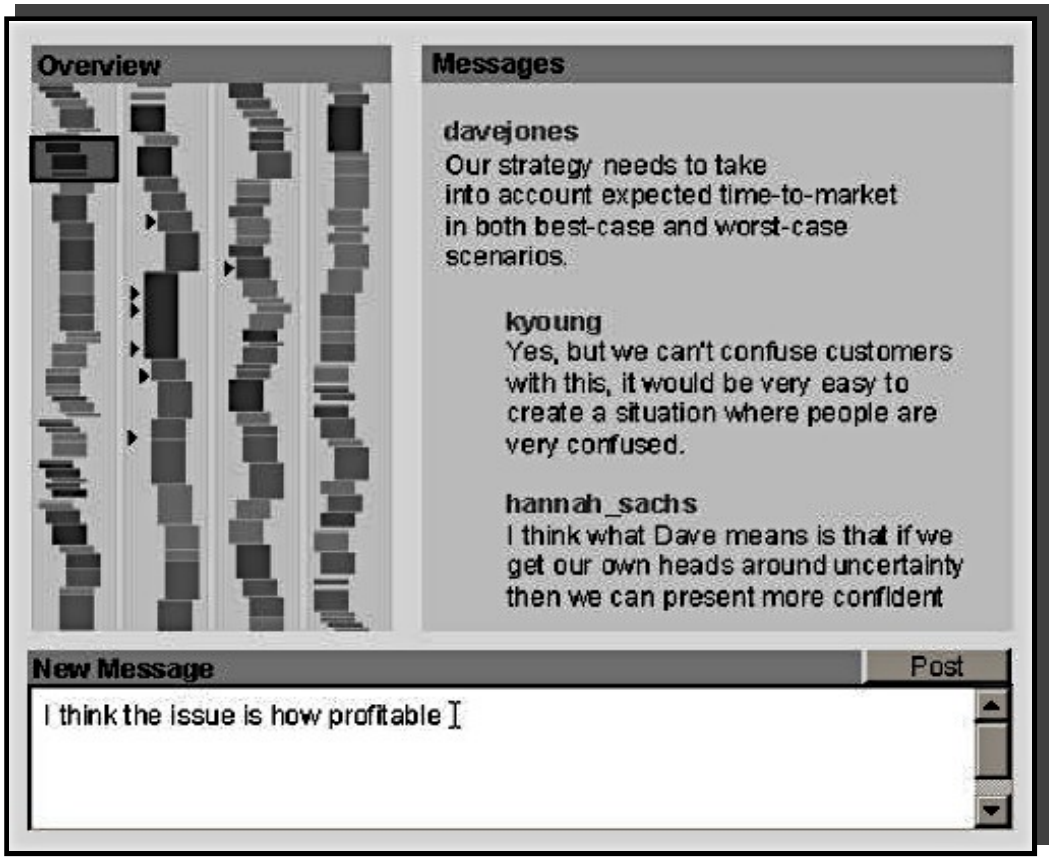
Y-Axis: posts to different threads



[Viegas and Smith]

Conversation Thumbnails

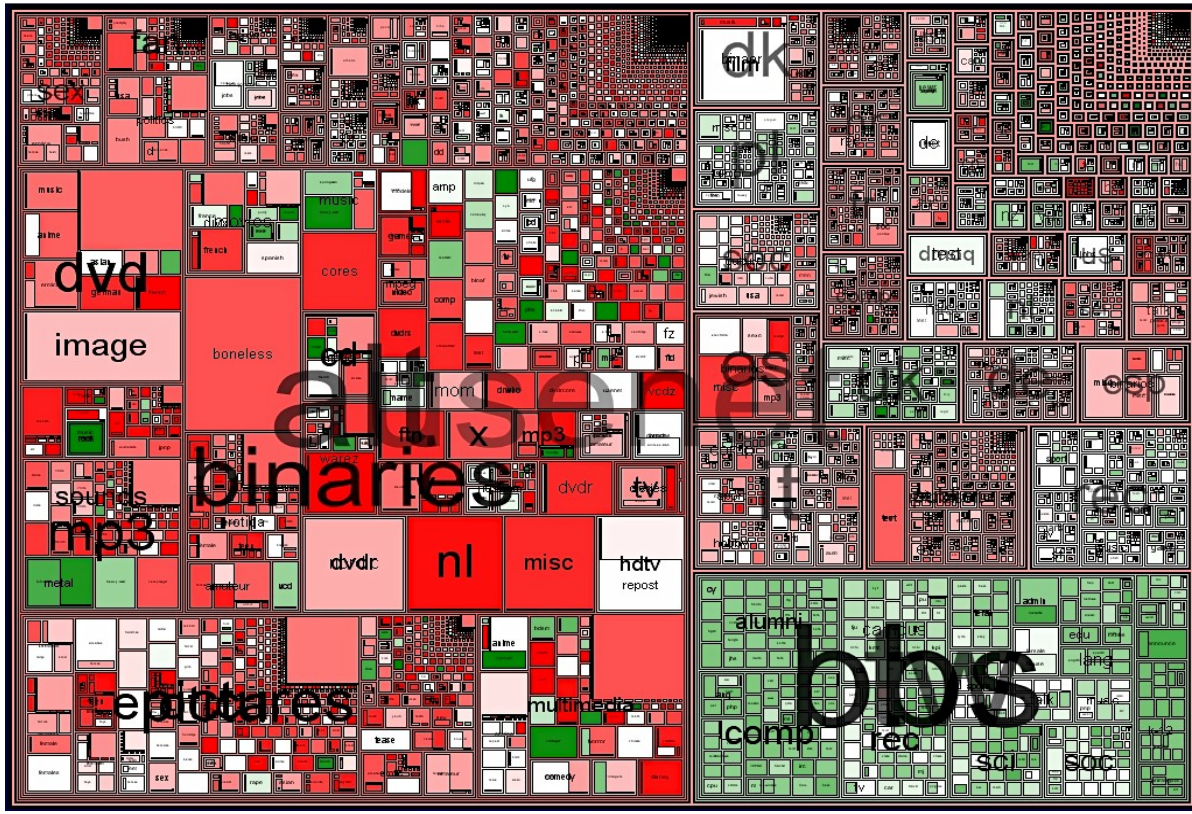
- For large-scale online conversations - employs a focus+context visualization technique that exploits message-level metadata to provide an easily navigable overview
  - Fast browsing – Zoomed out view shows the shape of the entire conversation tree. Mouse-over shows the actual text.
  - Color represents message importance; users may rate other people's messages.
  - As a new message is entered, arrows show messages with similar words – encouraging the author to stop and read.
  - Cuts down on duplicate ideas.



[Wattenberg and Millen]

Netscan: Usenet Hierarchy Treemap

- Relative sizes of the boxes are based on the number of posts for a month.
- **Green**: number of posts in that newsgroup increased
- **Red**: number of posts decreased
- The higher the intensity, the larger the change in posts.

