

Information Visualization

Intro, *Time Series Exercise*

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<http://www.cs.ubc.ca/~tmm/courses/547-19>

Visualization (vis) defined & motivated

Computer-based visualization systems provide visual representations of datasets designed to help people carry out tasks more effectively.

Visualization is suitable when there is a need to augment human capabilities rather than replace people with computational decision-making methods.

- human in the loop needs the details
 - doesn't know exactly what questions to ask in advance
 - longterm exploratory analysis
 - **speed up** through human-in-the-loop visual data analysis
 - presentation of known results
 - stepping stone towards automation: refining, trustbuilding
- intended task, measurable definitions of effectiveness

Logistics

Finding me

- email is the best way to reach me: tmm@cs.ubc.ca
- office hours Tue right after class (5-6pm)
 - or by appointment
 - unlikely to catch me by dropping by, usually either in meeting or elsewhere
- X661 (X-Wing of ICICS/CS bldg)
- course page is font of all information
 - don't forget to refresh, frequent updates
 - <http://www.cs.ubc.ca/~tmm/courses/547-19>

Audience

- no formal prerequisites
 - many areas helpful but not required
 - human-computer interaction (HCI), eg CPSC 544 this term or equivalent
 - computer graphics, cognitive psychology, machine learning, statistics, algorithms, <application domain>...
 - programming skills required for most project types
- open to non-CS people
 - if no programming background, can do analysis or survey project
- communication skills in English important for success
 - substantial reading, writing, discussion, presentations
- need strength in *at least* one of these 3: programming, English, HCI
 - unsuccessful combination:** weak ESL, weak programming, no HCI background
- open to informal auditors
 - some or all days of readings/discussion/exercises, you'll get out of it what you put into it...

Intros

- say your full name, program, year
- also sign up on paper sheet so I see who's here vs who's registered

Schedule, big picture

- once/week, 2-5pm Tuesdays, 12 sessions
- *Sep 3, no class: no CS grad classes, orientation events only*
- Sep 10, first class: today!
- Oct 22, no class: annual VIS conference
- Dec 3, last class: one week past usual time

- Dec 10, final presentations: afternoon, exact time TBD (1-5pm?)
- Dec 13, final reports due

Marking

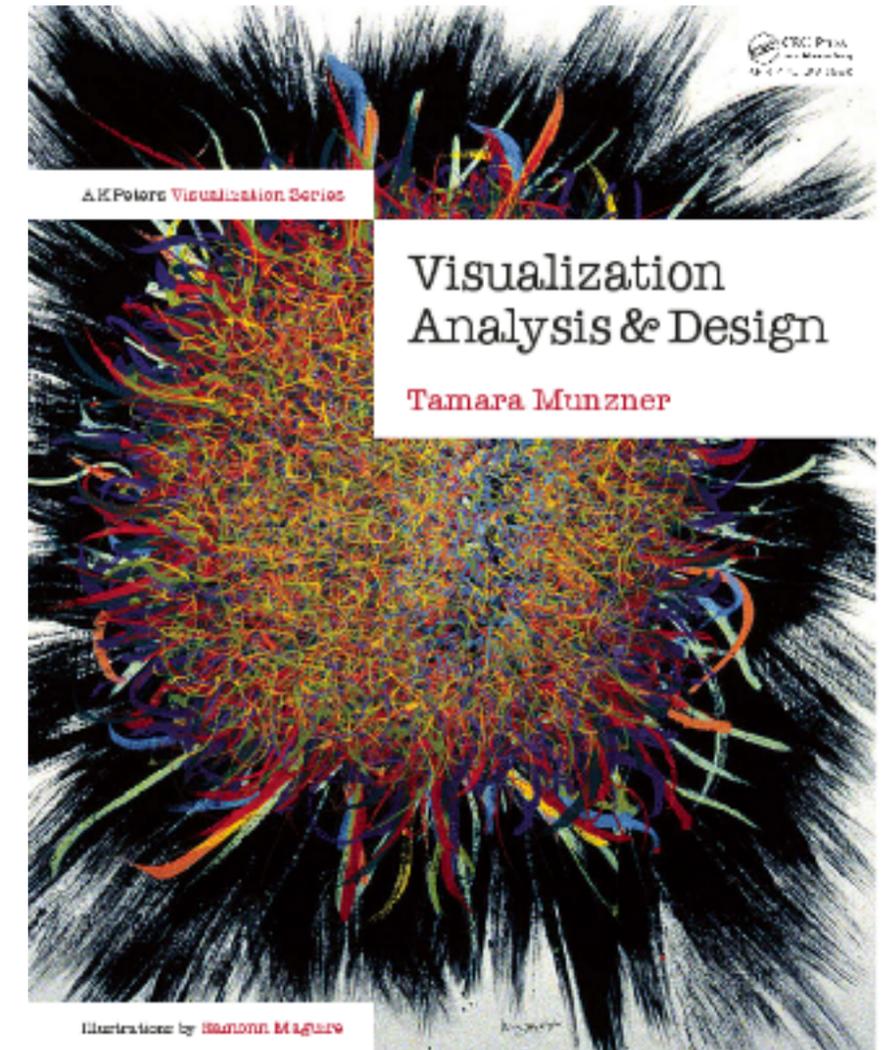
- 50% Project
 - 15% Intermediate Milestones (pass/fail)
 - extensive feedback along the way
 - but formative not summative
 - goal: help you make projects the best they can be!
 - 15% Final Presentation
 - 20% Final Report
 - 50% Content
- 20% Presentations (*probably, depending on final enrolment*)
 - 75% Content: Summary 50%, Analysis 25%, Critique 25%
 - 25% Delivery: Presentation Style 50%, Slide Quality 50%
- 30% Participation
 - 60% Written Comments
 - 25% In-Class Work/Exercises (pass/fail)
 - 15% Discussion
- marking by buckets
 - great 100%
 - good 89%
 - ok 78%
 - poor 67%
 - zero 0%

