Information and Scientific Visualization: Separate but Equal or Happy Together At Last

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nomenclature

infovis, scivis

foovis, barvis

names are unfortunate historical accidents
- but too late to change

not scivis iff data generated by scientists

infovis not unscientific

scivis not uninformative

distinction

is spatialization given (scivis) or chosen (infovis)

my infovis definition
- interactive visual representation to help person do a particular task

infovis: how to represent
- choosing, doing, evaluating
- huge space of possibilities: random walk ineffective
- need design guidelines, prescriptive advice

separation
- now judged by different criteria
- divergence allows each field to expand/improve faster
- room to explore before borders all tangled

infovis taxonomy

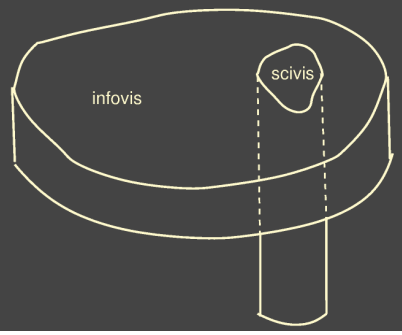
Ben Shneiderman
- The Eyes Have It: A Task by Data Type Taxonomy for Information Visualizations.
- Proc. 1996 IEEE Visual Languages
- citeseer.nj.nec.com/shneiderman96eyes.html

data
- 1D, 2D, 3D, ND, temporal, tree, network/graph

task
- overview, zoom, filter, details-on-demand, relate, history, extract

scope

sometimes choose the given space



infovis (vs. scivis)

strengths
- abstraction
- creating new visual metaphors
- design principles
- evaluation
- tasks, connection with users

weaknesses
- scalability
- adoption
- novelty for novelty's sake with visual metaphors
  need to characterize when effective
  hard to make effective ones

significant counterexamples both ways!

science

greatest application domain of infovis to date!

abstracting, generalizing from specific examples

our roots: scientists analyzing data
- statistical graphics grew from science, math

methodology

scientific method
- 1. observations
- 2. hypothesis
- 3. test
- 4. theorize/generalize

scientific method for vis
- 0. build vis tools
- 1. observe how humans use them to solve problems
- 2. hypothesize on how best to help people understand
- 3. evaluate hypothesis
- 4. build theories

contribution categories

techniques: building better/different vis tools
- here is new technique X [different: infovis]
- how to do X bigger/faster/generally [better: scivis]
- judge: evaluation strengthens, but not mandatory
- implicit assumption: there's some good reason to do X

systems: building too
- techniques alone not enough
- integration, data model issues

evaluation
- observe humans using tools to do task
  - informal to structured
  - application domain task to indirect simplified task

contribution categories 2

design study: describe and evaluate hypothesis
- ethnographic uncovering of user's tasks, needs
- discuss/justify/evaluate choices made
- relate visual encodings and interaction techniques to requirements of target task
- judge: novelty strengthens, but not mandatory
- lessons learned, principles discovered/gleaned
- not application-focused case study
  - reporting use of technique X in domain Y
- instead, useful artifact as means towards end
  - end: infovis prescriptive design guidelines

model
- new theoretical framework
  - hope: directed vs. random param space walk

blending many in one paper particularly strong

models

data models
- continuous
  - field: differentiate, rotate
- discrete
  - relations: predicate calculus, relational algebra
- determine methods of analysis in computer
- infovis uses both

mental models
- how people think about problems, world
- in your head, vs. data models in computer
- not as flexible: we're hardwired for strong preferences
  - space vs. time: 2D+T != 3D
- categorization as major cognition component
  - creating hierarchies to support reasoning

continua of distinction

application domain
- typical: CFD = scivis, social networks = infovis
- misleading, since could be either
  - Henze's linked derived spaces: infovis CFD chose useful phase space, instead of given space (my analysis, not author's)

continuous/discrete

spatial layout given/chosen

technique vs. design study

integration

solving real problems often multidisciplinary

- no surprise that combining infovis, scivis often works great!

Thanks

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