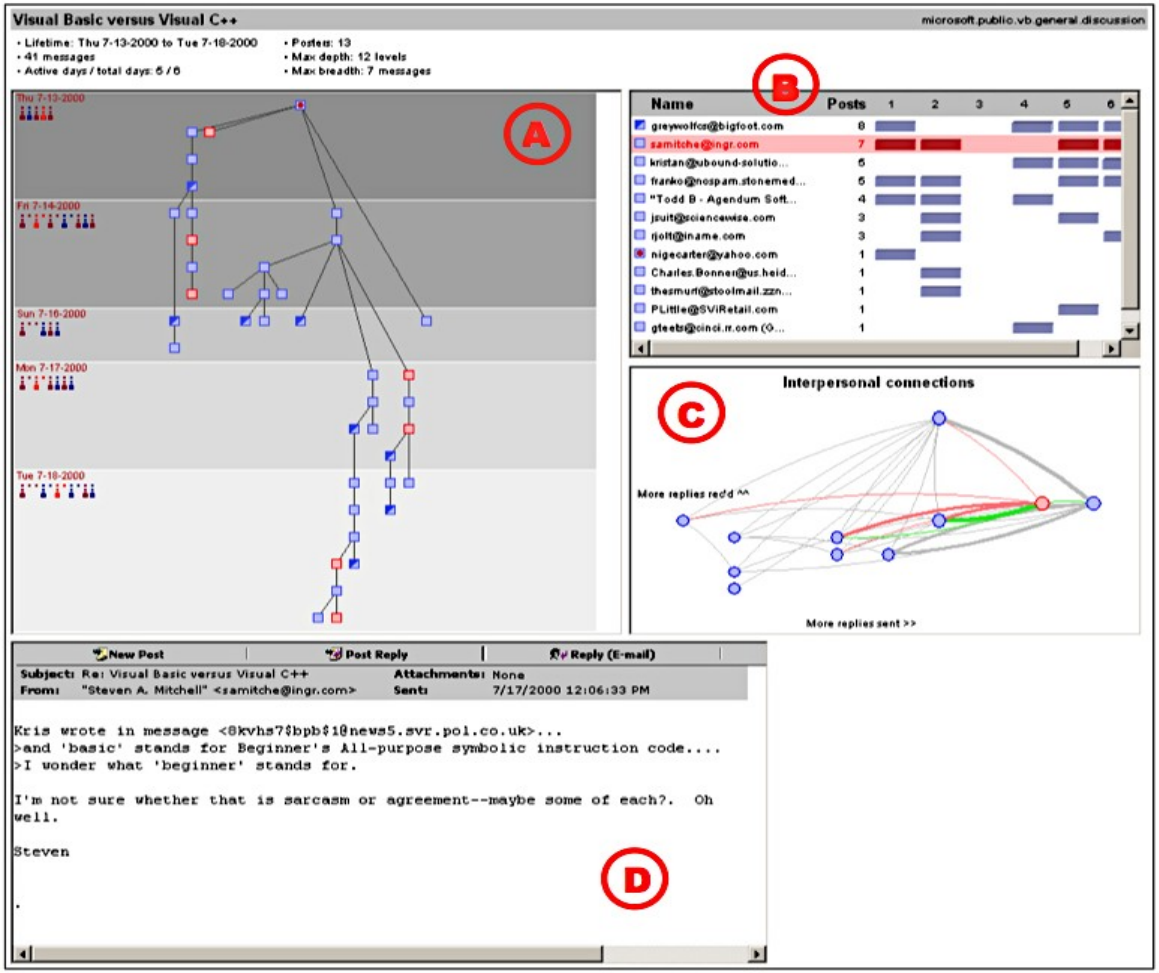


http://netscan.research.microsoft.com/treemap/

Netscan: Message Thread Dashboard

- Illustrating the structure of discussion threads like those found in Usenet newsgroups and the patterns of participation.

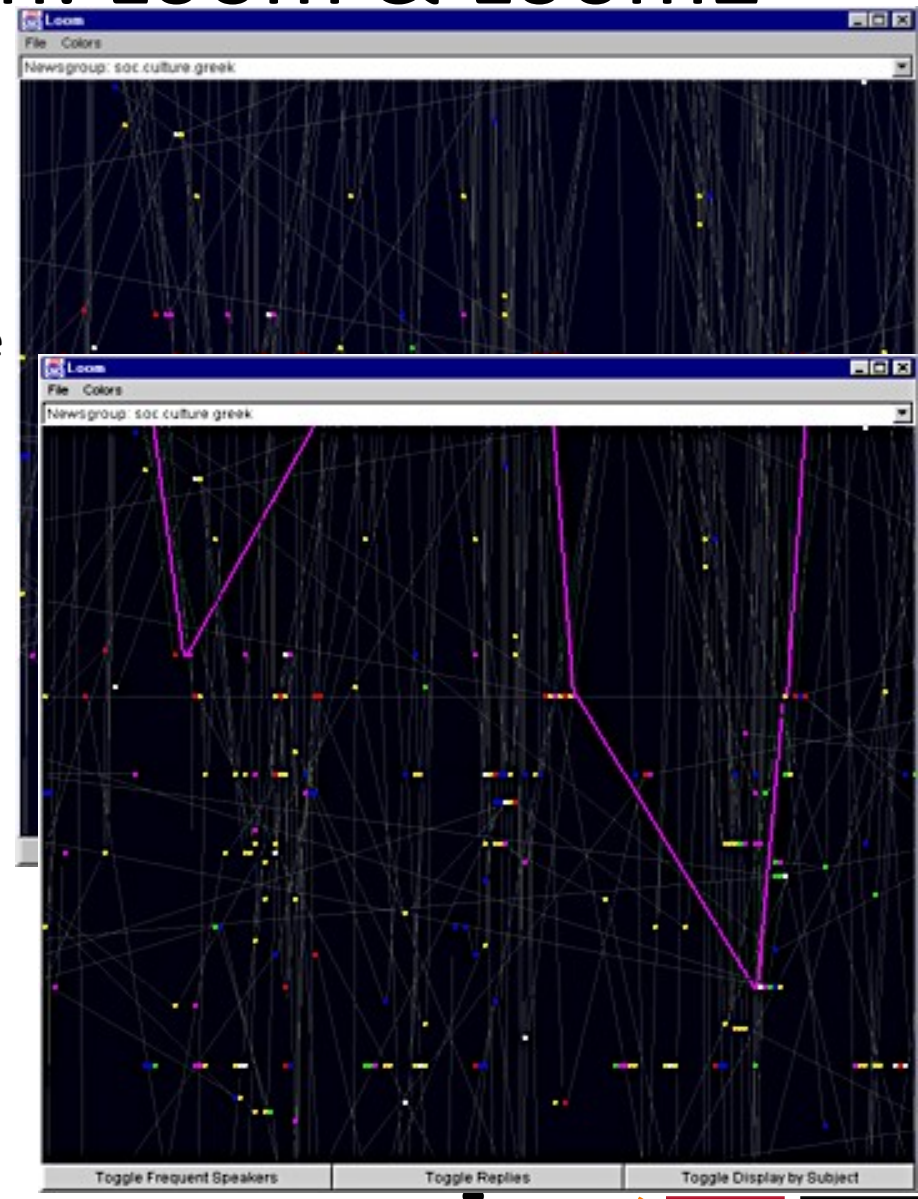
- Everything here pertains to a single message thread:
  - A: Thread tree
  - B: “Piano Roll”: list of posters of the thread; columns for each day contain bars if poster posted on that day
  - C: Interpersonal Connections chart (replies)
  - D: Message pane



[Smith and Fiore]

Newsgroup Visualization: Loom & Loom2

- Represents the pattern and textures of events in a threaded newsgroup as a weave of a digital fabric.
  - X-Axis: time
  - Y-Axis: users (posting)
  - Lines connect messages that belong to the same thread
- The objective of this project is to observe patterns in key events of newsgroups
  - entry and exit of participants in conversation
  - birth and death of subject threads
  - tone of messages (color)
  - path traversed by users as they create this social fabric
- It provides a means for traversing the threads and discovering the individual postings
  - patterns of usage
  - historical context for the postings
  - combined, the different threads tell a story

