

Visualization Process and Collaboration

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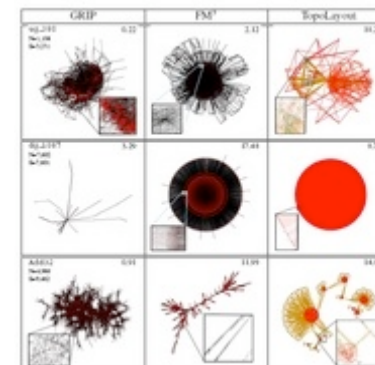
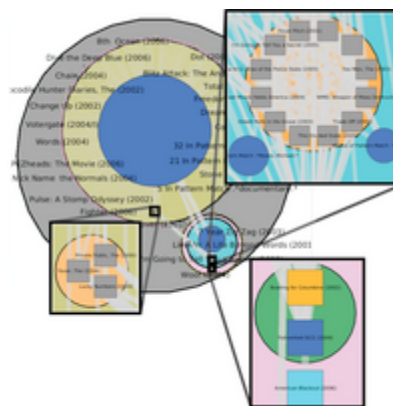
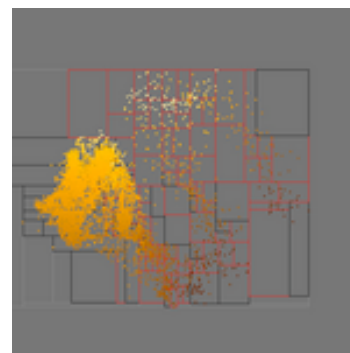
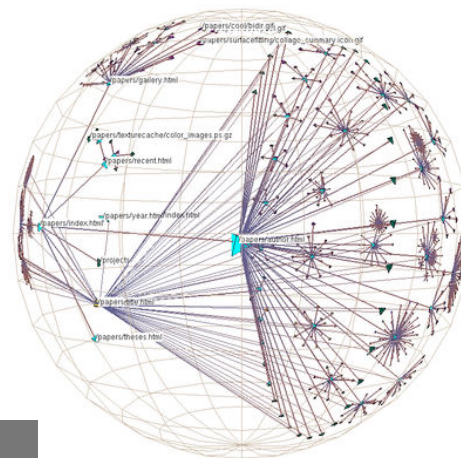
Dagstuhl Scientific Visualization Workshop

June 2009

<http://www.cs.ubc.ca/~tmm/talks.html#dagstuhl09>

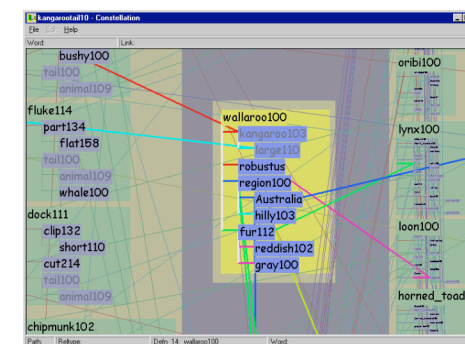
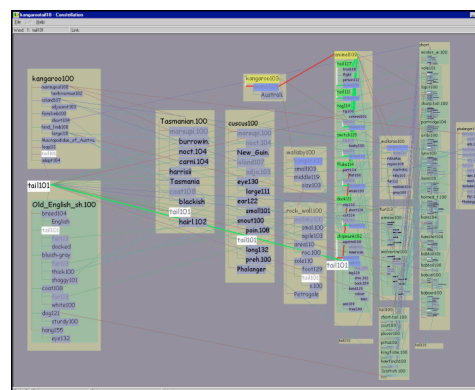
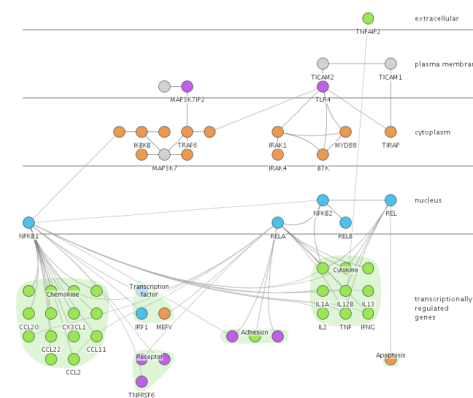
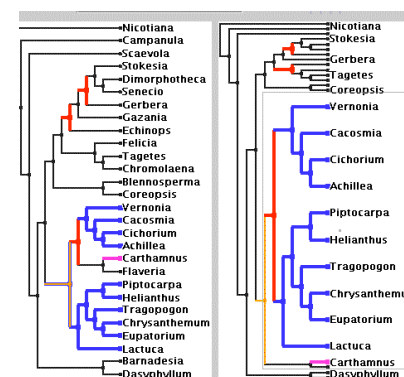
Technique-driven work

