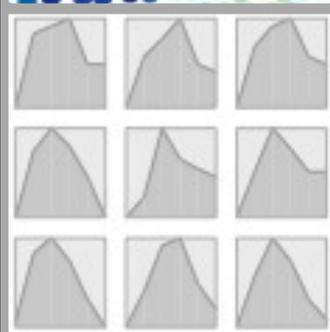
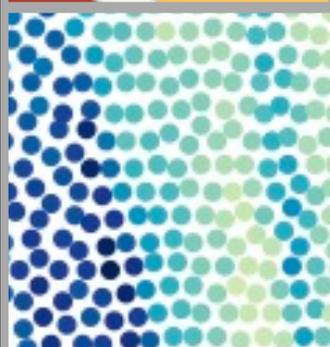
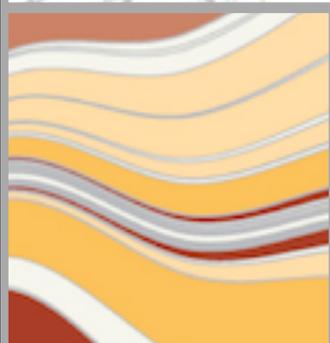
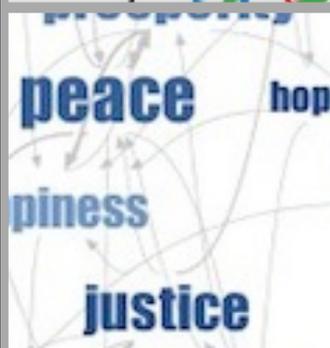
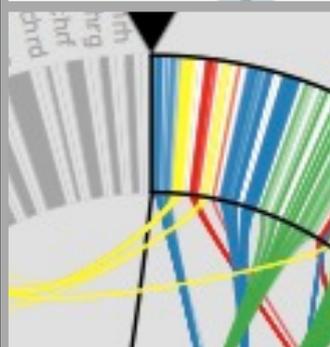
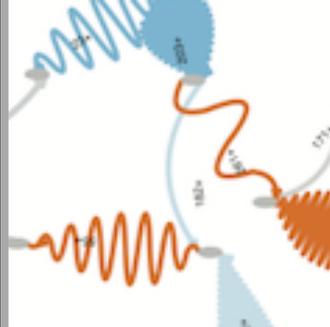