Class sessions

- first part: read & participate [30%]
 - before class:
 - you do readings (~4, mix of chapters & papers)
 - you submit comments before class
 - you respond to at least ~~two~~ one comment from classmates
 - during class:
 - sometimes I lecture (briefly) and we discuss
 - frequent in-class work/exercises/critique
- highly likely: presentations [20%]
 - before one of the classes: you read paper I assign on topic of your choice
 - during that class: you present it to everybody else (~10-15 min)
 - TBD depending on final enrollment*

Readings

- textbook
 - Tamara Munzner. Visualization Analysis and Design. AK Peters Visualization Series. CRC Press, 2014.
 - <http://www.cs.ubc.ca/~tmm/vadbook/>
 - library has multiple free ebook copies
 - to buy yourself, cheapest is amazon.com
 - hardcover bundled with ebook
- papers
 - links posted on course page
 - if DL links, use library EZproxy from off campus
- readings posted by 6 days before class
- ~4 each session: mix of chapters & papers



Comments submission & marking

- written comments on reading in advance, in two rounds
- round 1 due 10am (4 hrs before class), 90% of comment mark
 - 1 for each reading
 - bring printout or laptop with you, springboard for discussion
 - post to Canvas discussion group
- round 2 due 1:30pm (30 min before class), 10% of comment mark
 - written responses to at least 2 comments per session/week
 - you can only read comments from others after you post your own
- start as pass/fail marking, see how it goes
 - switch to explicit marking if quality concerns

Comments content

- comments or questions
- fine to be less formal than written report
 - correct grammar and spelling still expected
 - be concise: one paragraph is good
- should be thoughtful, show you've read and reflected
 - poor to ask something trivial to look up
 - ok to ask for clarification of genuinely confusing section
 - good to show that you're thinking carefully about what you read
 - great to point out something that I haven't seen before
- examples on <http://www.cs.ubc.ca/~tmm/courses/infovis/structure.html>

Class participation

- in-class group/individual exercises
- workshopping/critique for projects
- crucial part of course, attendance expected
 - tell me in advance if you'll miss class (and why)
 - tell me when you recover if you were ill
 - (written comments credit still possible if submitted in advance)

Projects [50%]

- groups of 2, 3, or 4
 - amount of work commensurate with group size
 - permission for solo project granted in exceptional circumstances, by petition
- stages
 - milestones along the way, mix of written & in-class
 - new last few years: formative feedback only
 - pitches (data/task), proposals, peer project reviews
 - final versions
 - final presentations (oral): Tue Dec 10, afternoon
 - whole dept invited, refreshments served
 - final reports (written): Fri Dec 13, 11:59pm
 - summative written feedback for both
- resources
 - more on datasets and tools later

Projects

- programming
 - common case (*I will only consider supervising students who do these*)
 - four types
 - problem-driven design studies (target specific task/data)
 - technique-driven (explore design choice space for encoding or interaction idiom)
 - algorithm implementation (as described in previous paper)
 - interactive explainer (like distill articles)
- analysis
 - use existing tools on dataset
 - detailed domain survey
 - particularly suitable for non-CS students
- survey
 - very detailed domain survey
 - particularly suitable for non-CS students