- 3D hyperbolic graphs
 - H3
- dimensionality reduction
 - steerable
 - MDSteer
 - GPU accelerated
 - Glimmer
- general multilevel graphs
 - layout
 - TopoLayout
 - interaction
 - Grouse, GrouseFlocks, TugGraph



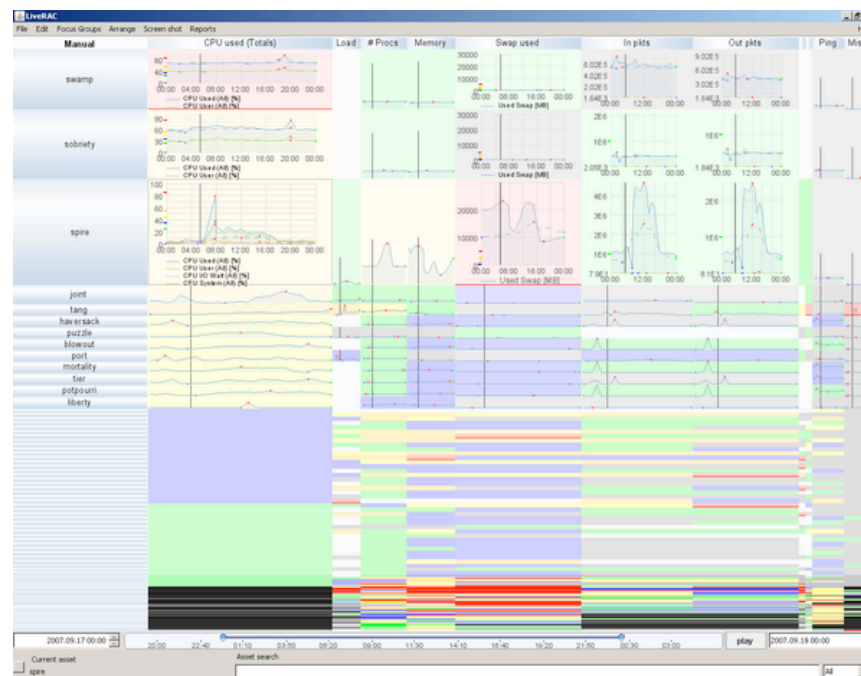
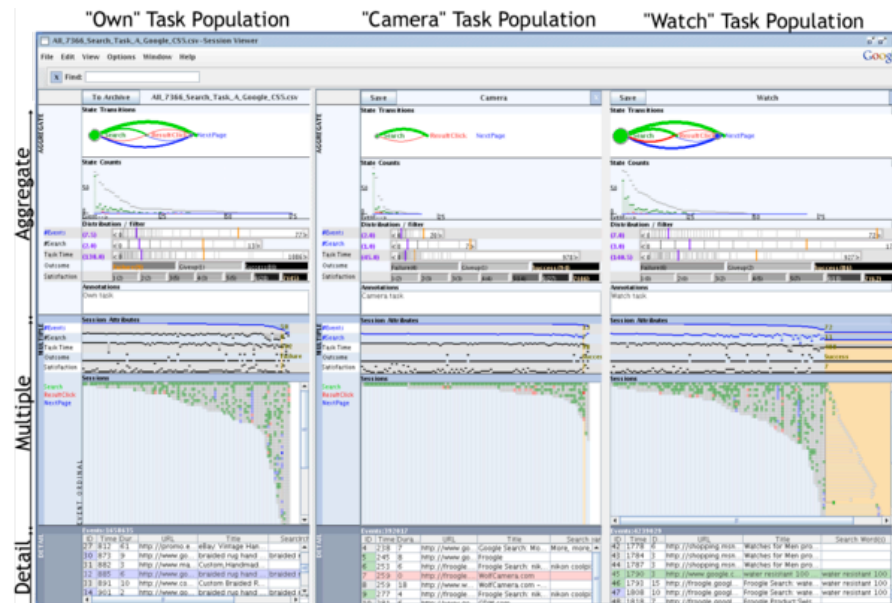
Problem-driven work