cs6964 | January 26 2012

TASKS & INTERACTION

Miriah Meyer
University of Utah



LAST TIME

-relativity of perception

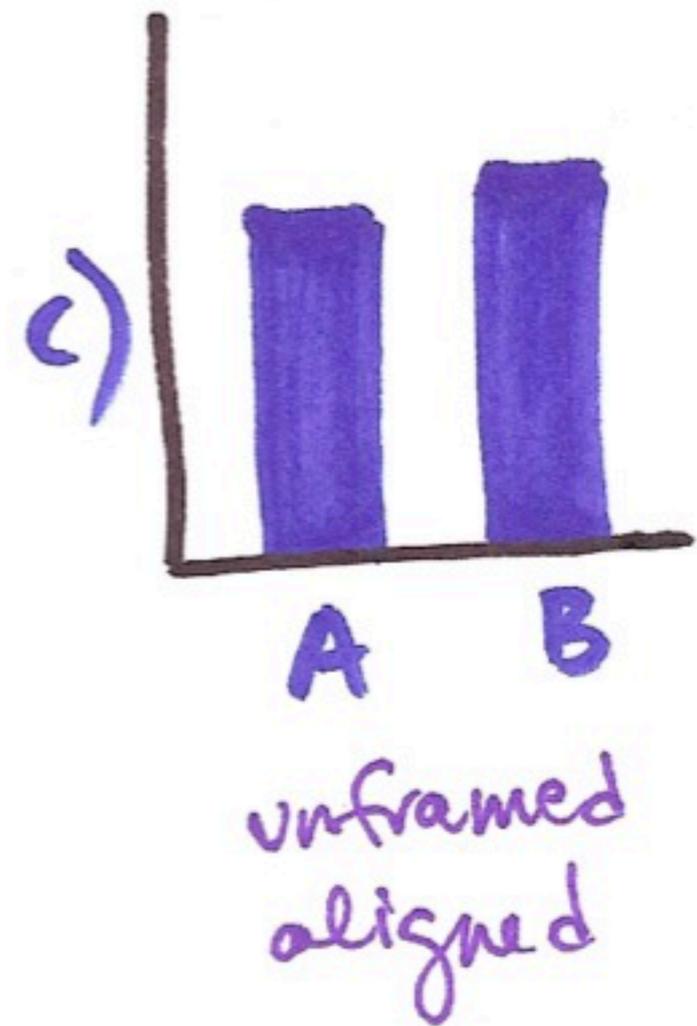
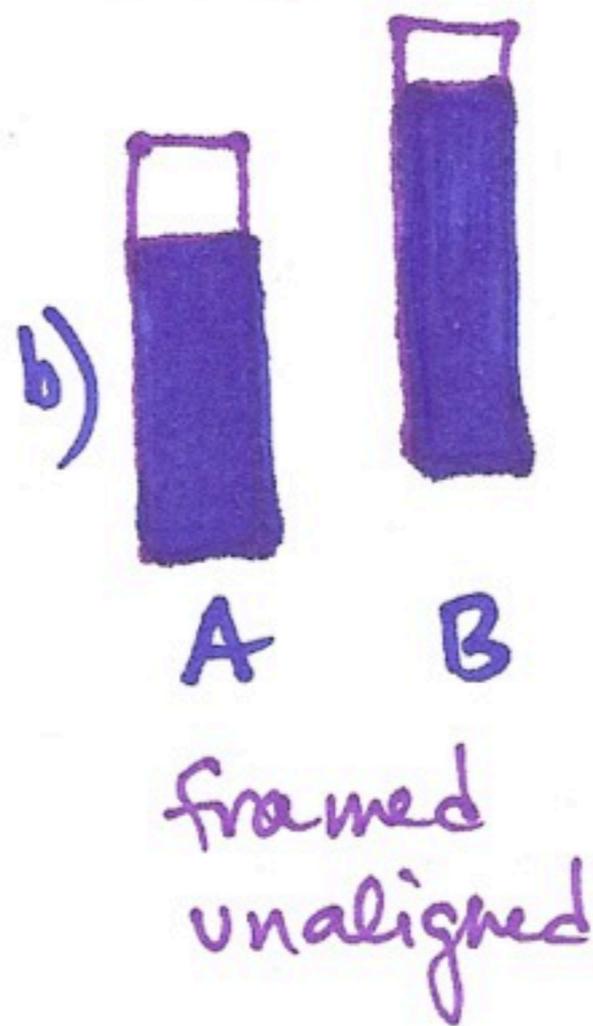
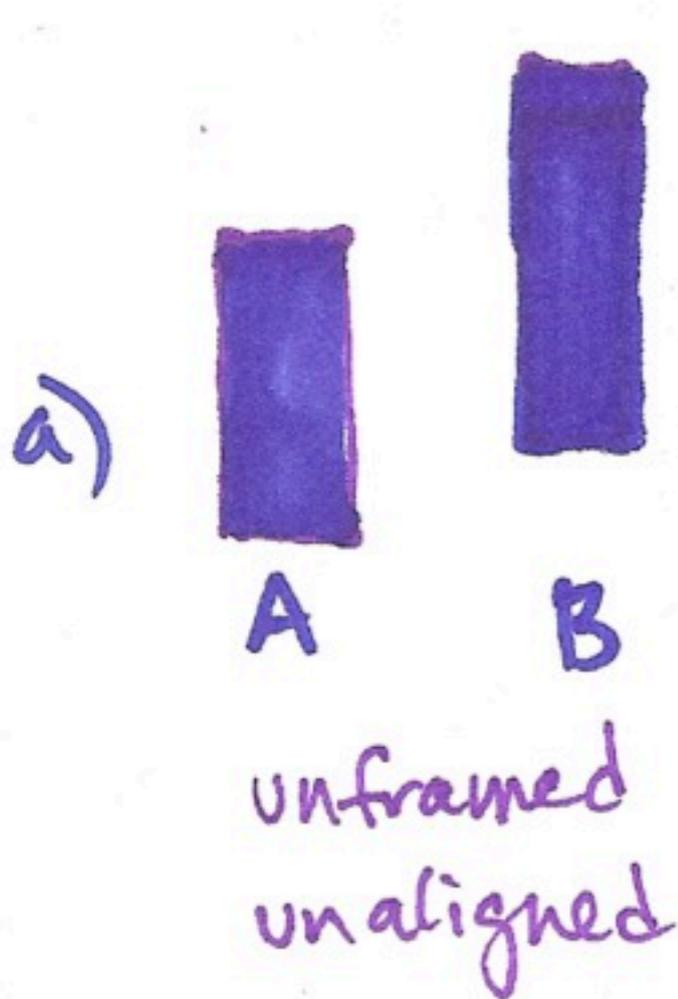
-marks and channels

-planar position

-color

WEBER'S LAW

we judge based on relative, not absolute, differences



MARKS

geometric primitives

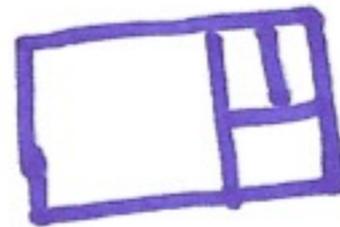
0D points



1D lines



2D areas



categorical

What / where

effectiveness

- planar position
- color hue
- shape
- stipple pattern

ordinal | quantitative

How much

effectiveness

- position on common scale
- position on unaligned scale
- length (1D size)
- tilt, angle
- area (2D size)
- curvature
- volume (3D size)
- lightness black/white
- color saturation
- stipple density

networks | same category

Grouping

salience

- Containment (2D)
- Connection (1D)
- Similarity (other channels)
- Proximity (position)

effectiveness

WHAT'S SO SPECIAL ABOUT THE PLANE?

