

Information Visualization

Intro, *Time Series Exercise*

Tamara Munzner

Department of Computer Science
University of British Columbia

7 September 2022

<http://www.cs.ubc.ca/~tmm/courses/547-22>

Welcome!

547: who's who

- Instructor:
 - Tamara Munzner (she)
- TA:
 - Mara Solen (they)



Land acknowledgement

- I want to acknowledge that UBC is on the traditional, ancestral, and unceded territory of the Musqueam people
- When I'm zooming from home, I want to acknowledge I'm working from the unceded territory of the Musqueam, Sto:lo, Squamish, & Tsleil-Waututh First Nations
 - Traditional: recognizes lands traditionally used and/or occupied by the First Nations
 - Ancestral: recognizes land that is handed down from generation to generation
 - Unceded: refers to land that was not turned over to the Crown (government) by a treaty or other agreement

Course Logistics

Finding info; finding me

- course page is font of all information
 - don't forget to refresh, frequent updates
 - <http://www.cs.ubc.ca/~tmm/courses/547-22>
- email is the best way to reach me: tmm@cs.ubc.ca
- office hours Wed right after class (6:15-7:15pm)
 - or by appointment (in-person or zoom), send email to schedule
 - my office is X661 (X-Wing of ICICS/CS bldg)
 - but unlikely to catch me by dropping by, usually either in meeting or elsewhere

Delivery mechanisms

- Live: small-group work, discussion / Q&A, lecture
- Web:
 - outwards: syllabus & all instructional materials, slides, videos, project deliverables
 - inwards: gdocs for small group work
- Piazza: all asynchronous discussion, also logistics and other updates
- Canvas: all handin, some marks (simple numeric)
- email: some marks (written feedback)

Intros

- async: Piazza self-intro thread
- sync: also sign up on spreadsheet so I see who's here (vs who's registered)
 - will use that for breakouts today also
 - if you have privacy concerns,
ok to leave off email (and/or last name) and send it to me directly
 - link on course page

<http://www.cs.ubc.ca/~tmm/courses/547-22>

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...

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 spreadsheet!

Schedule, big picture

- once/week, 3-6pm Wednesdays, 12 sessions
 - with short break roughly halfway through
- Sep 7, first class: today!
- no class
 - Oct 19, annual IEEE VIS conference
 - Nov 9, midterm break
- Dec 14, final presentations: afternoon, exact time TBD (2-6pm?)
- Dec 16, final reports due (8pm)

Marking

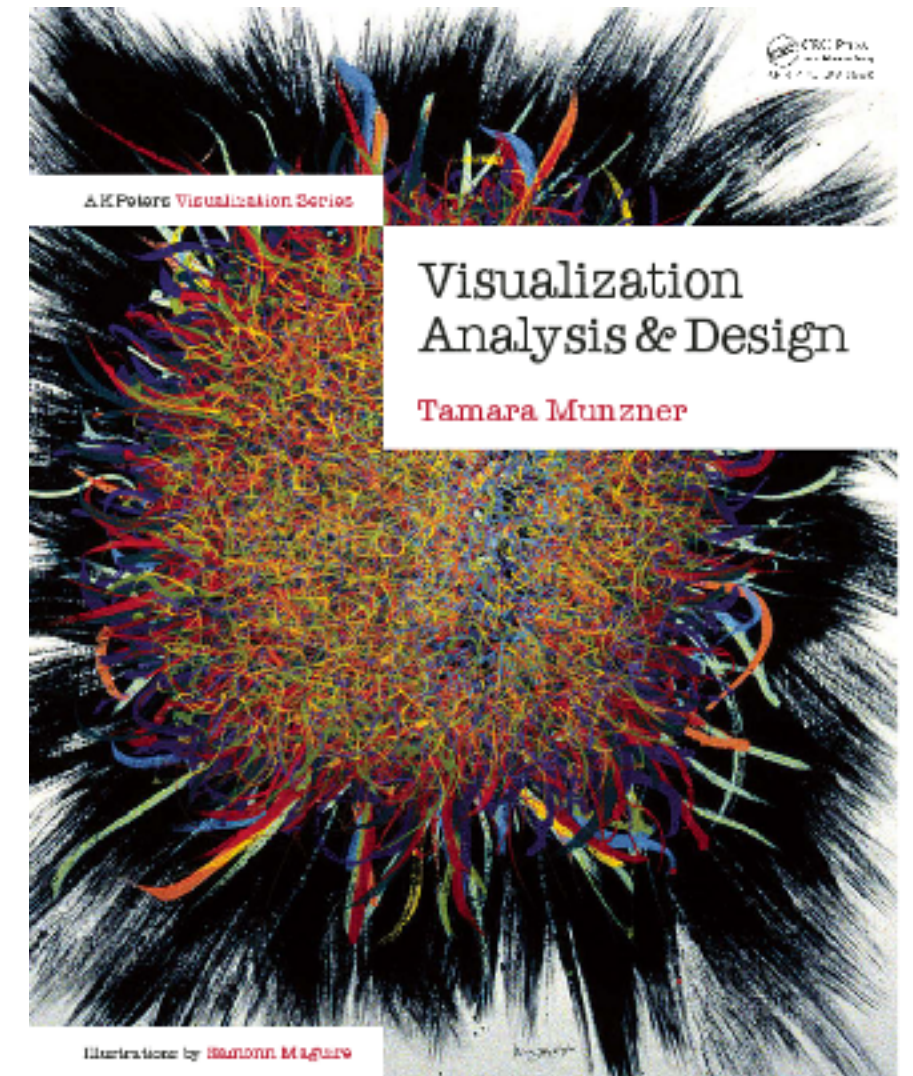
- 50% Project
 - 25% Intermediate Milestones (pass/fail)
 - so you'll get feedback along the way
 - formative not summative, goal: help you make projects the best they can be!
 - 15% Final Presentation
 - 25% Final Report
 - 60% Content
- 36% Asynchronous Readings & Online Discussion
 - 75% Comments on Readings, 25% Responses to Others
 - 4% per week, weeks 2-9; 1% per week, weeks 1 & 11; 2% per week, week 12
- 14% In-Class Participation
 - 12% In-Class Exercise Participation (12 sessions, 1% per session)
 - 2% Final Presentations Participation
- marking buckets
 - great 100%
 - good 89%
 - ok 78%
 - poor 67%
 - zero 0%