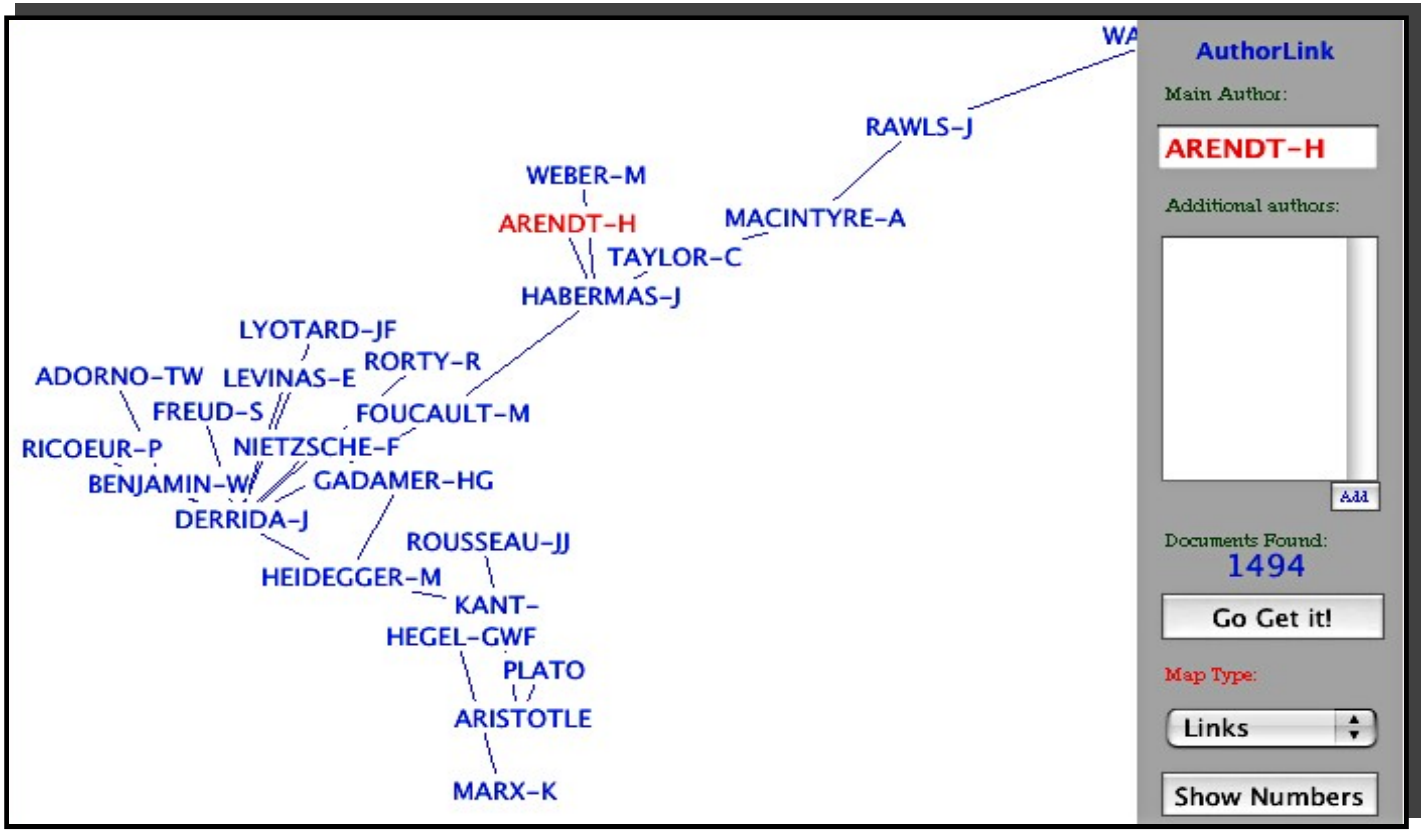


[Karahalios, Donath, and Kamin]

Content VO.04: Social Visualization

- Social Networks
- Conversation
- E-mails & Newsgroups
- Authoring
- Web 2.0
- Movements

AuthorMap: Citation Mapping and Visualization



AuthorMap explores author relationships through co-citation patterns. The assumption is that if two authors are often cited together by many other authors, these two authors likely have common intellectual interest in their research and writing.

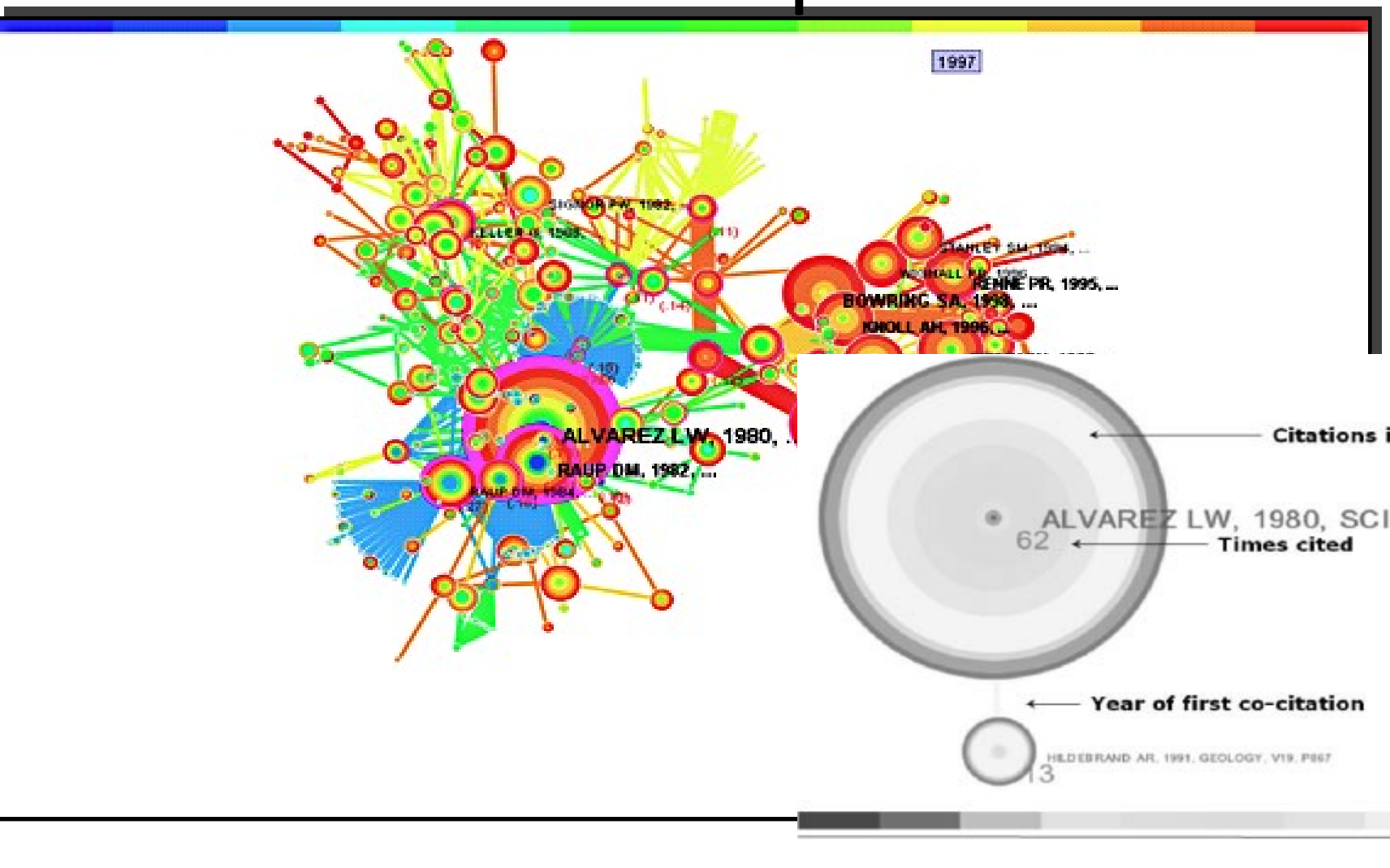
[authorlink]

AuthorMap: Citation Mapping and Visualization

- Related authors' pair-wise co-citation → map of a subject domain where authors on the map represent ideas or subtopics as well as their relationships.
- Author search:
  - AuthorMap generates a list of 25 authors co-cited most often with the given author
  - Two types of maps that visualize how these authors are related to each other based on their co-citation counts: Kohonen's self-organizing feature map (SOM) and Path Finder Network (PFNET).
- AuthorMap currently attaches to ISI Arts & Humanities Citation Index (AHCI), 1988-1997, with about 1.26 million records.

[authorlink]

CiteSpace



- Visualizing Patterns and Trends in Scientific Literature: 541 co-cited articles.

[Chen]

Content VO.04: Social Visualization

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Web 2.0

- Second generation of Internet-based services:
  - folksonomies and tagging applications,
  - social networking sites,
  - wikis,
  - blogs,
  - communication tools

Web 2.0 emphasizes online collaboration and sharing among users.

Social Bookmarking: del.icio.us

Some Basics:

- Social bookmarking website: store your bookmarks online, which allows you to access the same bookmarks from any computer and add bookmarks from anywhere.
- Use tags (non-hierarchical keywords) to organize and remember your bookmarks.
- Search and explore links that your friends and other people bookmark.
- Share favorites with friends, family, co-workers, and the community.