- power does not extend to 3D**

- perspective cues

- interfere with color and size channels*

- occlusion of data

WHY IS COLOR SO HARD TO USE?

Get it right in black and white.

Maureen Stone

-hue: categorical



-saturation: ordinal and quantitative



-luminance: ordinal and quantitative



-analysis task taxonomy

-interaction principles

target



translate



design



implement



validate

comments on readings?

-analysis task taxonomy

-interaction principles

WHAT ARE THE ANALYSIS TASKS IN A REAL-WORLD QUESTION?

What is cs6964 like?

What coffee drink should I order?

- 1) retrieve value
- 2) filter
- 3) compute derived data
- 4) find extremum
- 5) sort
- 6) determine range
- 7) characterize distribution
- 8) find outliers
- 9) cluster
- 10) correlate

RETRIEVE VALUE

-analysis task

- given a set of specific items, find attributes of those items

-real-world subquestion

- how many lectures are there in this class?
- how much is a medium latte?

FILTER

-analysis task

- given some concrete conditions on attribute values, find items satisfying those conditions

-real-world subquestion

- which lectures have only two required readings?
- which espresso drinks come with milk?

COMPUTE DERIVED DATA

-analysis task

- given a set of items, compute an aggregate numerical representation

-real-world subquestion

- what is the average number of slides per lecture?
- what is the median price of all coffee drinks?

FIND EXTREMUM

-analysis task

- find items possessing an extreme value of an attribute over its range of the data set

-real-world subquestion

- what is lecture has the most required readings?
- what is the cheapest espresso drink?

SORT

-analysis task

- given a set of items, rank them according to some ordinal metric

-real-world subquestion

- order lectures by popularity
- order drinks by volume

DETERMINE RANGE

-analysis task

- given a set of items an attribute of interest, find the span of values within the set

-real-world subquestion

- what is the range of time for in-class activities?
- what coffee drinks can i order?

CHARACTERIZE DISTRIBUTION

-analysis task

- given a set of items a quantitative attribute of interest, characterize the distribution of that attribute's values over the set

-real-world subquestion

- what is the distribution of homework grades?
- what is the distribution of caffeine content?

FIND OUTLIERS

-analysis task

- identify outliers with a given set of items with respect to a given relationship or expectation

-real-world subquestion

- are exceptions to the relationship of lecture time to in-class activity time?
- are their outliers in size to price?

CLUSTER

-analysis task

- given a set of items, find clusters of similar attribute values

-real-world subquestion

- are there groups of students with similar grades?
- is there a cluster of typical caffeine content?

CORRELATE

-analysis task

- given a set of items and two attributes, determine useful relationships between the values of those attributes

-real-world subquestion

- is there a correlation between lecture length and lecture popularity?
- do different genders have a preferred coffee drink?