Fundamental material

- first part: read & participate [50%]
 - before class: async discussion [36%]
 - you do readings (3/week, mix of chapters & papers)
 - you submit comments before class (by Mon 1pm)
 - you respond to at least one comment from classmates (by Wed 1pm)
 - during class [14%]
 - frequent in-class work/exercises/critique
 - some lecture & discussion

Readings

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



Comments submission & marking

- written comments on reading in advance, in two rounds
- round 1 due 1pm Mon (2 days before class), 75% of comment mark
 - 1 for each reading
 - post to Piazza
- round 2 due 1pm Wed (2 hrs before class), 25% of comment mark
 - written response to at least 1 comment per session/week
- start as pass/fail marking, see how it goes
 - switch to explicit marking if quality concerns

Comments content

- comments or questions
 - **NOT** summaries
- 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/547-22/structure.html>

Participation & missed work

- 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)
 - unless ill or emergency
 - written comments credit still possible if submitted in advance for async
- but if you cannot attend class (illness, quarantine, visa, other)
 - **you can work through in-class exercises solo**
 - inform me by private post on Piazza when done
 - UBC policy is to self-declare illness (no need for doctor note)

Pandemic mode

- masks strongly recommended indoor public spaces
 - if you eat or drink, remask between bites and sips

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): Wed Dec 14, afternoon (2-6?)
 - whole dept invited, refreshments served. live talk or prerecorded video, your choice
 - final reports (written): Fri Dec 16, 8pm
 - 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/547-22/projectdesc.html#examp>

This week

- async read only
 - Course Logistics (no comments, no responses)
- async read & comment
 - VAD Chapter 1 (comments only, no responses)
 - due Fri Sep 9 1pm
- async discuss
 - self-intros
 - due Fri Sep 9 1pm
- sync (now!)
 - logistics Q&A
 - time series exercise
 - small groups mixed with lecture / discussion

Next Time

- to read & discuss (async, before next class)
 - VAD book, Ch 2: What: Data Abstraction
 - VAD book, Ch 3: Why: Task Abstraction
 - paper: Nested Model
- round 1 comments on readings due Mon Sep 12 1pm
- round 2 responses due Wed Sep 14 1pm