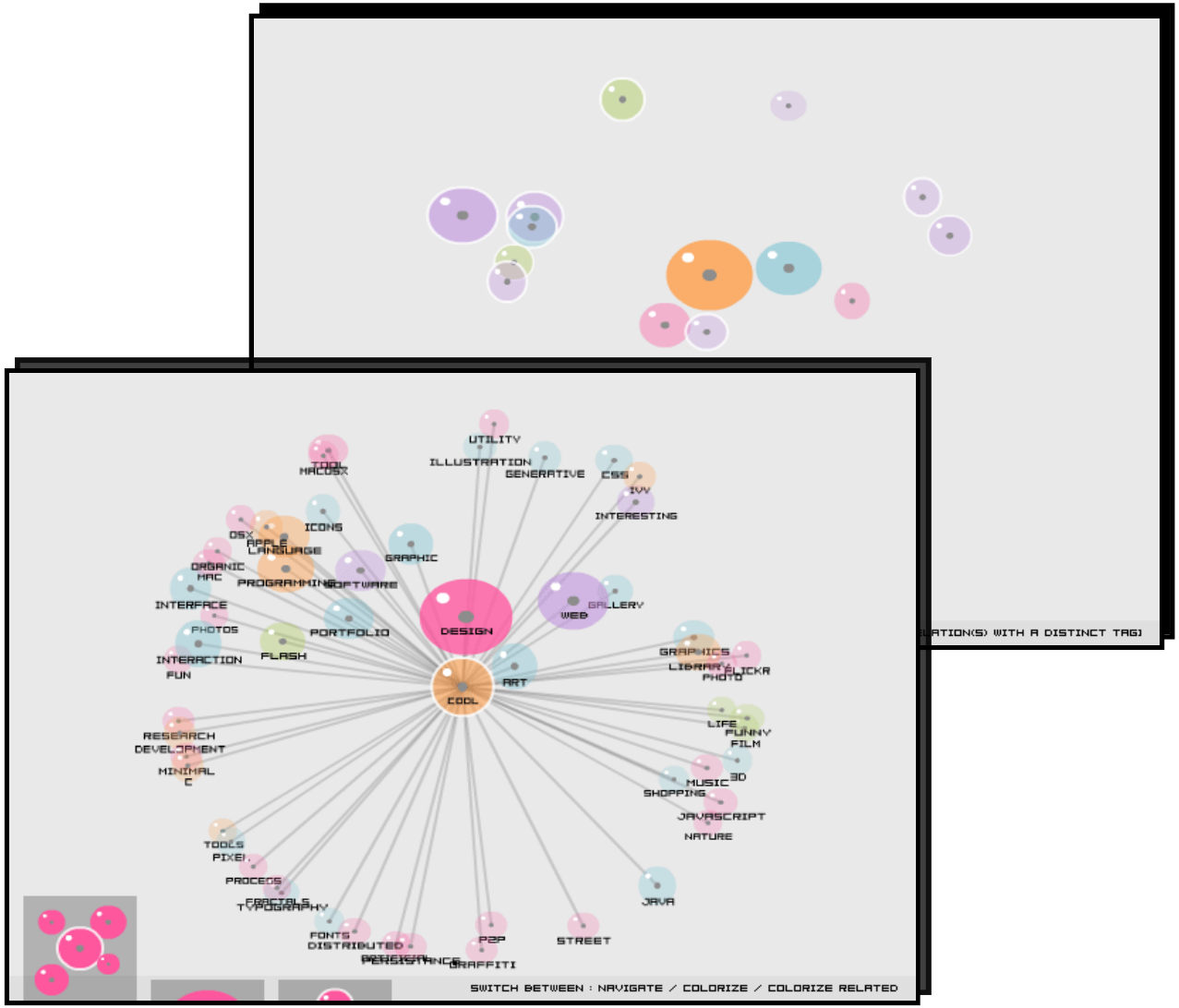
[del.icio.us]

Social Bookmarking: Tag Clouds

[del.icio.us]

Social Bookmarking: Delicious Soup

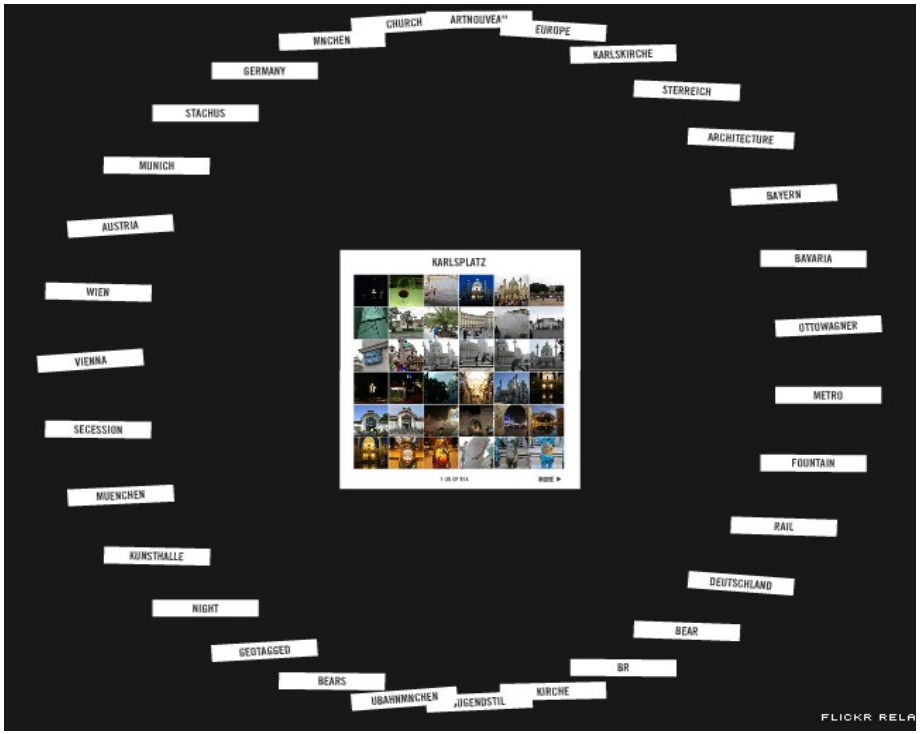
- Reveals user's del.icio.us activities
- Graph shows relations among tags
  - Size: importance of tag
  - Color: tag category



[www.zitvogel.com/deliciousoup/index.php]

Visualizing Tags: Flickr Browser

- Online photo management and sharing application:
  - Publish photos or share them with friends
  - Comment, tag, and annotate photos
  - Explore and search photos



- Surf Flickr's "tag space":
  - Flickr tags are keywords used to classify images.
  - Each tag has a list of 'related' tags, based on clustered usage analysis.

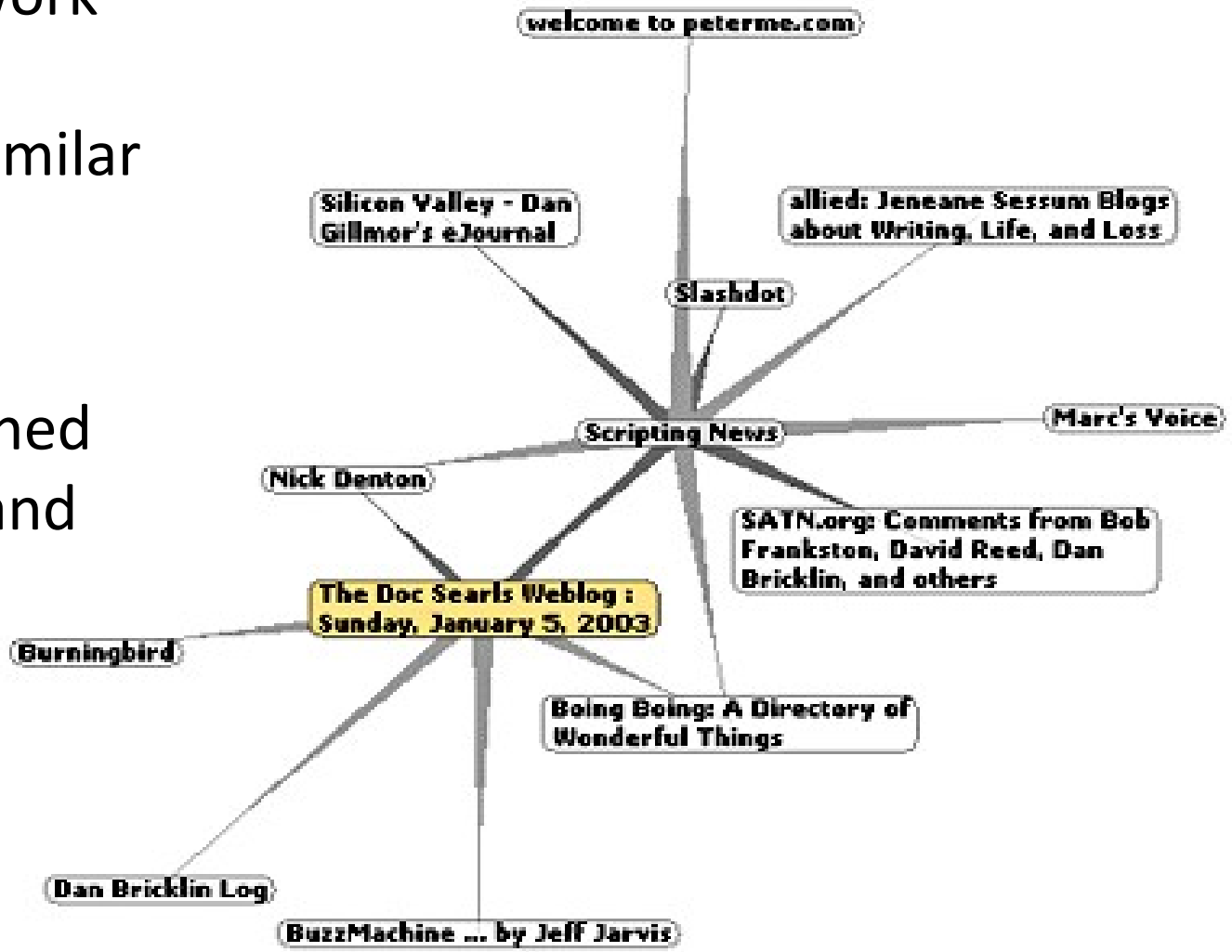
[www.airtightinteractive.com/projects/related_tag_browser]