- evolutionary tree comparison
 - TreeJuxtaposer
- protein-gene interaction networks
 - Cerebral
- linguistic graphs
 - Constellation



Problem-driven work

- web logs
 - SessionViewer
- large-scale system monitoring
 - LiveRAC



Collaboration

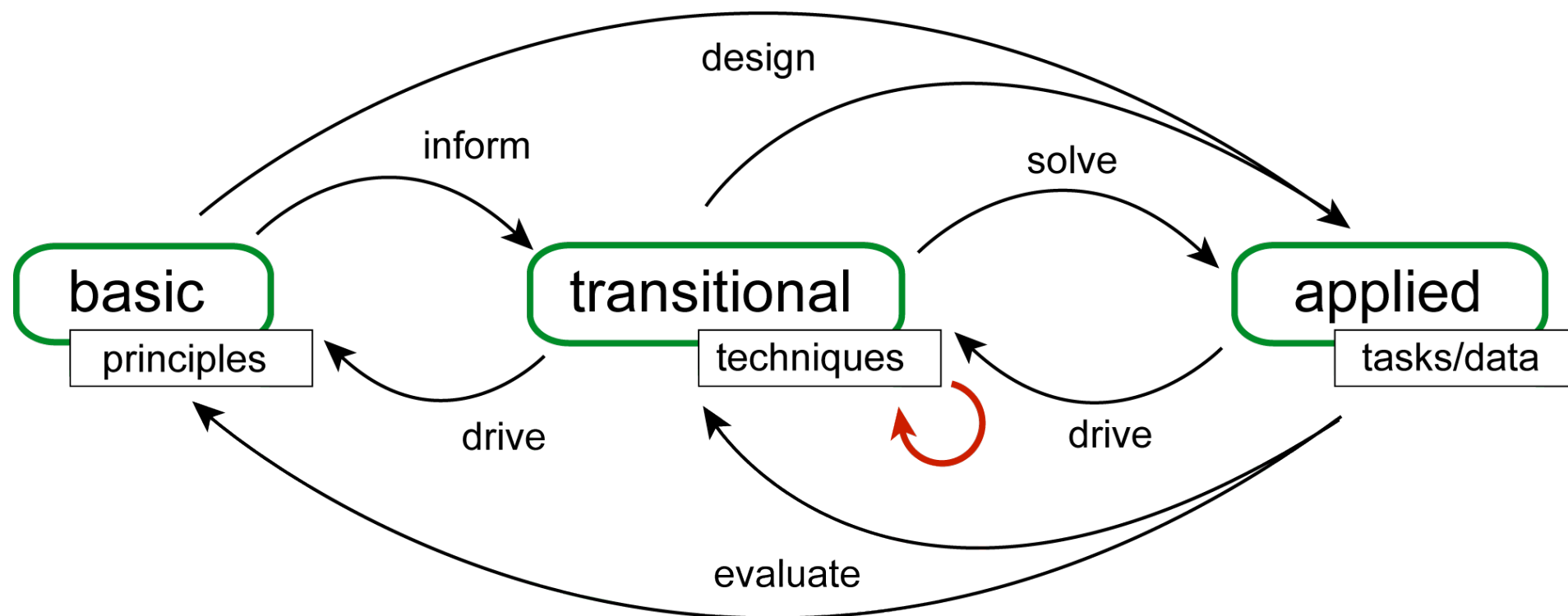
- sometimes you approach users
- sometimes they approach you
 - **not** guarantee of success!
- challenges
 - learning each others' language
 - finding right people/problems where needs of both are met
- collaboration as dance/negotiation
 - initial contact is only the beginning
 - continuous decision process: when to end the dance?
 - after initial talk?
 - after further discussion?
 - after get feet wet with start on real work?
 - after one project?
 - after many projects?