Visualization

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

Break

- move into small breakout groups by end of break

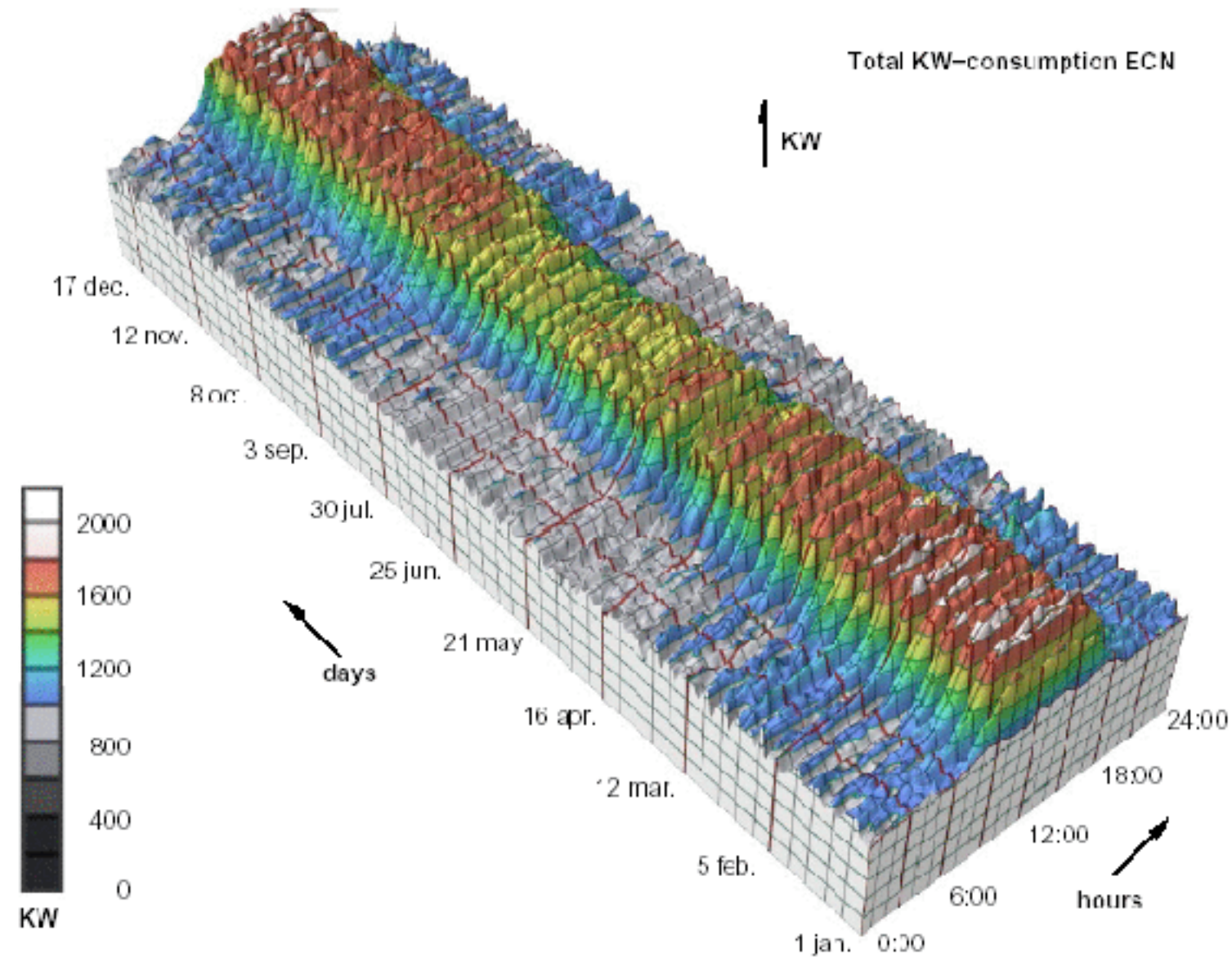
Exercise: Time Series

Now: In-class design exercise, in small groups

- Three time-series scenarios
 - 1: every 5 min, duration 1 year, 1 thing: building occupancy rates
 - 2: several years and several things: every 5 min, 5 years, 10 currencies
 - 3: several parameters, many things: every 5 min, 1 year, 10 params on 1000 machines
- Small-group exercise: 60+ min
 - breakout groups (4 people/group)
 - brainstorm possible visual encodings & interactions for each scenario
 - document in your group's googledoc w/ text & sketch images
 - reportback: I'll flip through googledocs, some questions for group spokesperson
- Design space examples/discussion: 15-20 min

Case 1: 3D Approach (Not Recommended)