-analysis task taxonomy

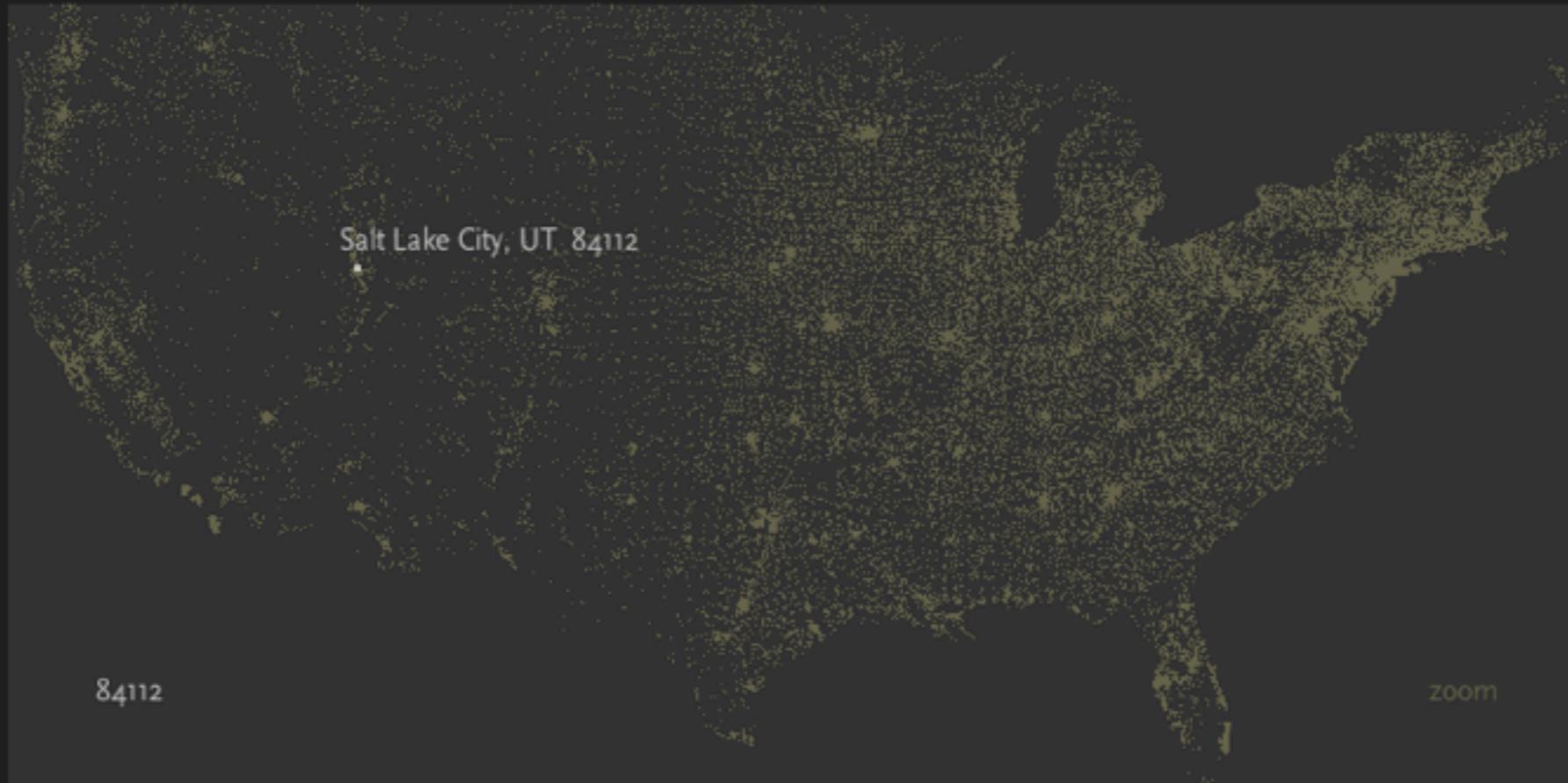
-interaction principles

-classes of change

-eyes over memory

CLASSES OF CHANGE

changing selection

<< [ben fry](#)

Hit the letter **z**, or click the word **zoom** to enable or disable zooming.
Hold down **shift** while typing a number to replace the previous number
(U.S. keyboards only).

zipdecode

This project began a very short sketch (a few hours) that I created because I was curious about how the numbering works for postal codes in the states.

A detailed description of this project (and source code for an updated version) can be found in my book [Visualizing Data](#).

Last updated 28 September 2004... This version adds several features over the original, including zoom, some new colors (thanks to [Eugene Kuo](#)), and a better zip code database (because of all the people who

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Baby Name > [×](#)
Press 'enter' to see exact matches.