Visualizing Blogs

- Basic Terminology:
  - Inbound/Outbound Link - Links to/from your site.
  - Inbound/Outbound blogs - Sites blogrolling you and you blogrolling them.
  - Blogroll - List of fairly permanent links to your favorite blogs/sites.
  - RSS - An XML format used for syndicating news or news like content. Many Weblogs make content available in RSS

Visualizing Blogs: Blog Neighborhood

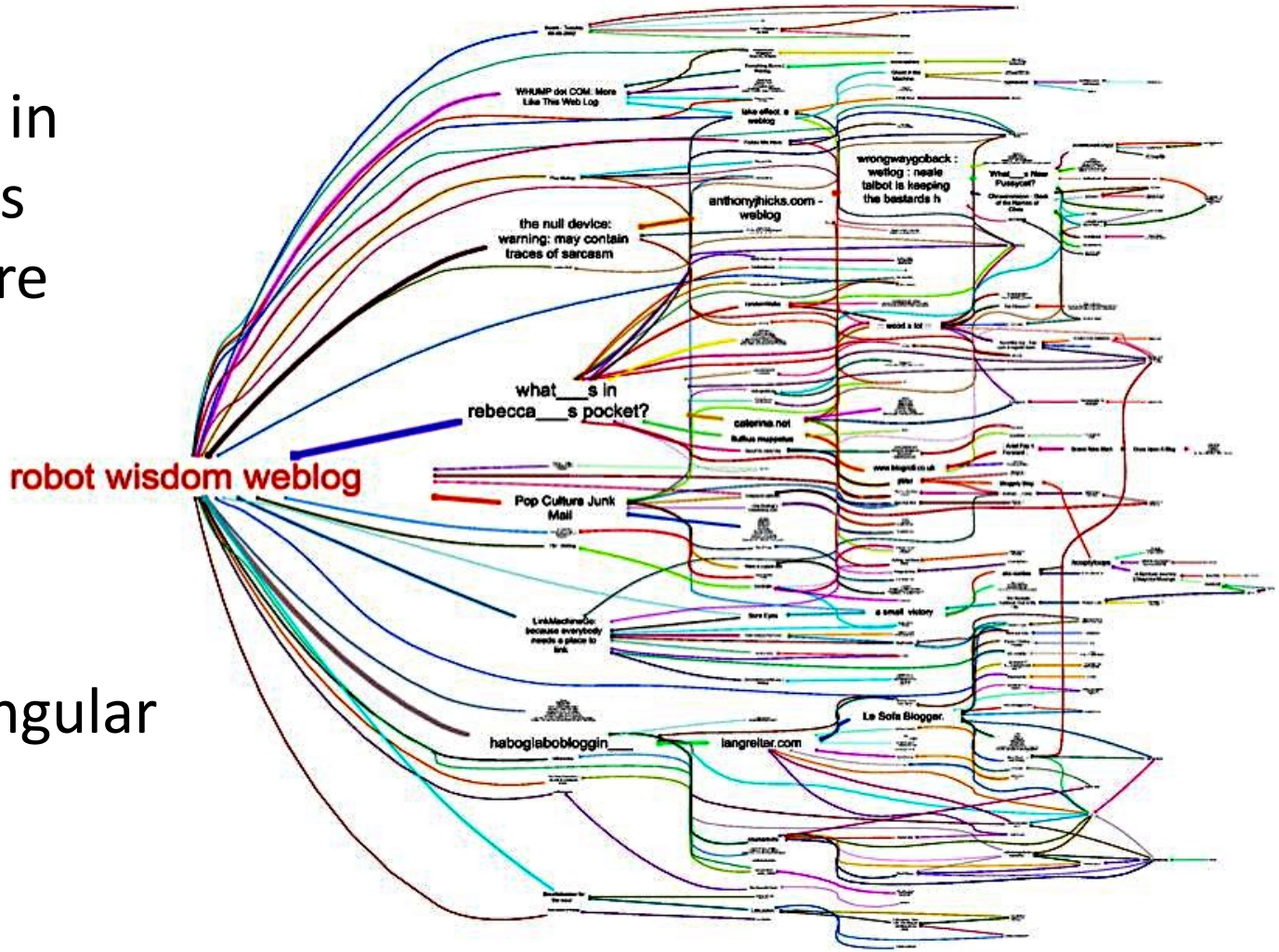
- Maps the social network of blogs by grouping together blogs of a similar nature.
- Similar nature is defined as who you blogroll and who blogrolls you.
- Uses TouchGraph



[blogstreet.com/visualneighborhood.html]

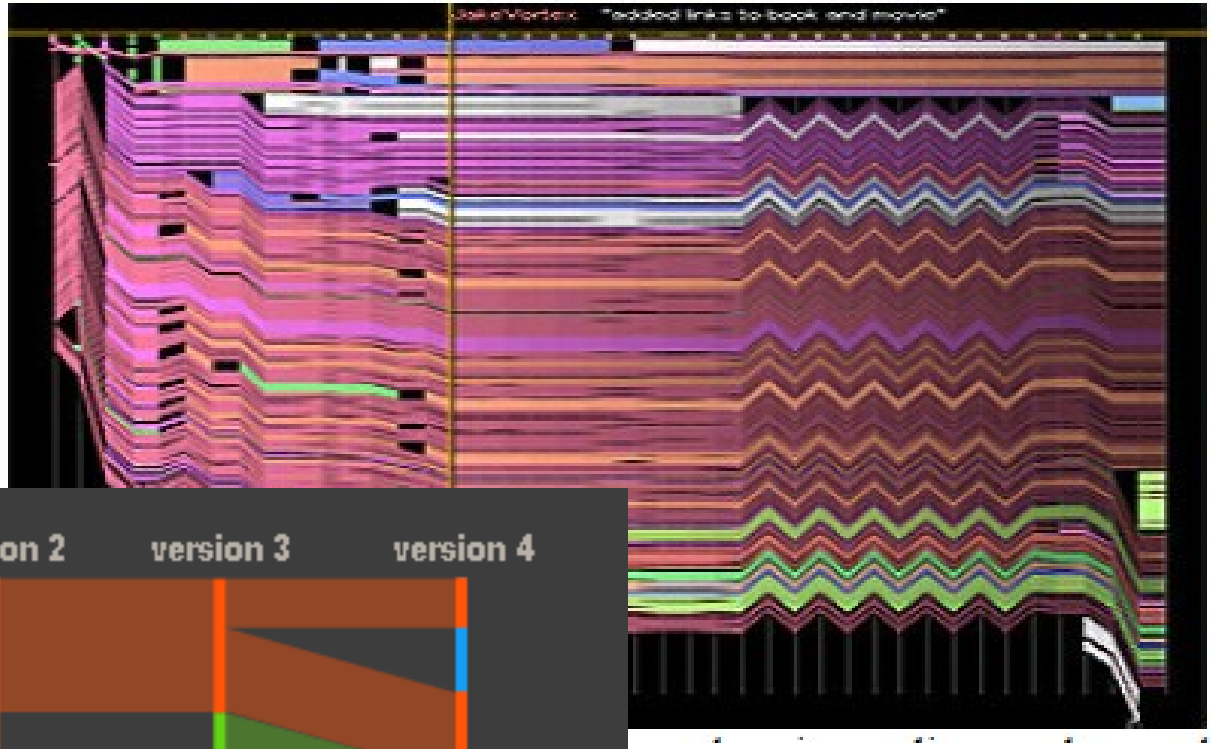
Visualizing Blogs: Blog Genealogy

- Focal node, Robot Wisdom weblog, is in red. Its descendants branch out in a more traditional tree structure.
- Childless blogs represented in triangular clumps.