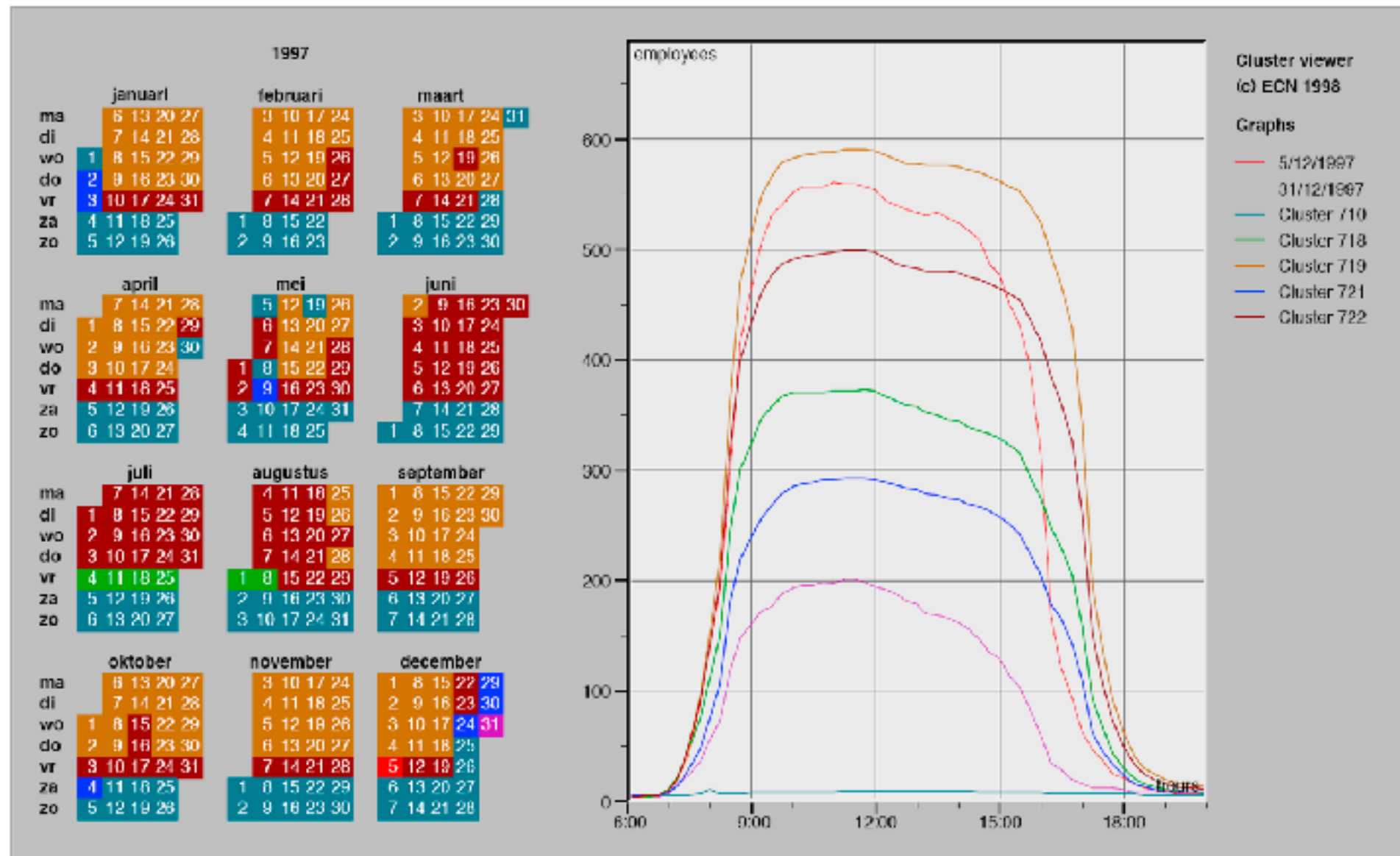
- extruded curves: detailed comparisons impossible