Both Boys Girls

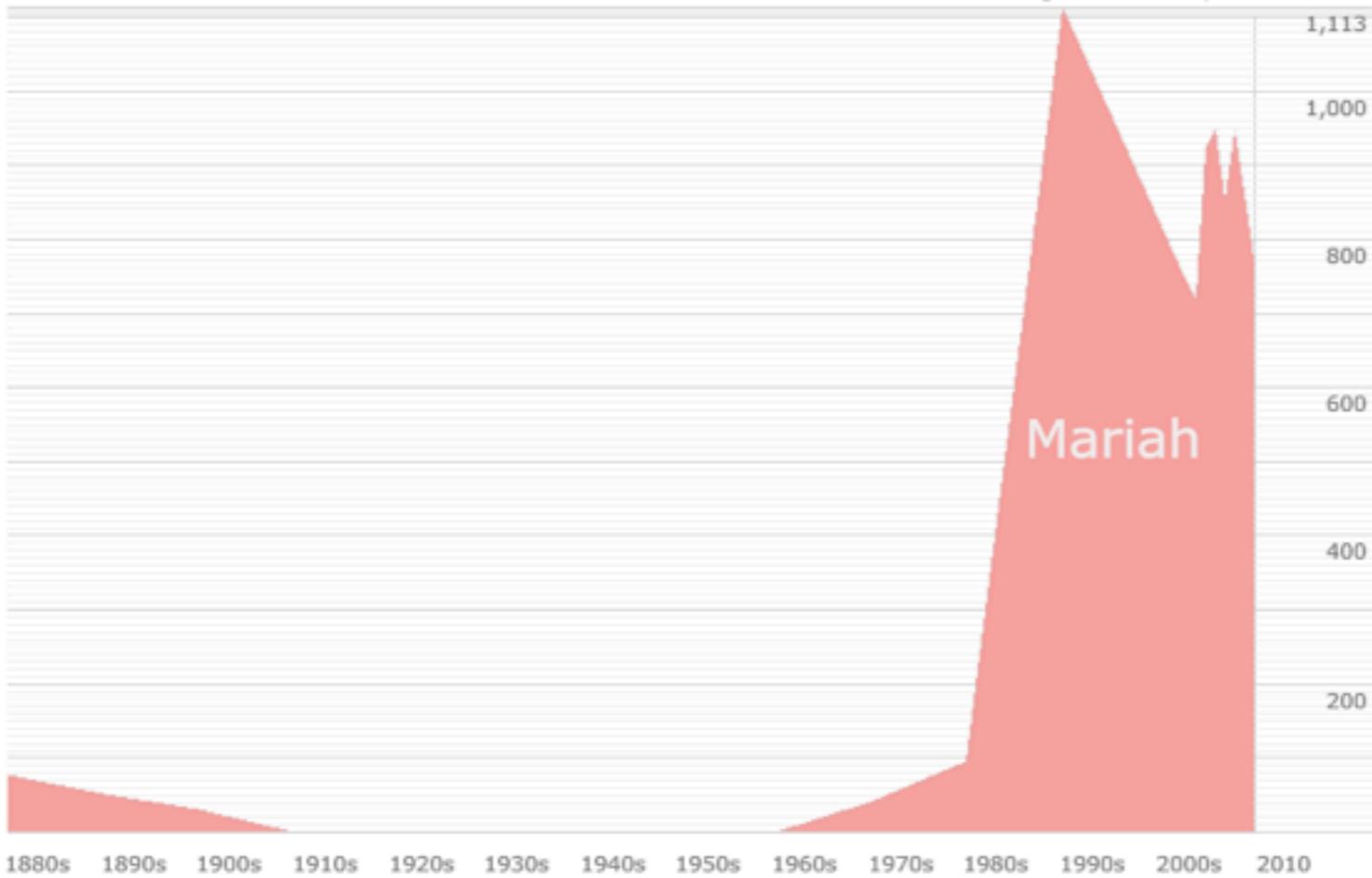
2010 rank: boys

1000	500	100	25	1
------	-----	-----	----	---

girls

1000	500	100	25	1
------	-----	-----	----	---

Names starting with 'MARIAH' per million babies



Click a name graph to view that name. Double click to read more about it.

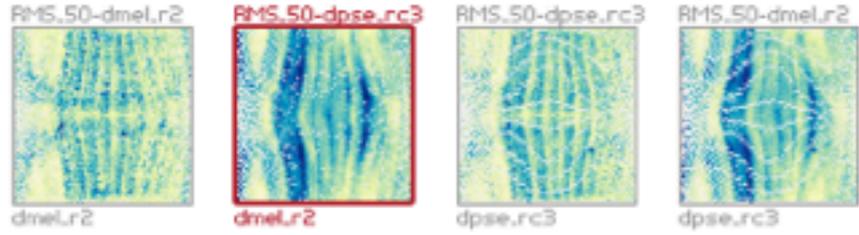
tinyprints
Celebrate Every Moment in Style with Invites, Birth Announcements and more!