Projects: Design studies

- BYOD (Bring Your Own Data)
 - you (or your teammates) have your own data to analyze
 - thesis/research topic
 - personal interest
 - dovetail with another course (sometimes works, but timing may be tricky)
- FDOI (Find Data Of Interest)
 - many existing datasets, see resource page to get started
 - <http://www.cs.ubc.ca/group/infovis/resources.shtml>
 - can be tricky to determine reasonable task

Project examples

- <http://www.cs.ubc.ca/~tmm/courses/547-17F/projectdesc.html#examp>

Presentations [20%]

- probably - *depends on final enrollment! TBD*
- present, analyze, and critique one paper
 - send me topic choices, I will assign papers accordingly
- expectations
 - slides required
 - summary/description important, but also your own thoughts
 - analysis according to book framework
 - critique of strengths and weaknesses
- timing
 - exact times TBD depending on enrollment
 - likely around 15 +/- 5 minutes each
- topics at <http://www.cs.ubc.ca/~tmm/courses/infovis/presentations.html>

Enrollment

- don't worry if you're not registered yet, just attend and keep up
 - major churn is normal the first few weeks
 - spaces will definitely open up
- do make sure you've signed up on paper sheet going around!
- registered students currently have fob access to FSC 2330 door
 - will update after final enrollment settles (after Sep 17)
 - you can work in this room when not otherwise in use
 - other classes: Tue/Thu 9:30-11am, Tue 5-8pm, Fri 1-4pm
 - DFP Seminar: 2nd & 4th Wed 12-1pm