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

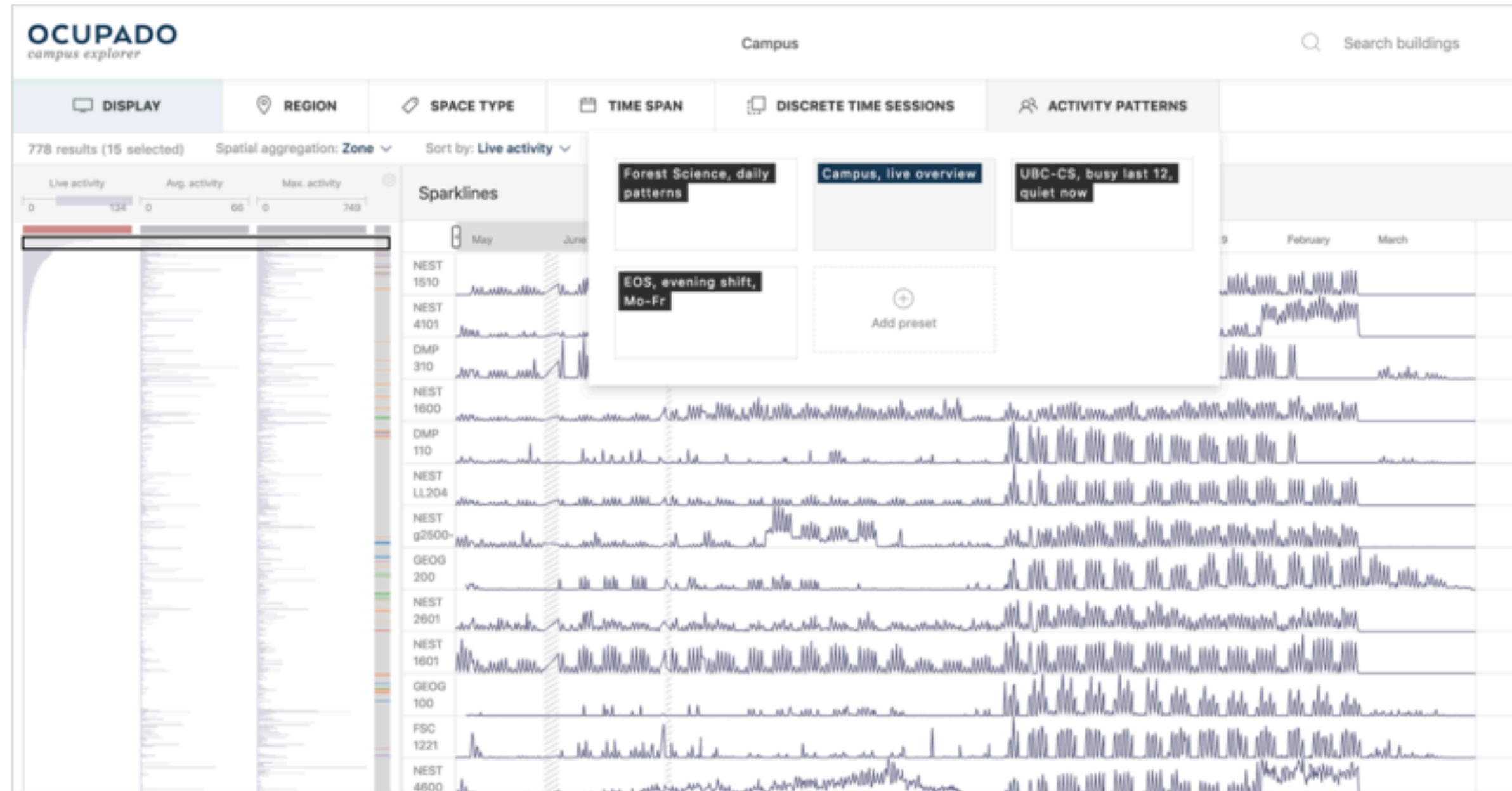
Case 1: Cluster-Calendar Solution

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