BABY SHOWER
SEPTEMBER 2010

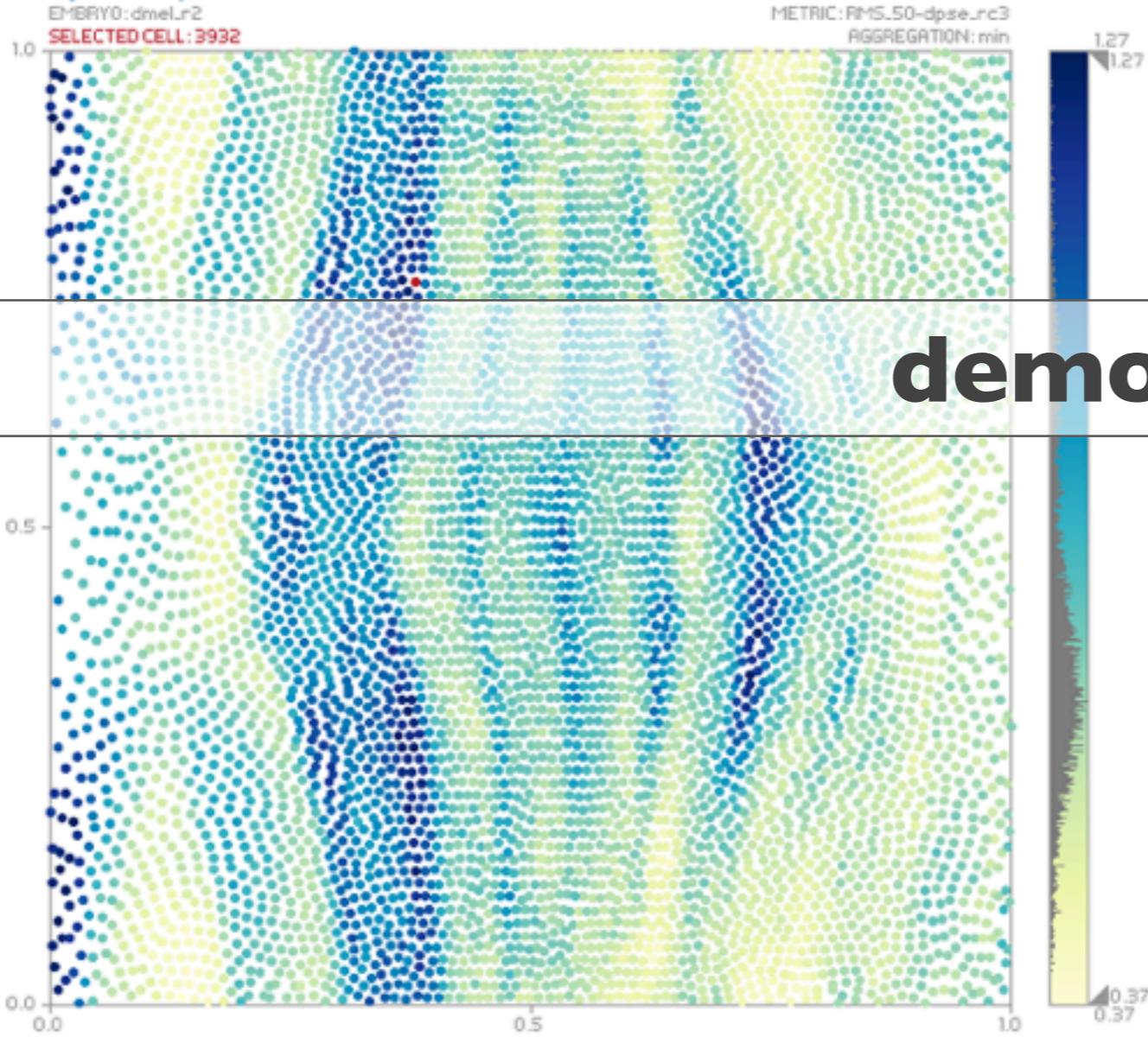
CLASSES OF CHANGE

changing highlighting

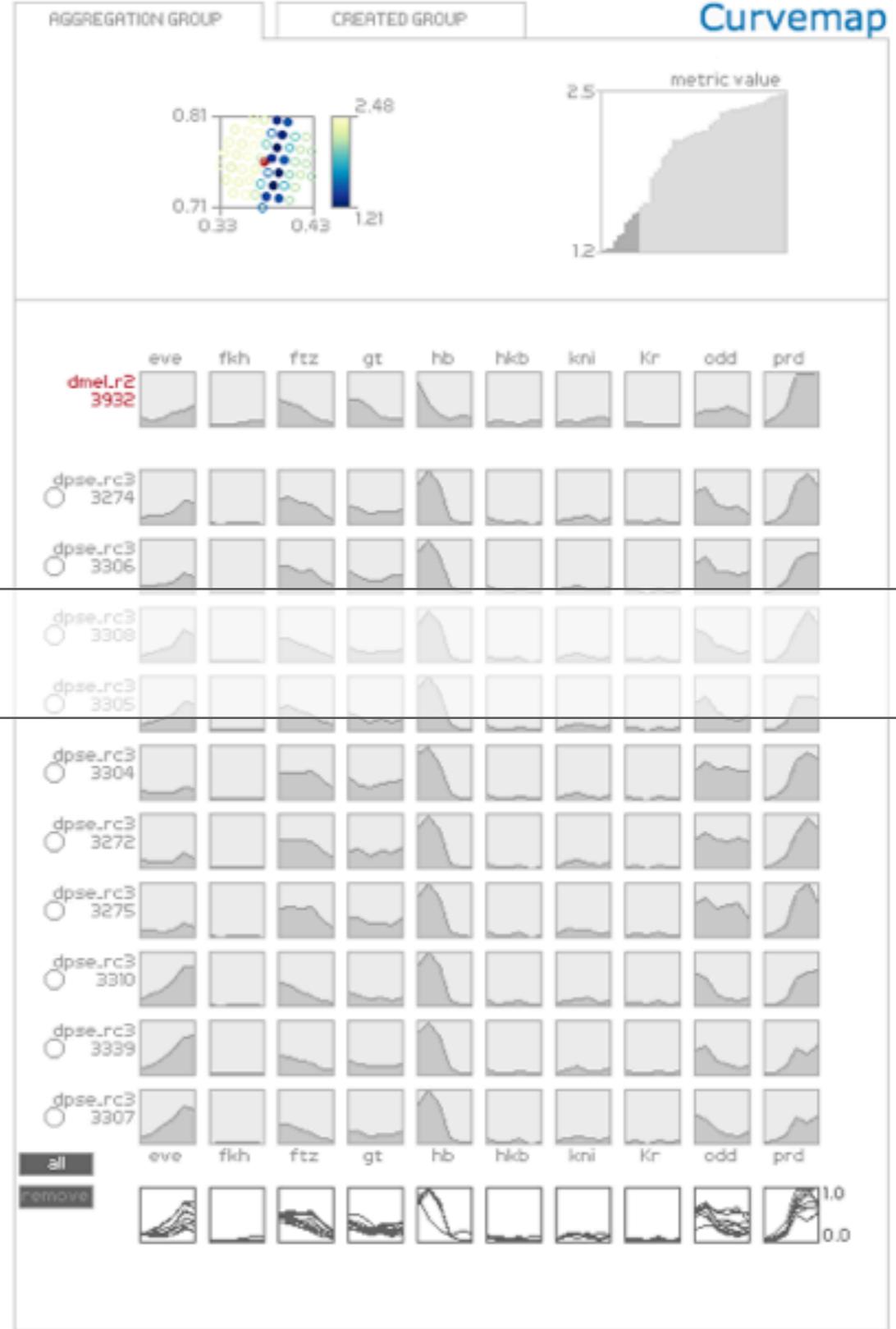
Summaries



Embryo Map



Curvemap



The New York Times

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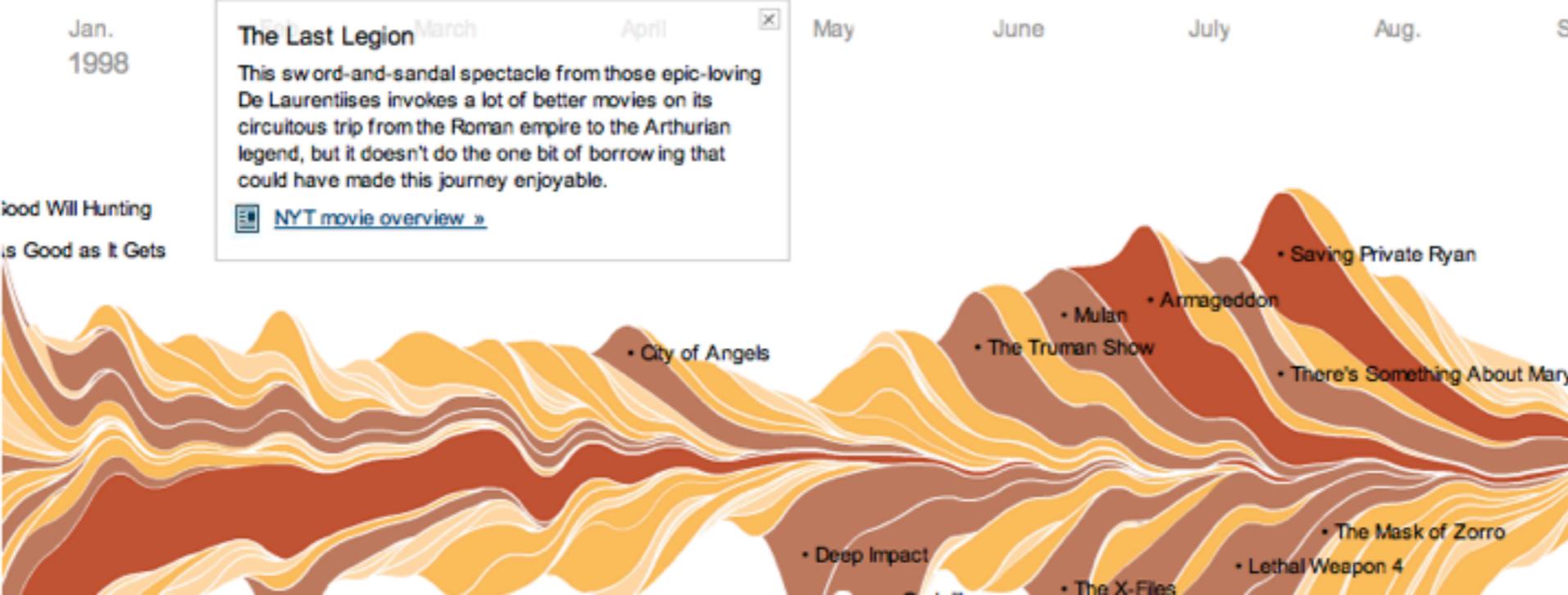
February 23, 2008

E-MAIL FEEDBACK

The Ebb and Flow of Movies: Box Office Receipts 1986 - 2008

Summer blockbusters and holiday hits make up the bulk of box office revenue each year, while contenders for the Oscars tend to attract smaller audiences that build over time. Here's a look at how movies have fared at the box office, after adjusting for inflation.

Find Movie Go



CLASSES OF CHANGE

changing view | navigation

Google Maps

http://maps.google.com/maps?f=q&source=s_q&hl=en&geocode=&q=university+of+utah&aq=&ll=37.0625,-95.677068&sspn=91.5

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Miriah Meyer 1 Share...