Visualizing Wikis: History Flow

Visualization of editing activity of multiple authors on an Wikipedia article over time



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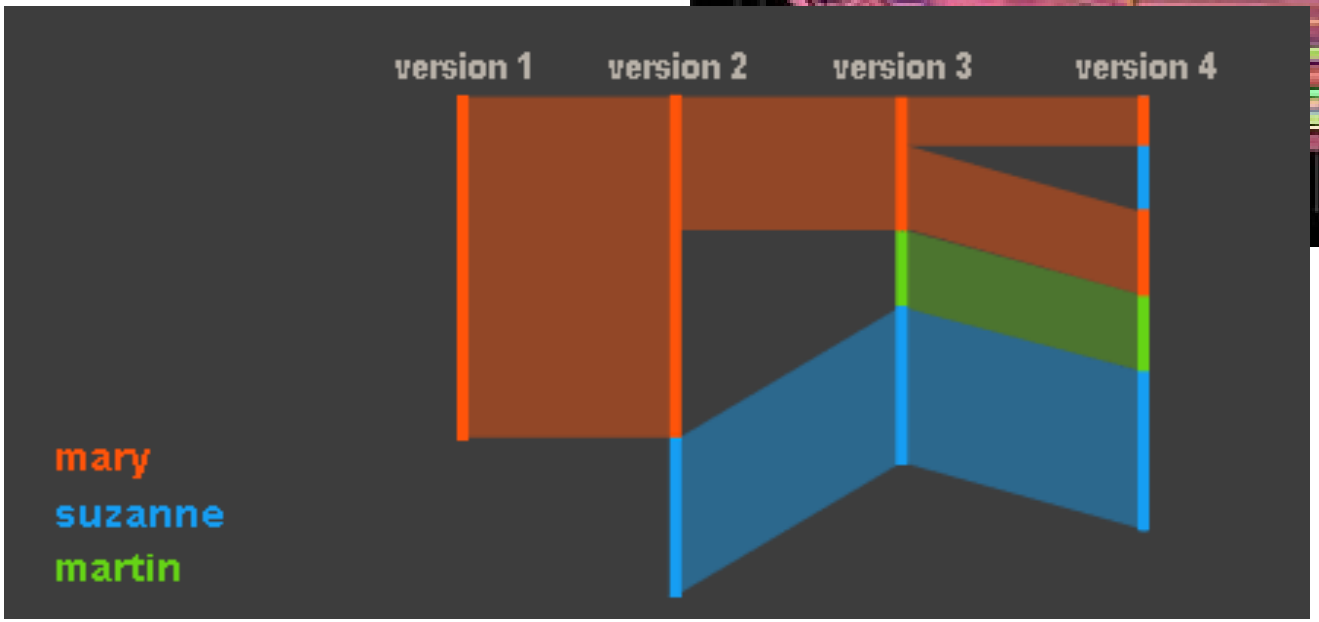


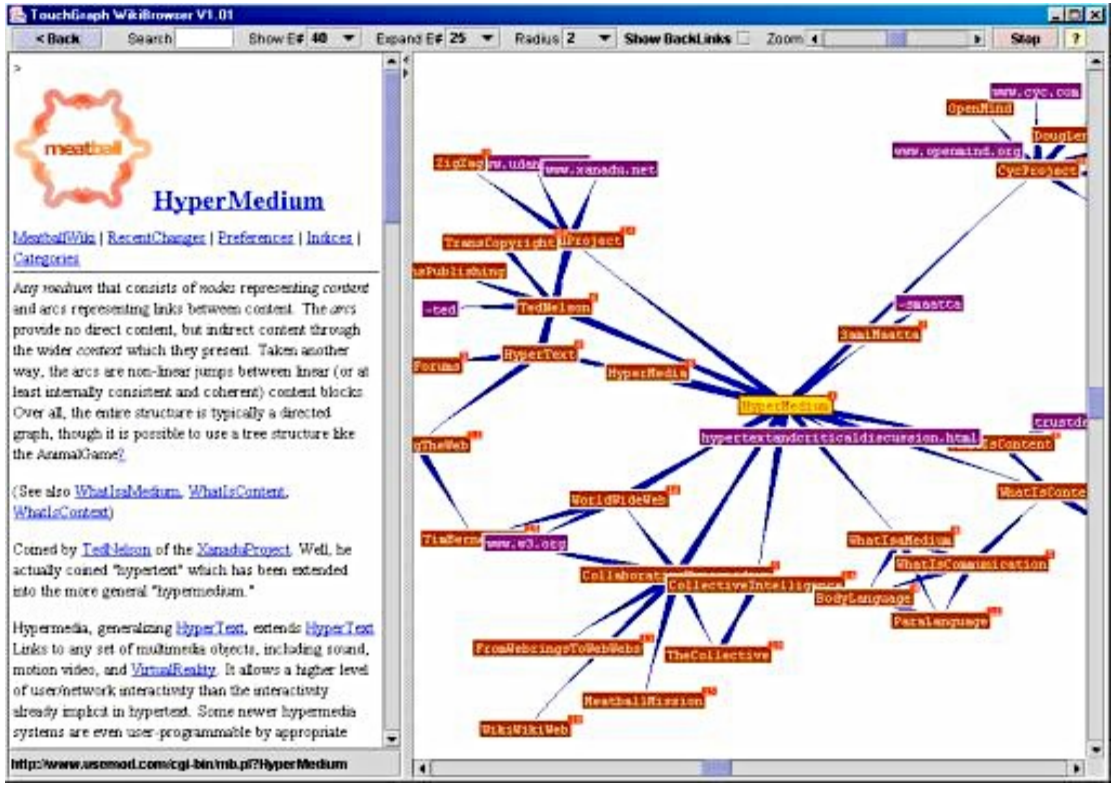
[Viegas and Wattenberg]

Fernanda Viegas and Martin Wattenberg at the Personal Democracy Forum Conference 2010

http://www.youtube.com/watch?v=zeVODwQAYT8&feature=player_embedded

Visualizing Wikis: TouchGraphWikiBrowser

- Goal: creating rewritable text
- Rewriting:
  - correcting and adding text
  - moving text within the page
  - **moving text by creating new pages, or moving text between pages**
- Graph visualization encourages **reorganization**, because pages dealing with the same themes would naturally end up clustered together.
- Allow users to vote on link relevance.