Case 1.5: Ocupado

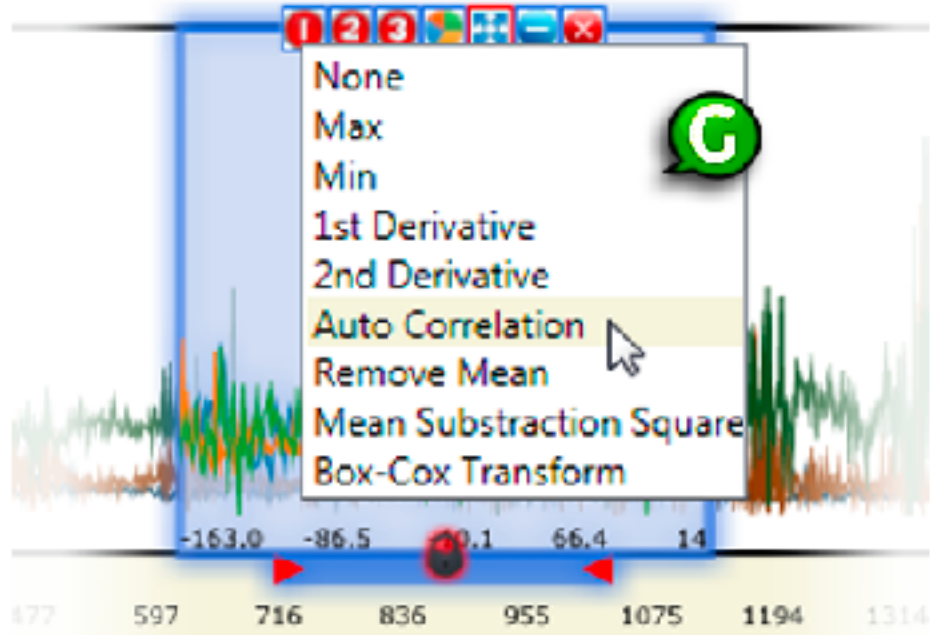
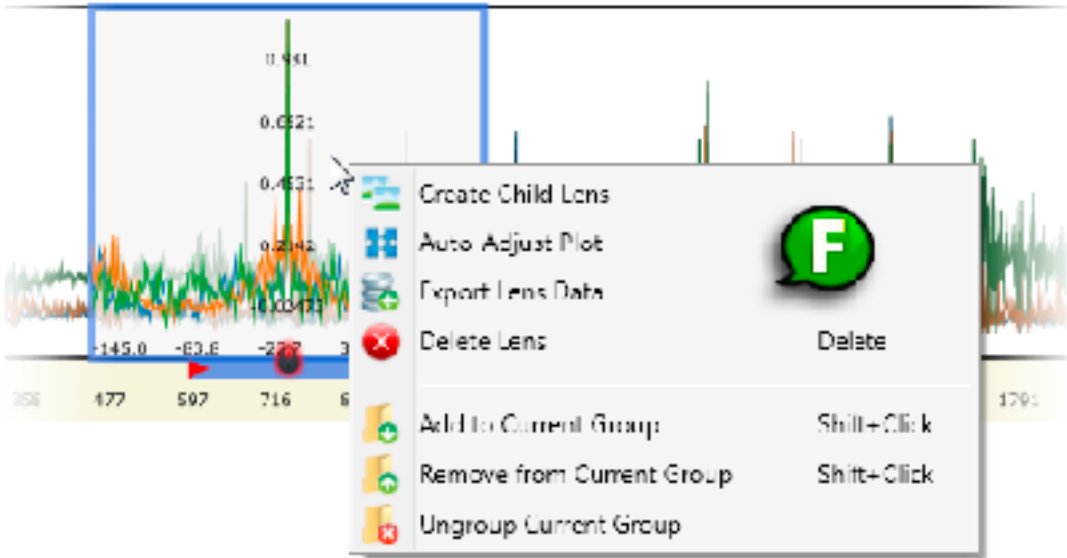
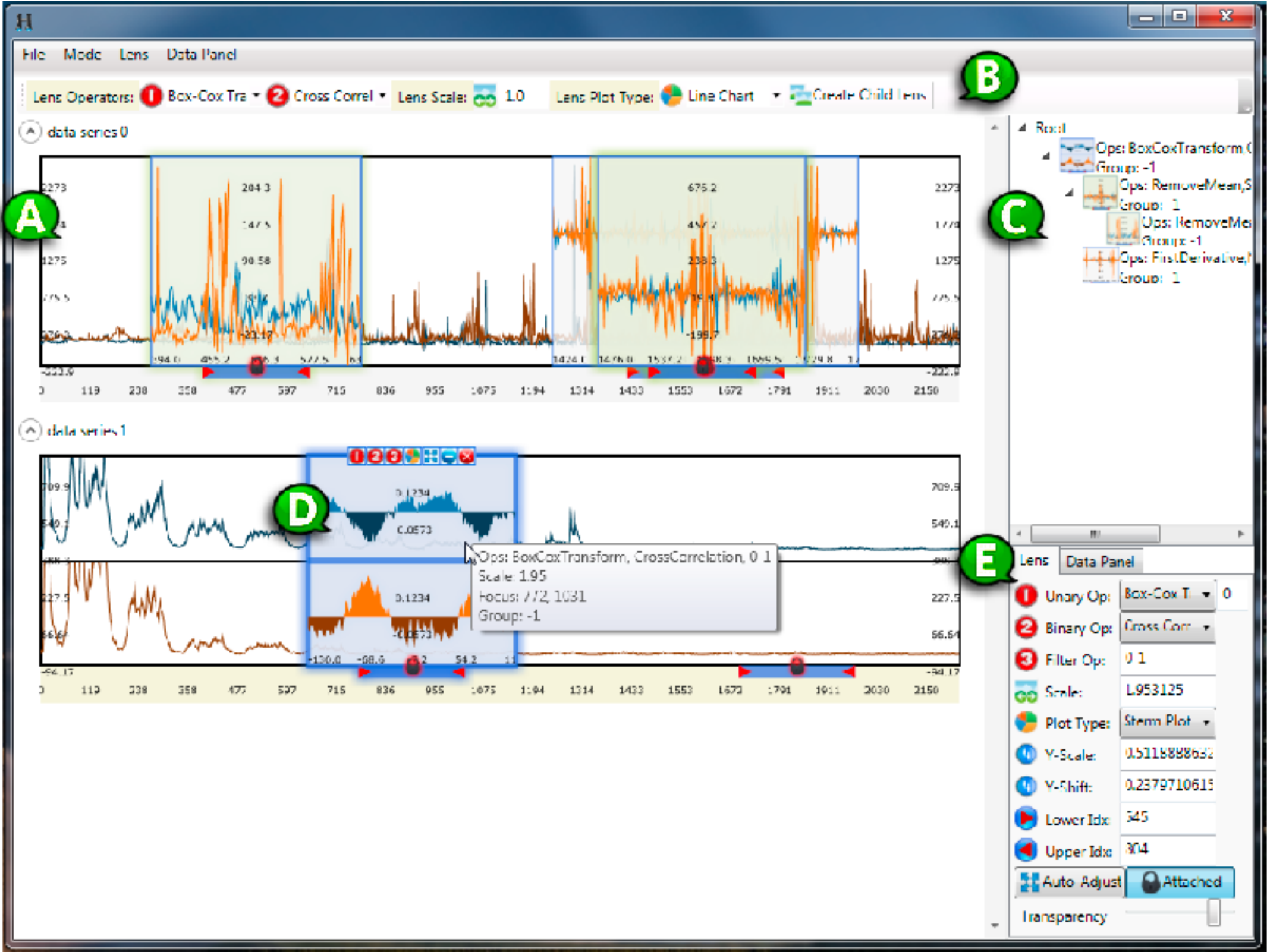
<https://youtu.be/KcwjVK8eUdw>