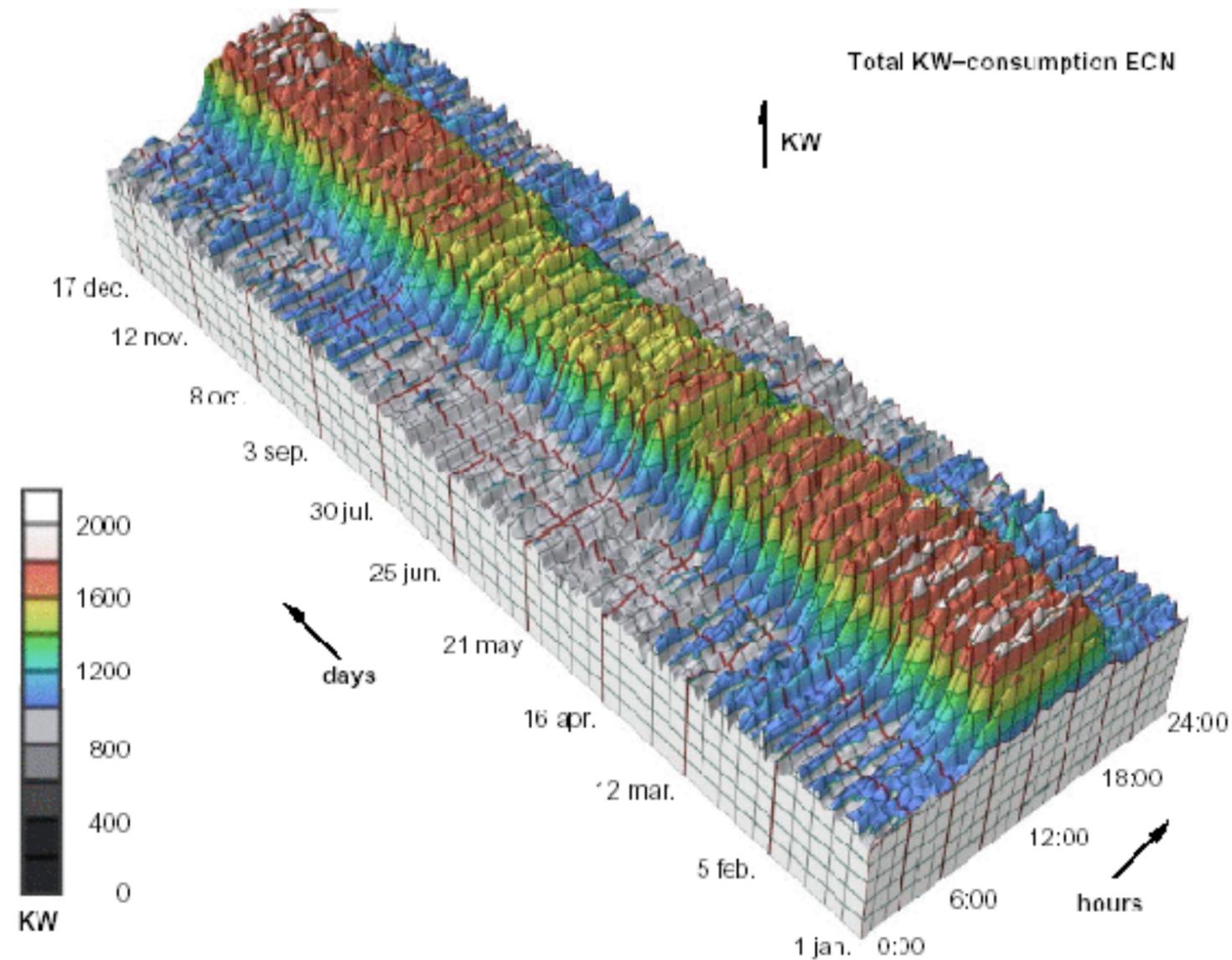
Break

Now: In-class design exercise, in small groups

- Five time-series scenarios
 - A: every 5 min, duration 1 year, 1 thing: building occupancy rates
 - B: every 5 min, 1 year, 2 things: currency values (exchange rate)
 - C: several years and several things: every 5 min, 5 years, 10 currencies
 - D: many things: every 5 min, 1 year, CPU load across 1000 machines