Research Cycles, Collaboration, and Visualization

<http://www.cs.ubc.ca/~tmm/talks.html#leiden07>

- 4-slide version of hour-long collaboration talk
 - research cycles and collaborator roles
 - value of collaboration: success stories
 - difficulty of collaboration: when to walk away

Research cycles



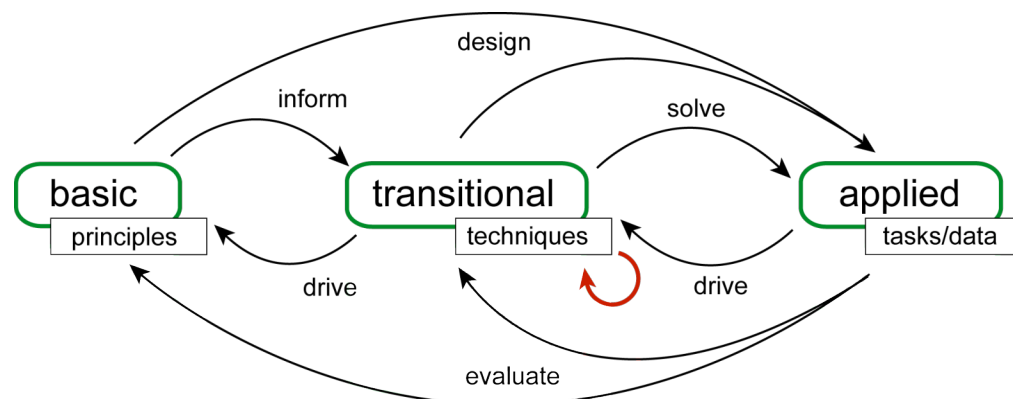
Johnson, Moorhead, Munzner, Pfister, Rheingans, and Yoo.
NIH/NSF Visualization Research Challenges Report. IEEE CS Press, 2006.

- difficult for one person to cover all roles
- collaboration is obvious way to fill in gaps

Four process questions

- ask them early in dance/negotiation!
- what is the role of my collaborators?
- is there a real need for my new approach/tool?
- am I addressing a real task?
- does real data exist and can I get it?

Collaborator roles



- left: providers of principles/methodologies
 - HCI, cognitive psychology
 - computer graphics
 - math, statistics
- right: providers of driving problems
 - domain experts, target app users
- middle: fellow vis practitioners
- middle: fellow tool builders, outside of vis
 - often want vis interface for their tools/algs
 - do not take their word for it on needs of real users