Ocupado: Visualizing Location-Based Counts Over Time Across Buildings. Oppermann and Munzner. Computer Graphics Forum (Proc. EuroVis), 2020.

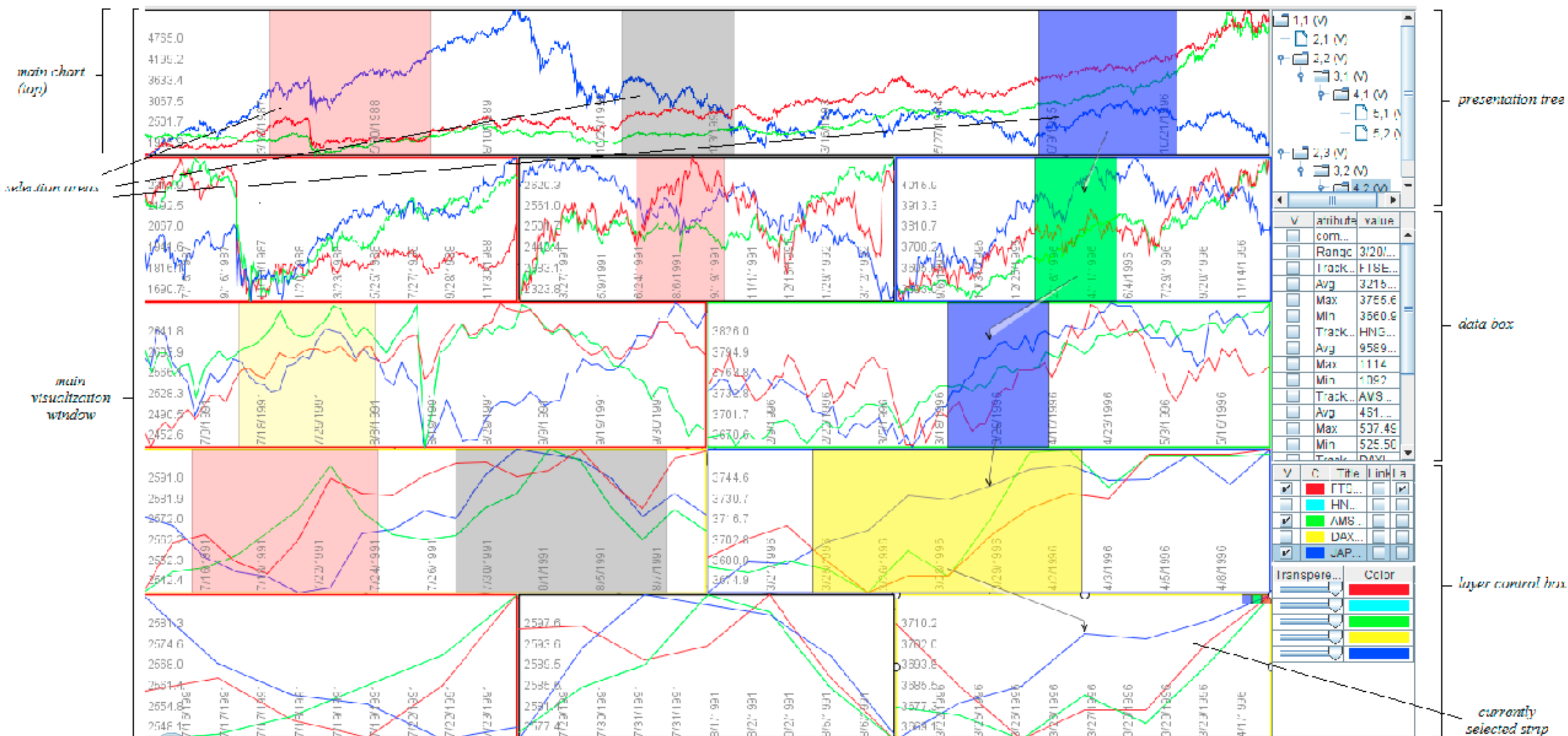
Case 2: ChronoLenses