 - E: several parameters, many things: every 5 min, 1 year, 10 params on 1000 machines
- Small-group exercise: 15-20 min
 - one group per table (4 people/group)
 - discuss/sketch possible visual encodings appropriate for your assigned scenario
- Reportback: 30-40 min
 - 3 min from each group
- Design space examples/discussion: 20-30 min

Case A: 3D Approach (Not Recommended)

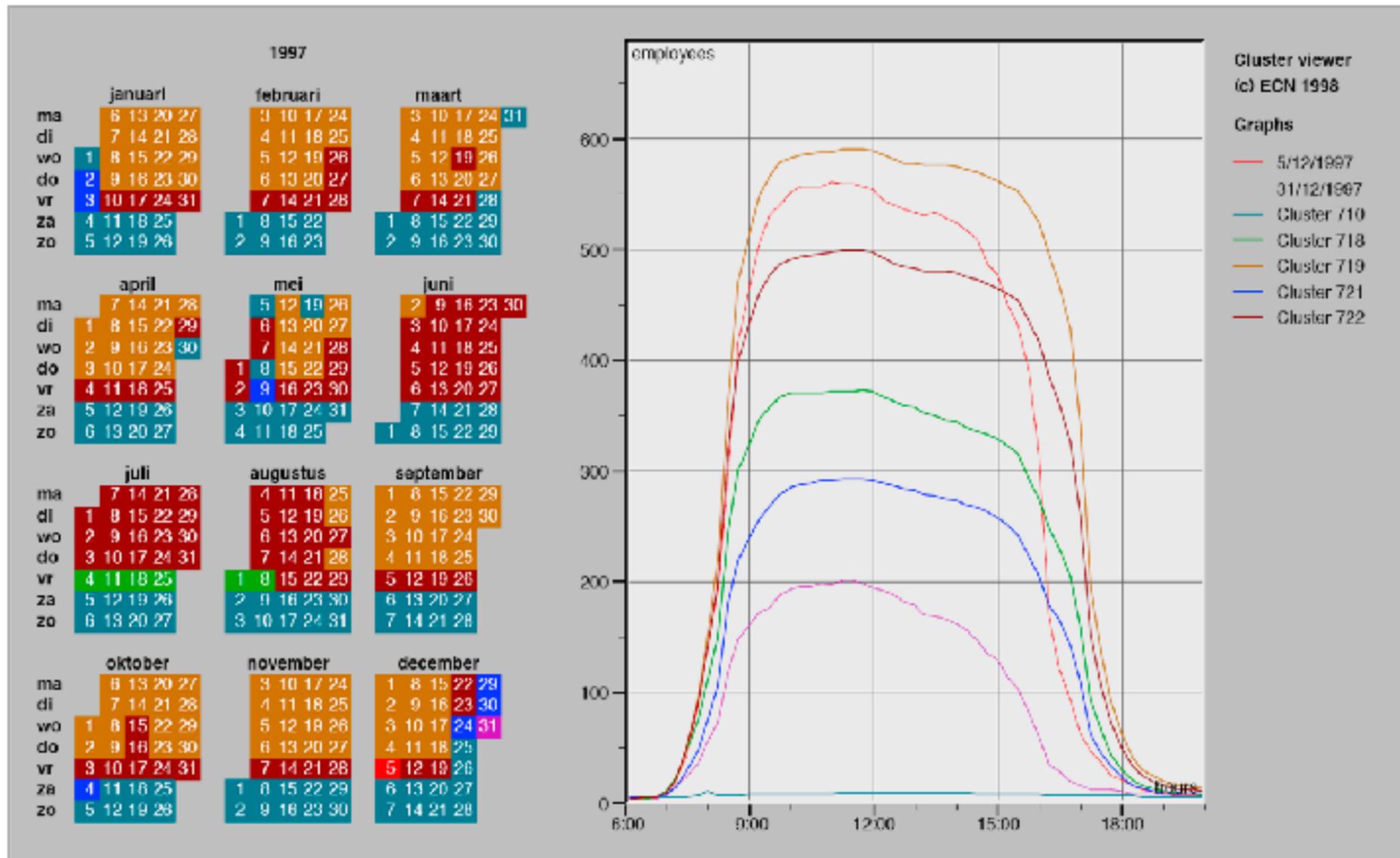
- extruded curves: detailed comparisons impossible