Characteristics I look for in collaborators

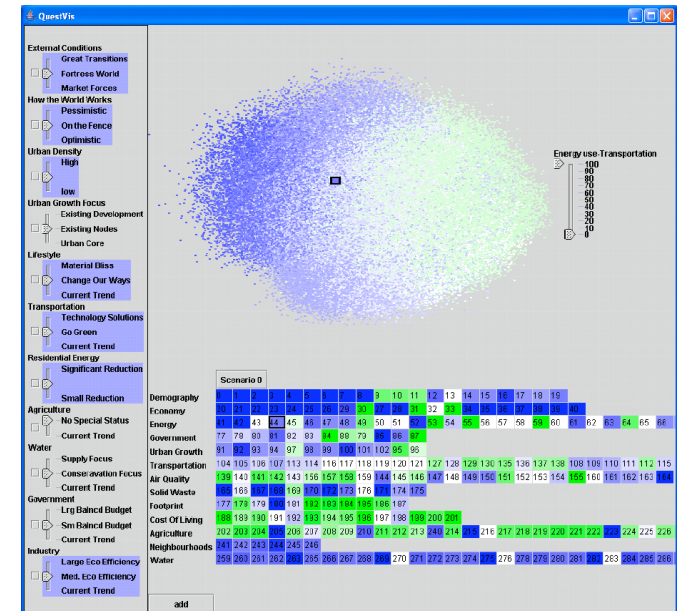
- people with driving problems
 - big data
 - clear questions
 - need for human in the loop
 - enthusiasm/respect for vis possibilities
- all collaborators
 - has enough time for the project
 - research meetings are fun
 - no laughter is a very bad sign
 - (project has funding - ideally...)

Tricky collaboration: sustainability vis

- environmental sustainability simulation
 - citizens in communities making policy choices
 - facilitator leads workshops
- initial focus: high-dimensional dataset
 - 11 input variables, 3 choices each
 - 100K output scenarios, with 300 indicators
 - existing tool only shows a few outputs at once
 - hard to understand entire scenario
 - impossible to compare scenarios
 - goal: show linkages between inputs and outputs

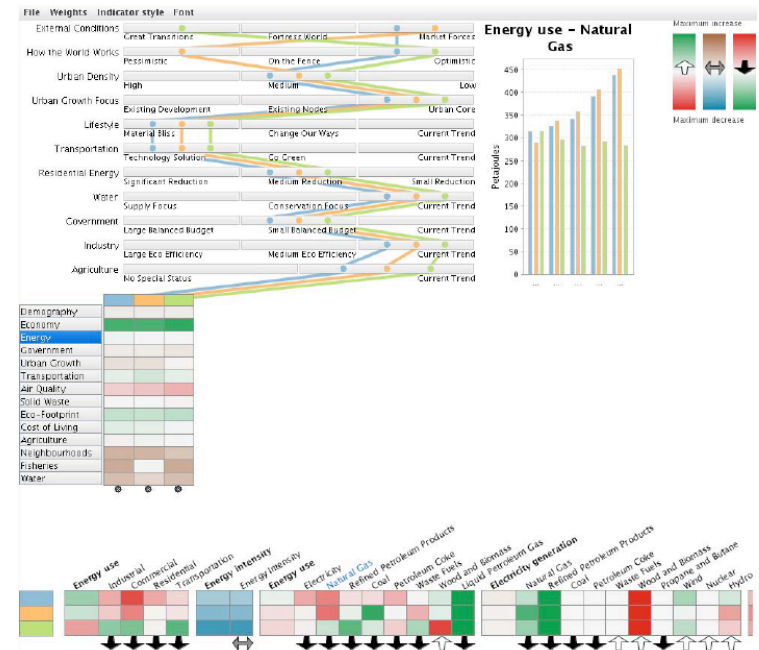
First prototype

- linked views
 - needed refining
- dimensionality reduction
 - too confusing for general public use
 - bad match to true dimensionality of dataset