[www.usemod.com/cgi-bin/mb.pl?TouchGraphWikiBrowser]

Content VO.04: Social Visualization

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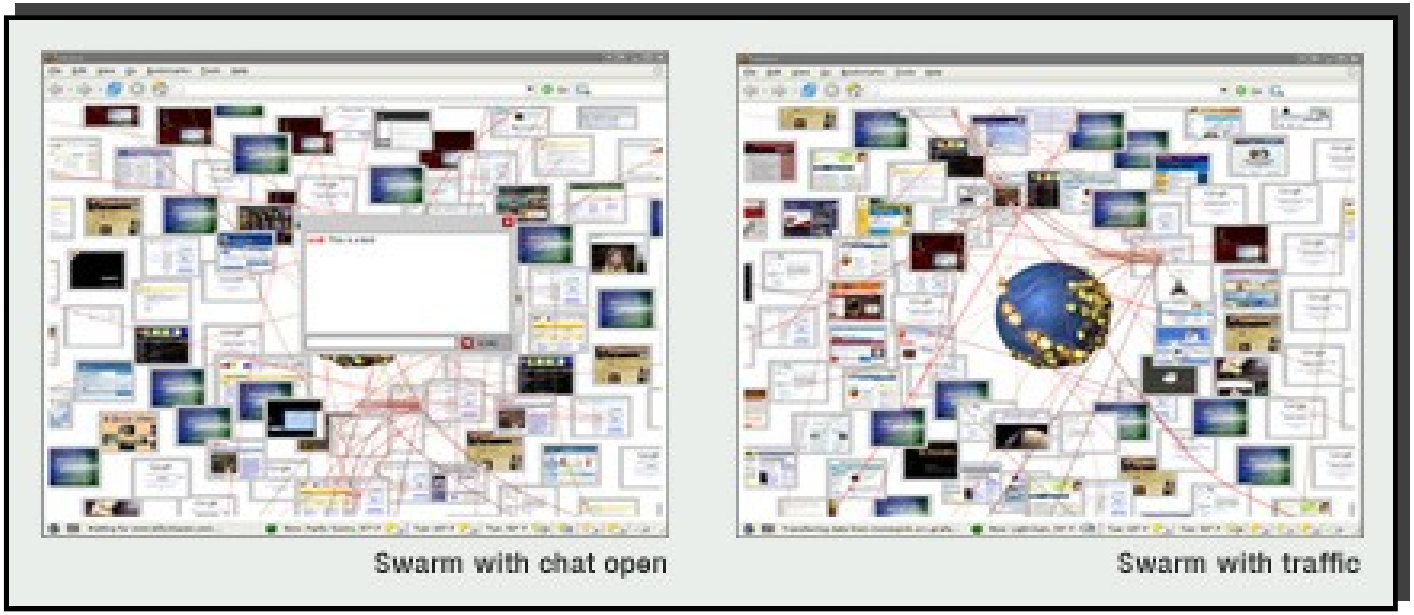
- Web 2.0
- Movements

Movements in the Web: Swarm

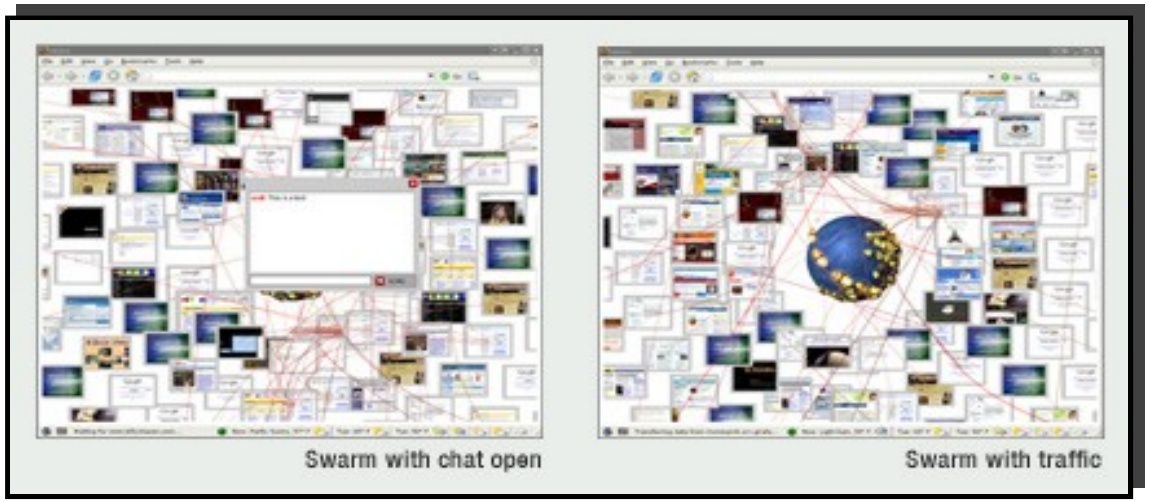


- Shows what websites people are visiting, right now.
- Tool for browsing the web.
- Graphical map of hundreds of websites, all connecting to each other.
- Updates itself every second with where people are going and coming from.

[swarmthe.com]

Movements in the Web: Swarm (2)

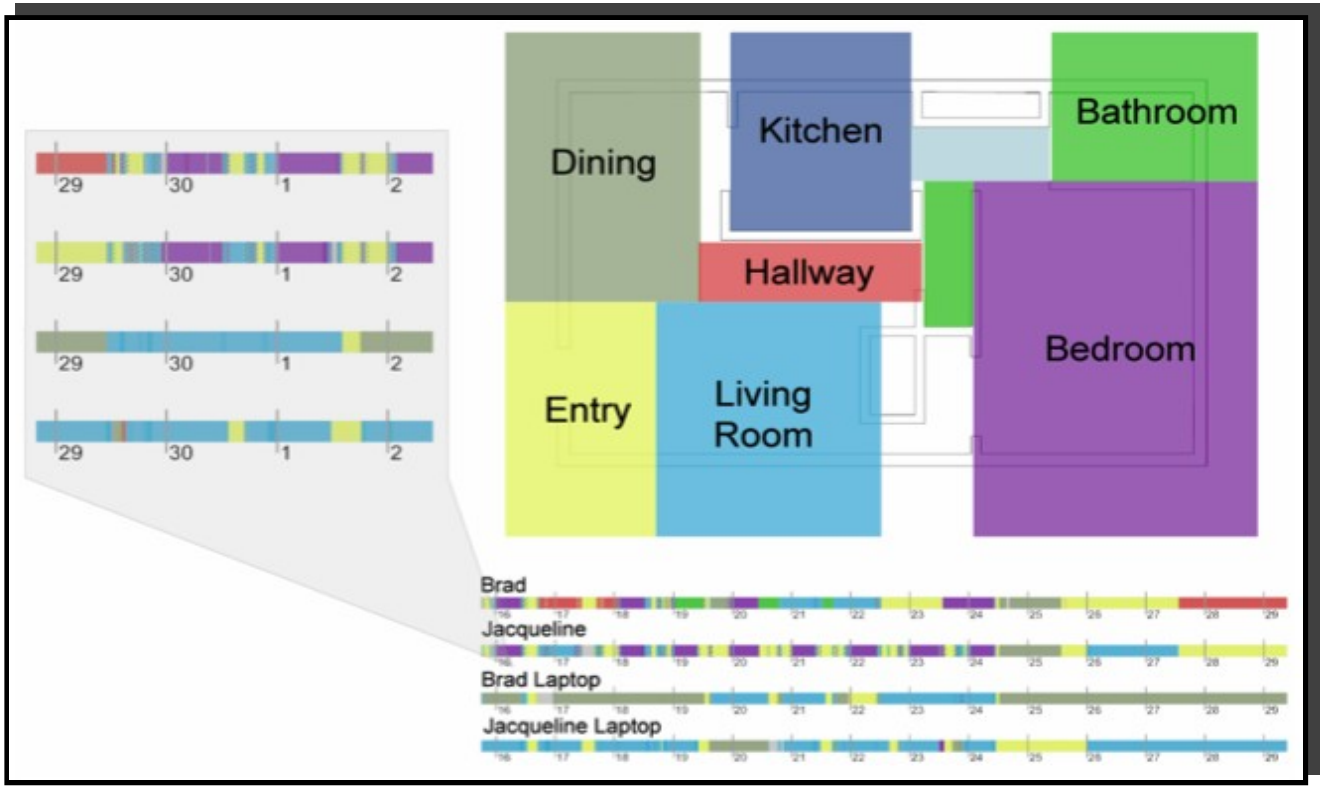
- As sites become more popular,
  they move towards the center of the swarm.
- Website traffic is symbolized with thin lines.
- Chat about any link you see.
- Data collected with Firefox Extension:
  Websites you visit are anonymously sent to Swarm.



[swarmthe.com]

Movements in the Physical World

- Visualizations of sensor data collected during an ongoing study of people's movement in domestic spaces.
- People's movement and activities as they go about their daily routine:
  - track the location of people and wireless laptops in the home
  - log the use of laptops and desktops



[Aipperspach, et al.]