<https://youtu.be/k7pl8ikczqk>



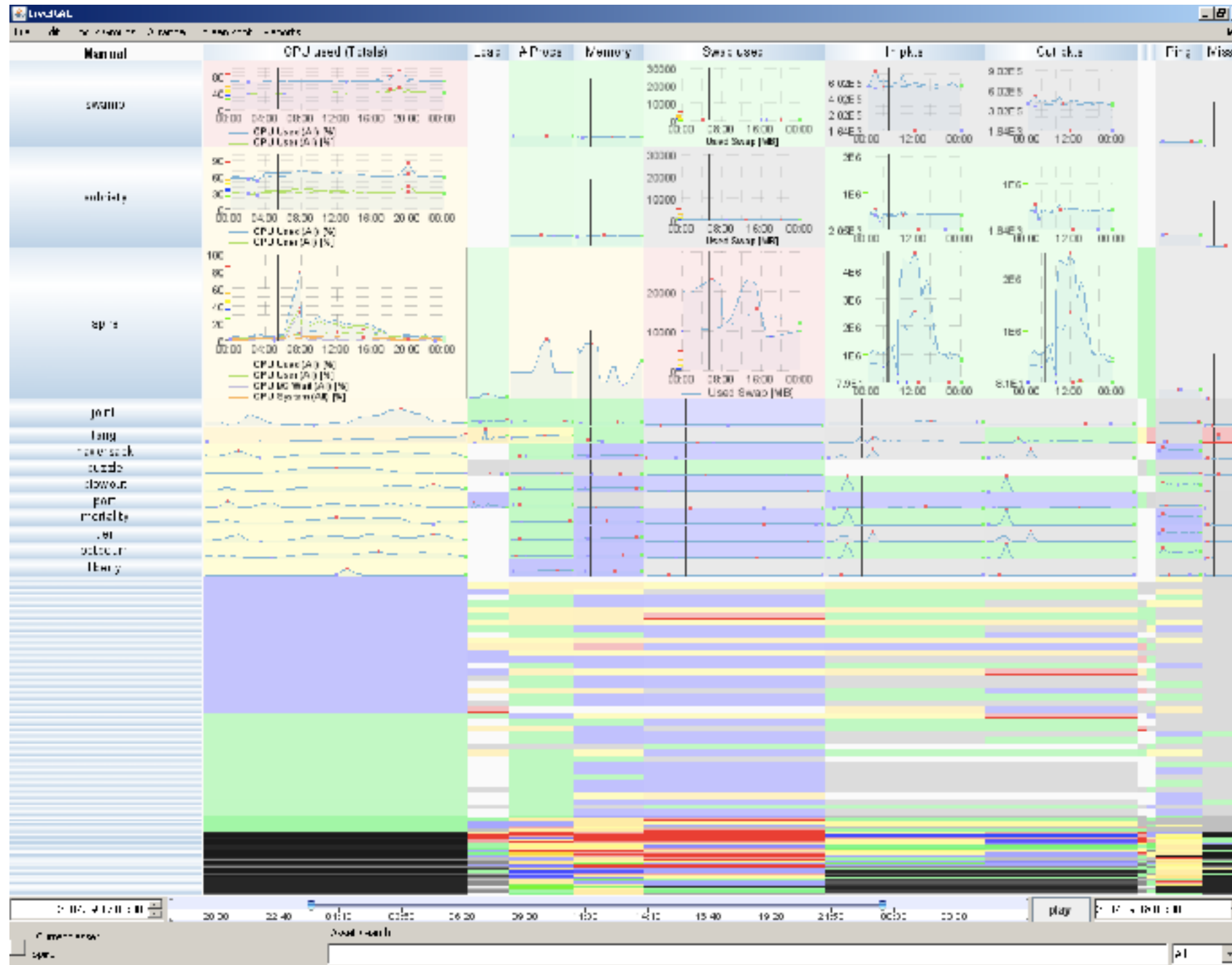
Other Case (compare 2) : Stack Zooming

<https://youtu.be/dK0De4XPm5Y>



Case 3: LiveRAC

<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.]