Second prototype

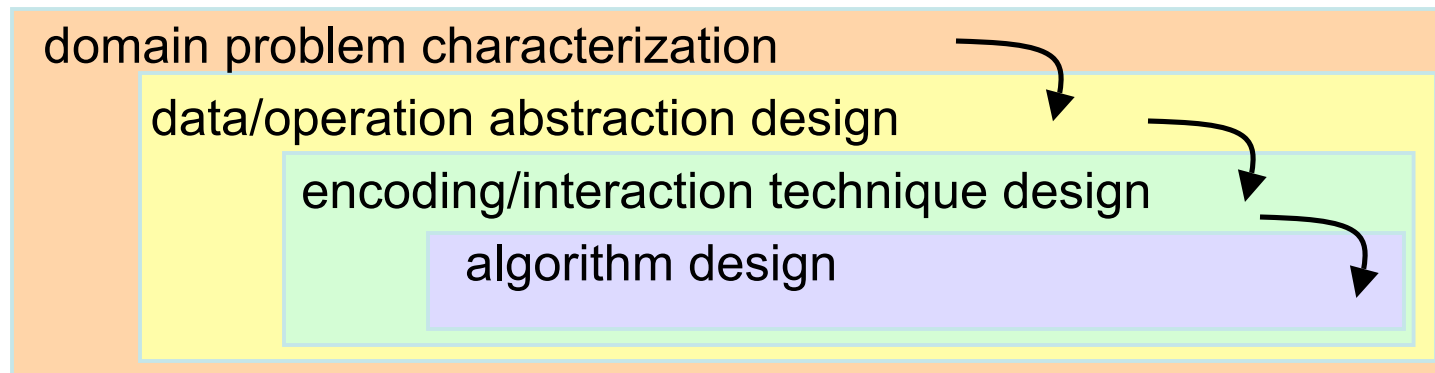
- better linked views
 - solved interesting aggregation problem



- but not deployed
 - real goal was policy choices and behavior change
 - not to absorb details of how simulation works!
- got the task wrong!

Process model: what can go wrong?

- wrong problem: they don't do that
- wrong abstraction: you're showing them the wrong thing
- wrong encoding/interaction: the way you show it doesn't work
- wrong algorithm: your code is too slow



Different threats to validity at each level

threat: wrong problem

validate: observe and interview target users

threat: bad data/operation abstraction

threat: ineffective encoding/interaction technique

validate: justify encoding/interaction design

threat: slow algorithm

validate: analyze computational complexity

implement system

validate: measure system time/memory

validate: qualitative/quantitative result image analysis

[test on any users, informal usability study]

validate: lab study, measure human time/errors for operation

validate: test on target users, collect anecdotal evidence of utility

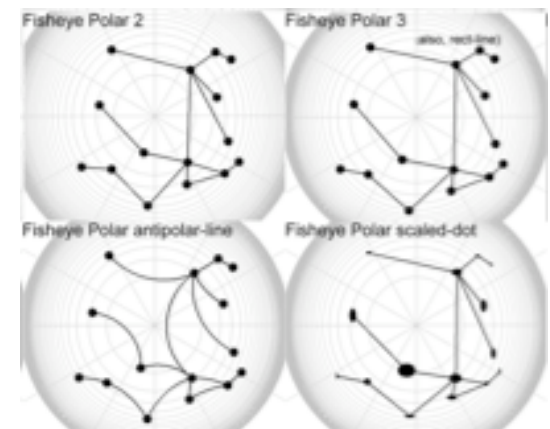
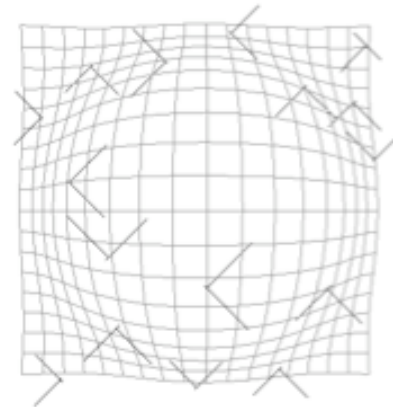
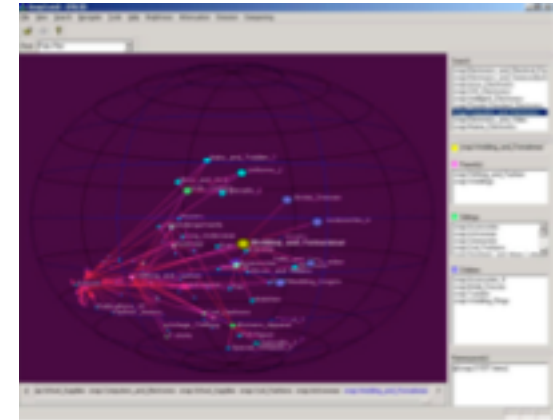
validate: field study, document human usage of deployed system