[Cluster and Calendar based Visualization of Time Series Data. van Wijk and van Selow, Proc. InfoVis 99.]

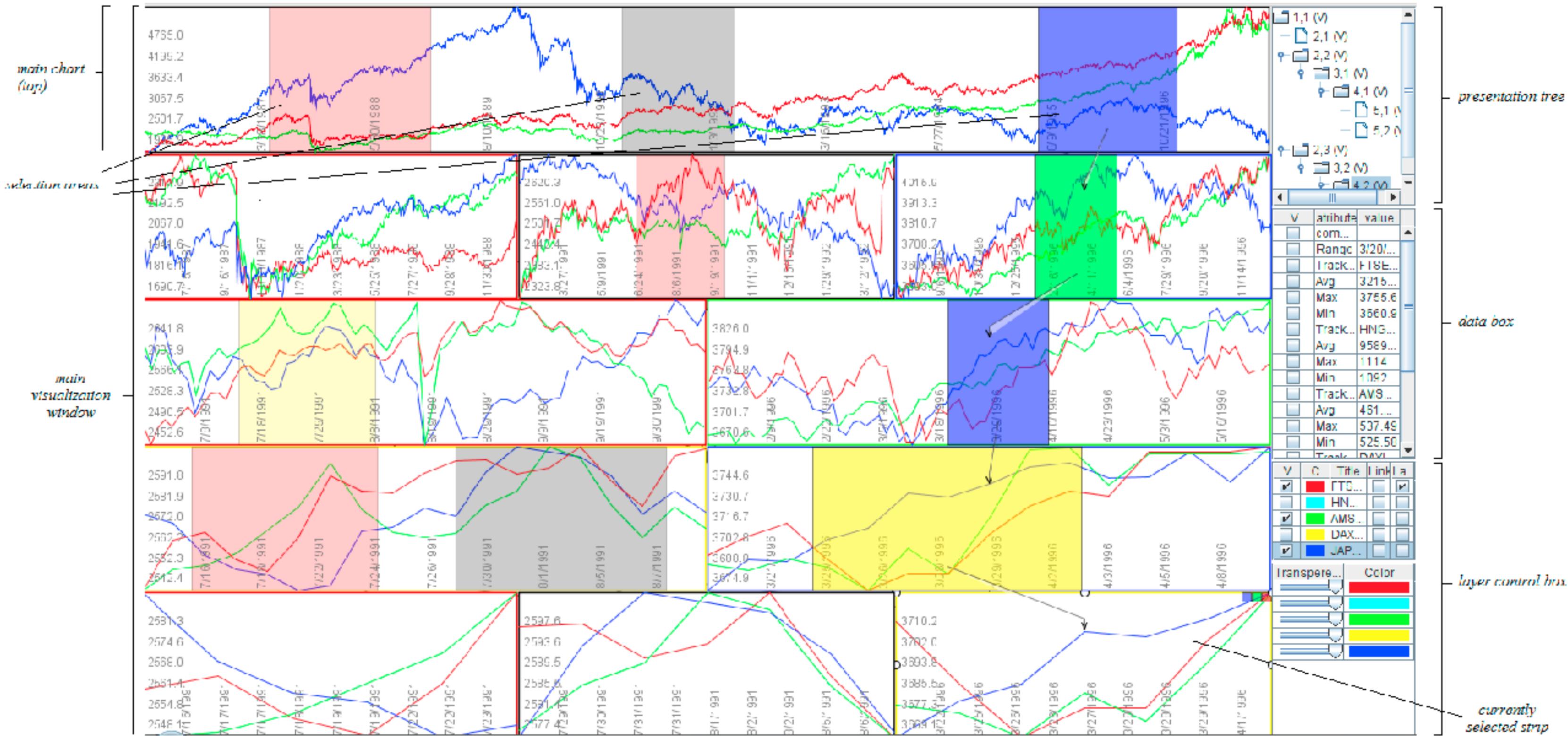
Case A: Cluster-Calendar Solution

- derived data: cluster hierarchy
- juxtapose multiple views: calendar, superimposed 2D curves



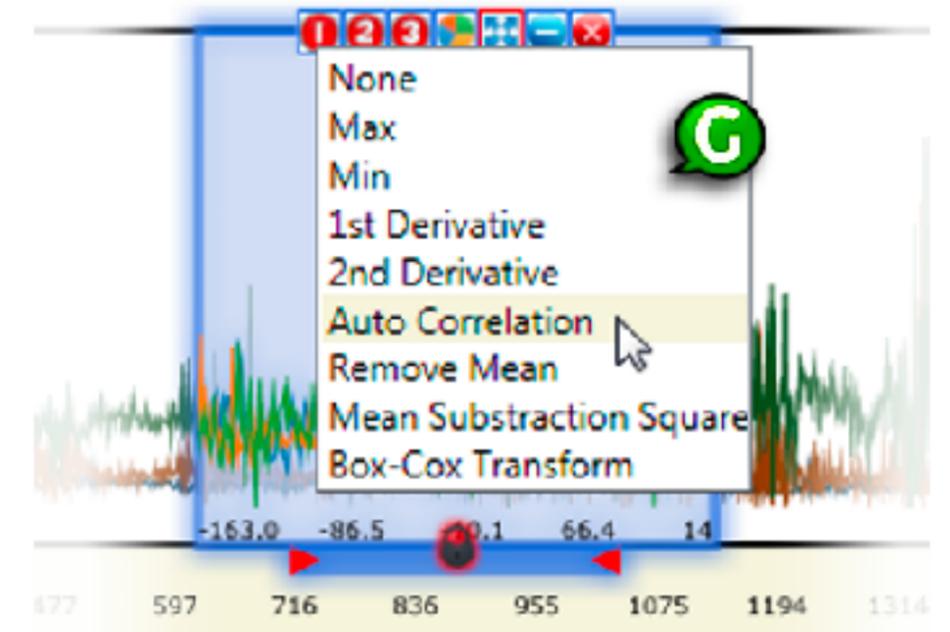
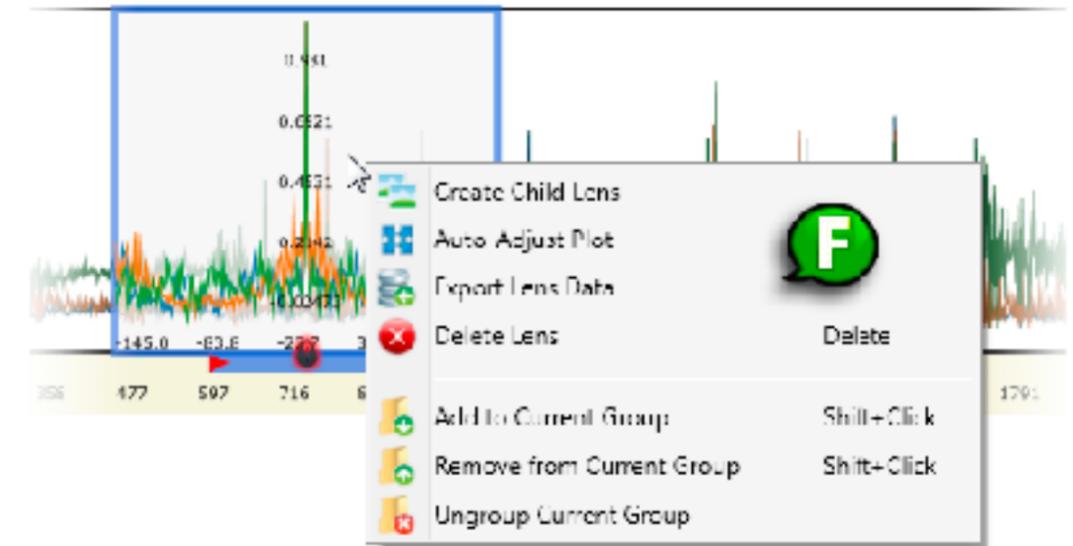
Case B: Stack Zooming