Movements in the Physical World (2)

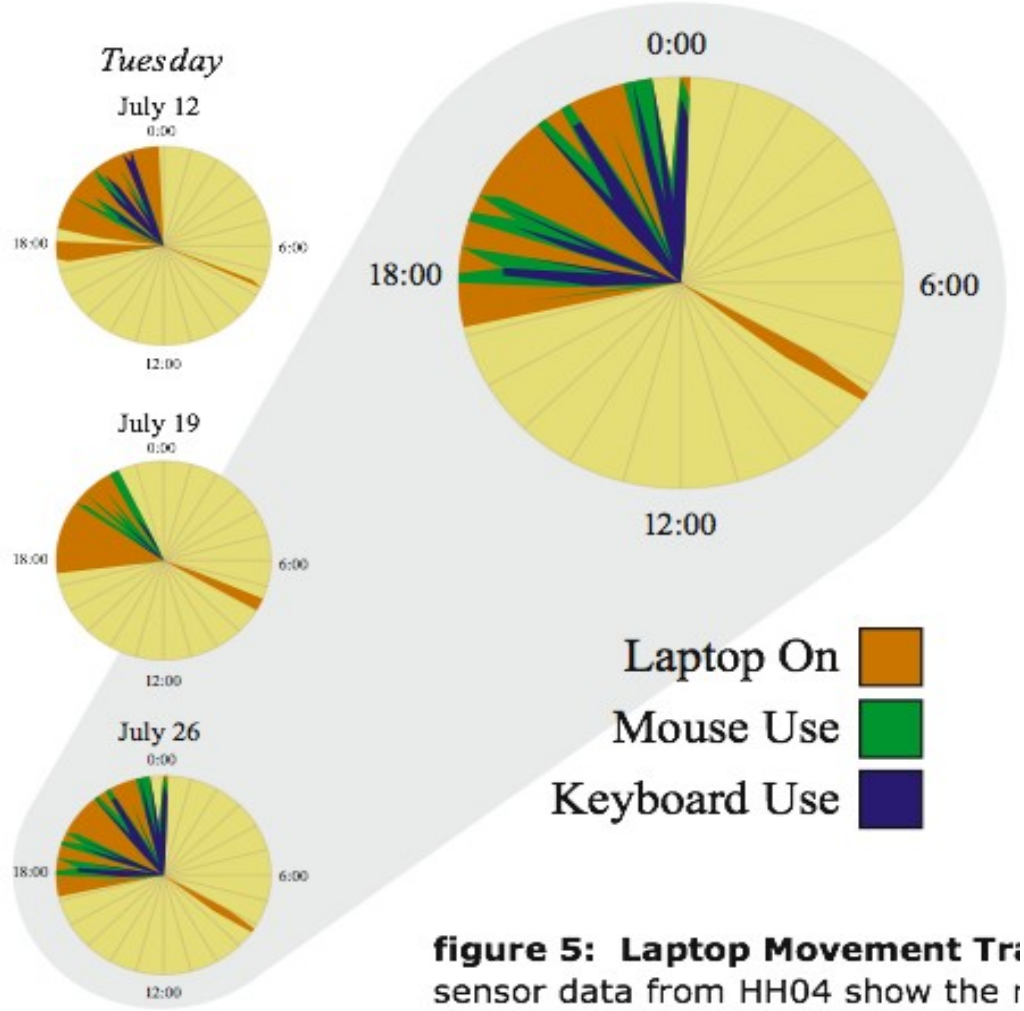
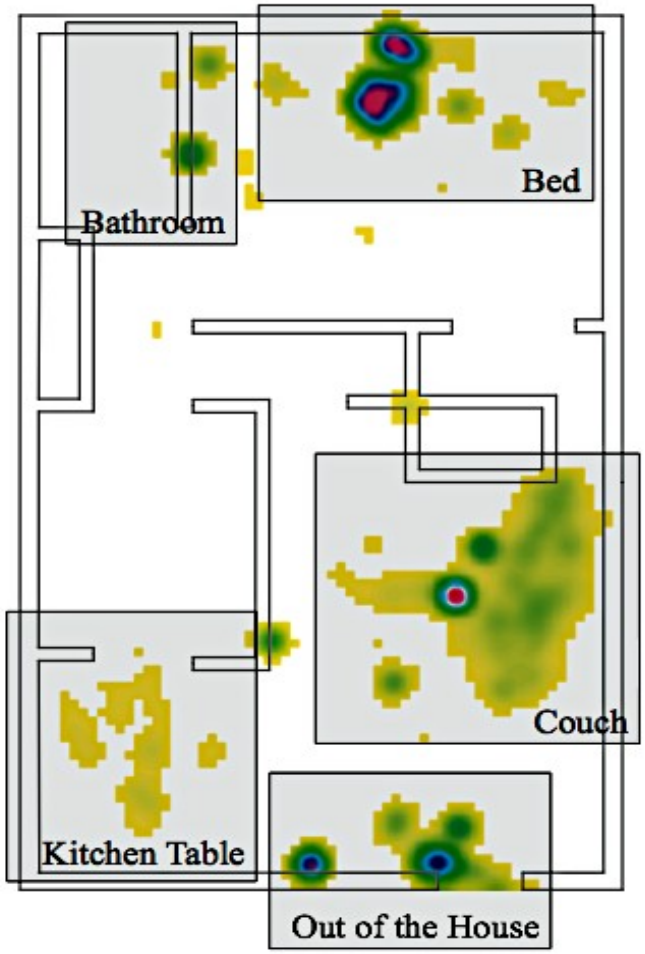
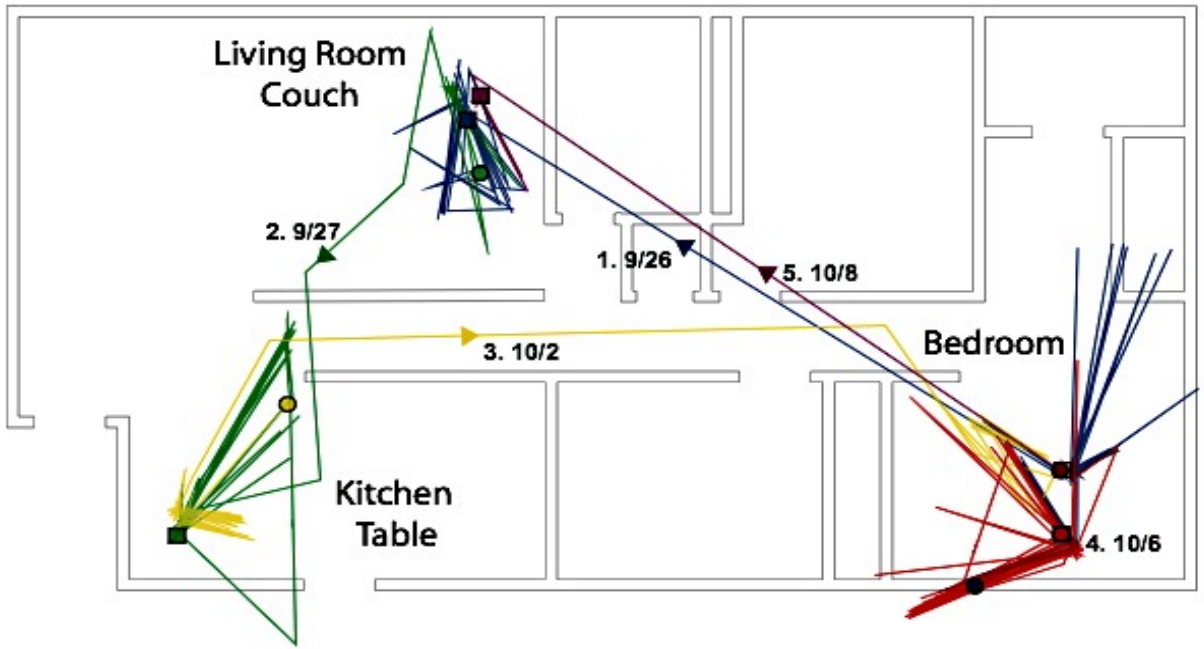


figure 5: Laptop Movement Tra
sensor data from HH04 show the r

[Aipperspach, et al.]

Movements in the Physical World (3)





[Aipperspach, et al.]

Thanks to ...

- Silvia Miksch
- Monika Lanzenberger

...for making nice slides of previous classes available.

Some References & Resources

- **[authorlink]** Howard White, Xia Lin, and Jan Buzydlowski: Citation Mapping and Visualization, http://project.cis.drexel.edu/authorlink/ (checked online 30. Nov. 2007).
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