validate: observe adoption rates

<http://www.cs.ubc.ca/labs/imager/tr/2009/process>

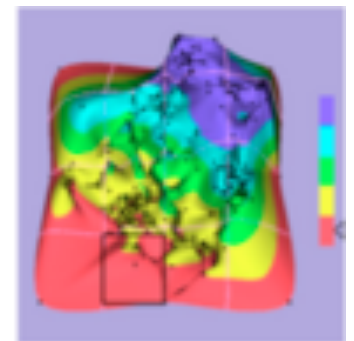
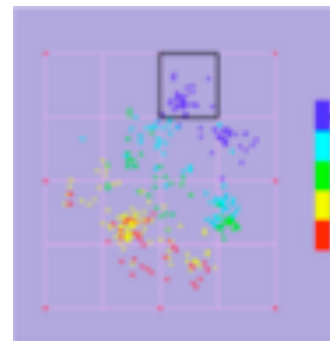
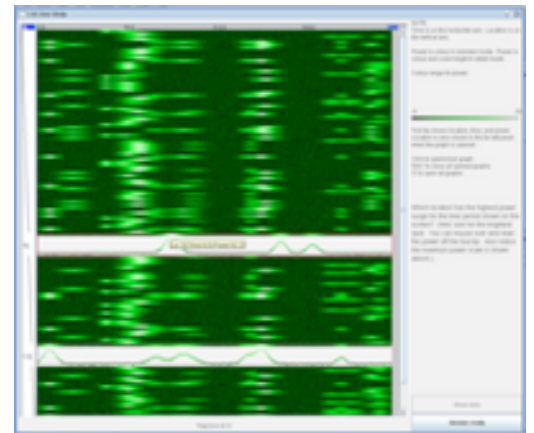
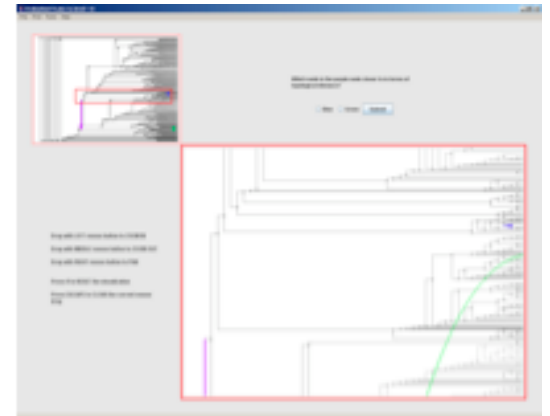
Studies: different flavors

- head to head system comparison (HCI)
 - H3 vs. 2D web browser
- psychophysical characterization (cog psych)
 - impact of distortion on visual search
 - on visual memory



Studies: different flavors

- characterize technique applicability, derive design guidelines
 - stretch and squish vs. pan/zoom navigation
 - separate vs. integrated views
 - 2D points vs. 3D landscapes



Studies: different flavors

- requirements analysis
(before starting)
 - semi-structured interviews
 - watch what they do before new tool introduced:
current workflow analysis
- field study of deployed system
(after prototype refined)
 - watch them use tool:
characterize what they can do now