<https://youtu.be/dK0De4XPm5Y>



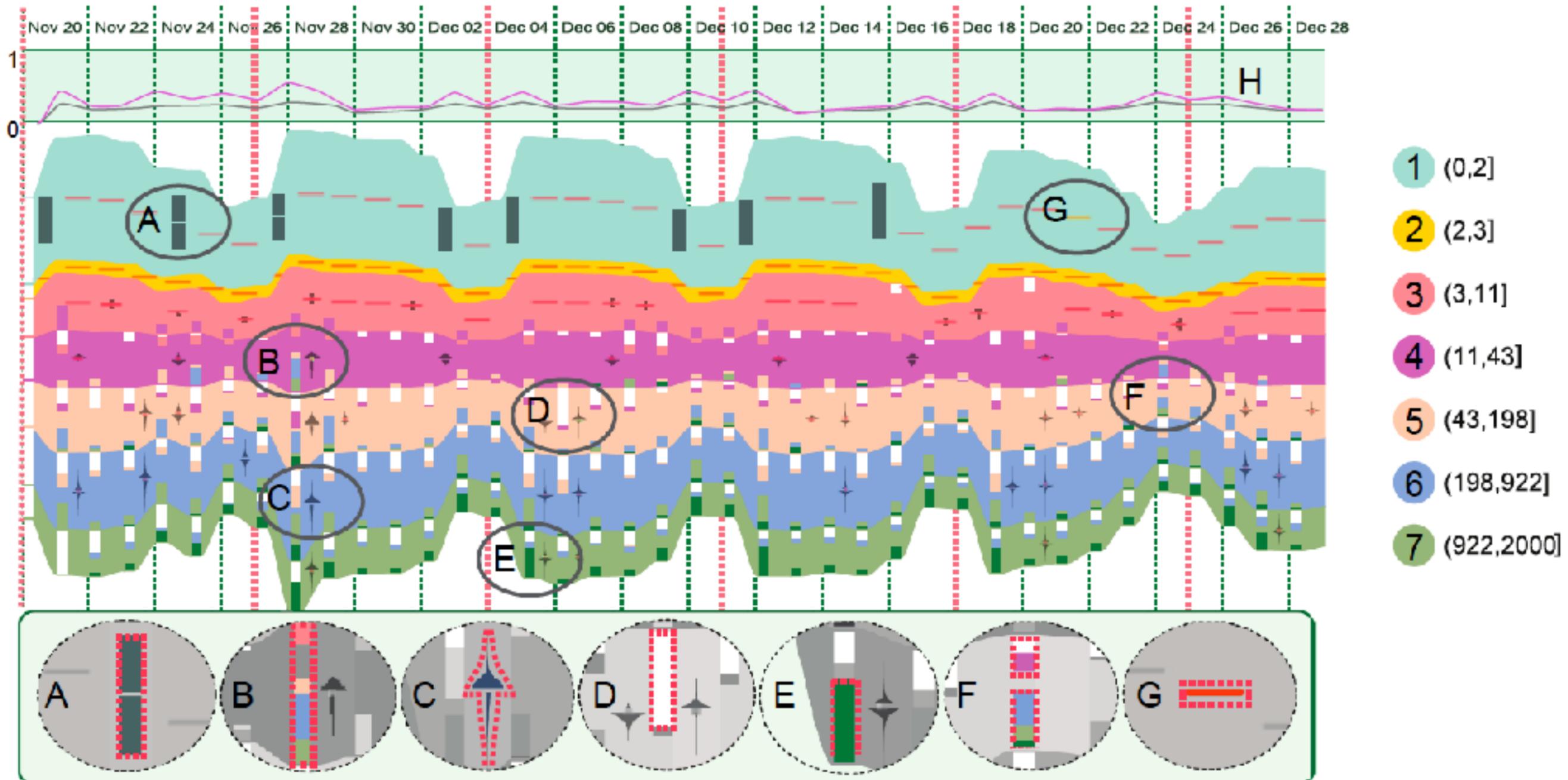
Case C: ChronoLenses

<https://youtu.be/k7pl8ikczqk>



Case D: RankExplorer

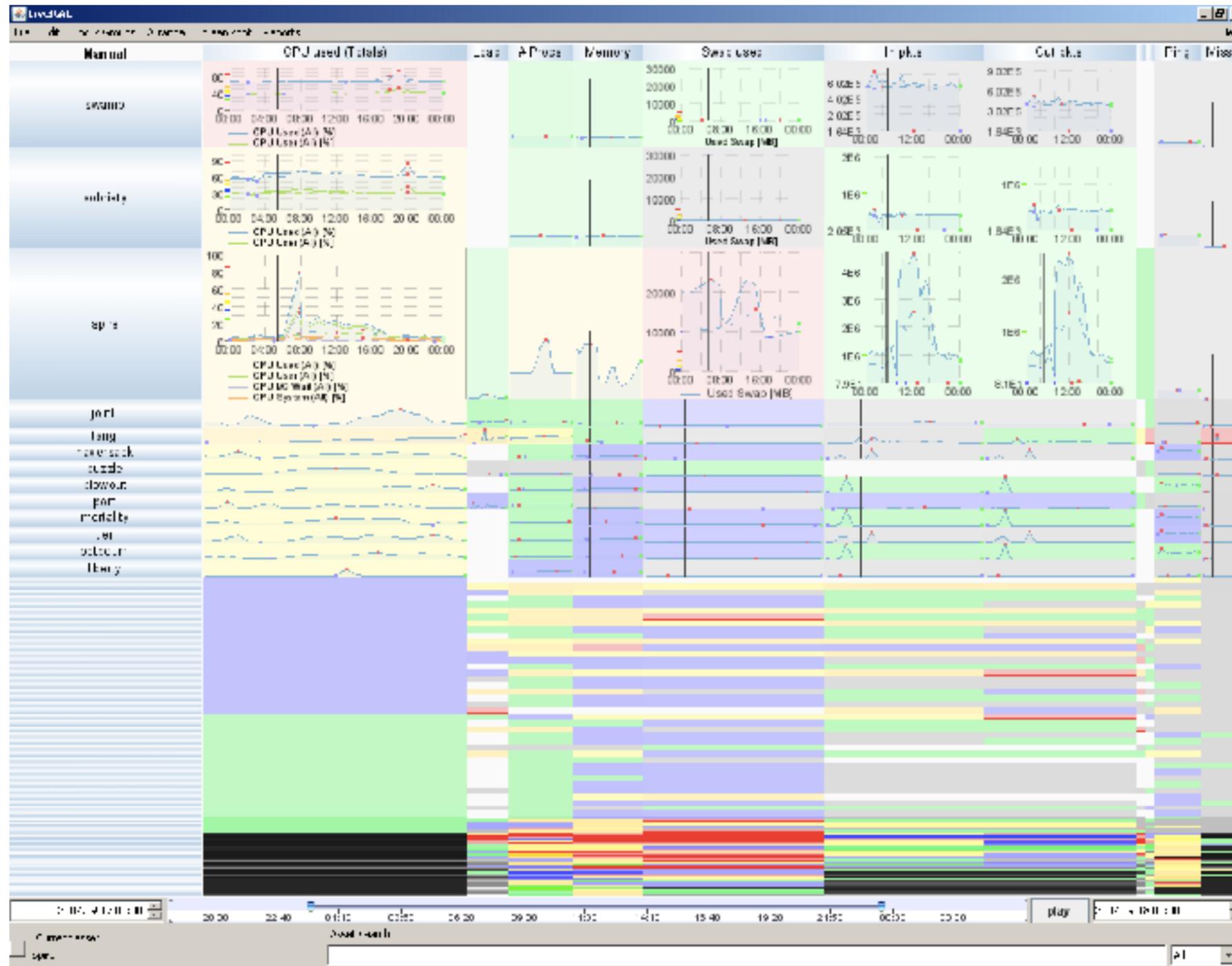
<https://youtu.be/rdgnlqcZ2A4>



[RankExplorer: Visualization of Ranking Changes in Large Time Series Data. Shi, Cui, Liu, Xu, Chen and Qu. IEEE TVCG 12(18):2669-2678 (Proc. InfoVis 2012)]

Case E: LiveRAC video

<http://youtu.be/Id0c3H0VSkw>



[LiveRAC - Interactive Visual Exploration of System Management Time-Series Data. McLachlan, Munzner, Koutsofios, and North. Proc. Conf. on Human Factors in Computing Systems (CHI) 2008, pp 1483-1492.]

Next Time

- to read
 - VAD book, Ch 1:What's Vis, and Why Do It?
 - VAD book, Ch 2:What: Data Abstraction
 - VAD book, Ch 3:Why:Task Abstraction
 - paper: Design Study Methodology