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 ★★★★★ 72 reviews
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 "worst ever" -

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<< [BEN FRY](#)

isometricblocks

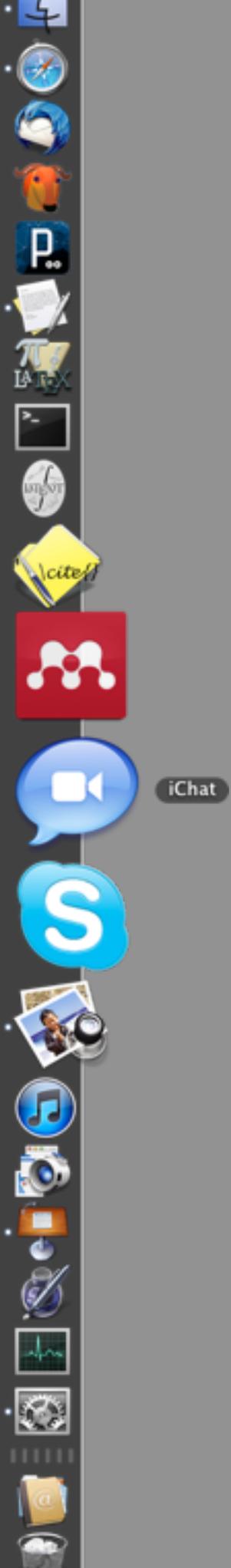
When comparing the genome of two different people, you'll see single letter changes (called SNPs, pronounced "snips") every few thousand letters. An interesting feature of SNPs is that their ordering has distinct patterns, where sets of consecutive changes are most often found together. There are many methods for looking at this data, so this piece combines several of them into a single visual display. The project is described in greater detail in my [dissertation](#), starting in chapter four.

View 2D 2D Even Spacing 2D Quantitative 3D 3D with LD Units LD Units from above



CLASSES OF CHANGE

changing spatial ordering | sorting



EYES OVER MEMORY

**-many interaction techniques
implicitly rely on memory**

-very limited working memory

“It is things that make us smart”

Donald Norman

IMPLICATIONS FOR ANIMATION

- external versus internal memory**

- easy to compare views by moving eyes*

- hard to compare view to memory of what you saw*

ComParrot
by Bonnie J. Malcolm

Can you spot 12 differences between these pictures?



www.comparrotpuzzles.com © 2001 Bonnie J. Malcolm

ComParrot
by Bonnie J. Malcolm

Can you spot 12 differences between these pictures?



ComParrot

by Bonnie J. Malcolm

Can you spot 12 differences between these pictures?



www.comparrotpuzzles.com © 2001 Bonnie J. Malcolm



Solution: 1. Top tree leaf removed. 2. Nose line on left giraffe removed. 3. Shadow on lower left coconut removed. 4. Leaf vein below removed. 5. Ear line on left giraffe removed. 6. Bottom spot on right giraffe colored in. 7. Small leaf at right of tree colored in. 8. Horn on right giraffe removed. 9. Spot on left giraffe moved. 10. Branch on left side shorter. 11. Gecko tail longer. 12. Gecko eye missing.

Int. J. Human-Computer Studies (2002) **57**, 247–262

doi:10.1006/ijhc.1017

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Animation: can it facilitate?

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(Received 1 March 2001 and accepted in revised form 4 April 2002)

Graphics have been used since ancient times to portray things that are inherently spatiovisual, like maps and buildings. In the modern era, graphics have been used to portray things that are metaphorically spatiovisual, like graphs and organizational

RECOMMENDED READING

charts. The assumption is that graphics can facilitate comprehension, learning, memory, communication and inference. Assumptions aside, research on static graphics has shown that only carefully designed and appropriate graphics prove to be beneficial for conveying complex systems. Effective graphics conform to the Congruence Principle according to which the content and format of the graphic should correspond to the content and format of the concepts to be conveyed. From this, it follows that animated graphics should be effective in portraying change over time. Yet the research on the

WHEN TO USE ANIMATION?

GOOD: STORYTELLING

Hans Rosling shows the best stats you've ever seen | Video on TED.com

http://www.ted.com/talks/hans_rosling_shows_the_best_stats_you_ve_ever_seen.html

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TALKS

Hans Rosling shows the best stats you've ever seen

TED2006, Filmed Feb 2006; Posted Jun 2006



3,471,109 Views  33k

INTERACTIVE TRANSCRIPT ▶
ABOUT THE SPEAKER ▶
ABOUT THIS TALK ▼

You've never seen data presented like this. With the drama and urgency of a sportscaster, statistics guru Hans Rosling debunks myths about the so-called "developing world."

 THE ROLEX ARTS INITIATIVE PAIRS ESTABLISHED MENTORS WITH EMERGING PROTÉGÉS FOR A YEAR OF CREATIVE COLLABORATION

00:17 | 19:53 **Share** **Rate**

WHAT TO WATCH NEXT

Hans Rosling's new insights on

GOOD: STORYTELLING

Hazards of Storing Spent Fuel - Interactive Feature - NYTimes.com

http://www.nytimes.com/interactive/2011/03/12/world/asia/the-explosion-at-the-japanese-reactor.html

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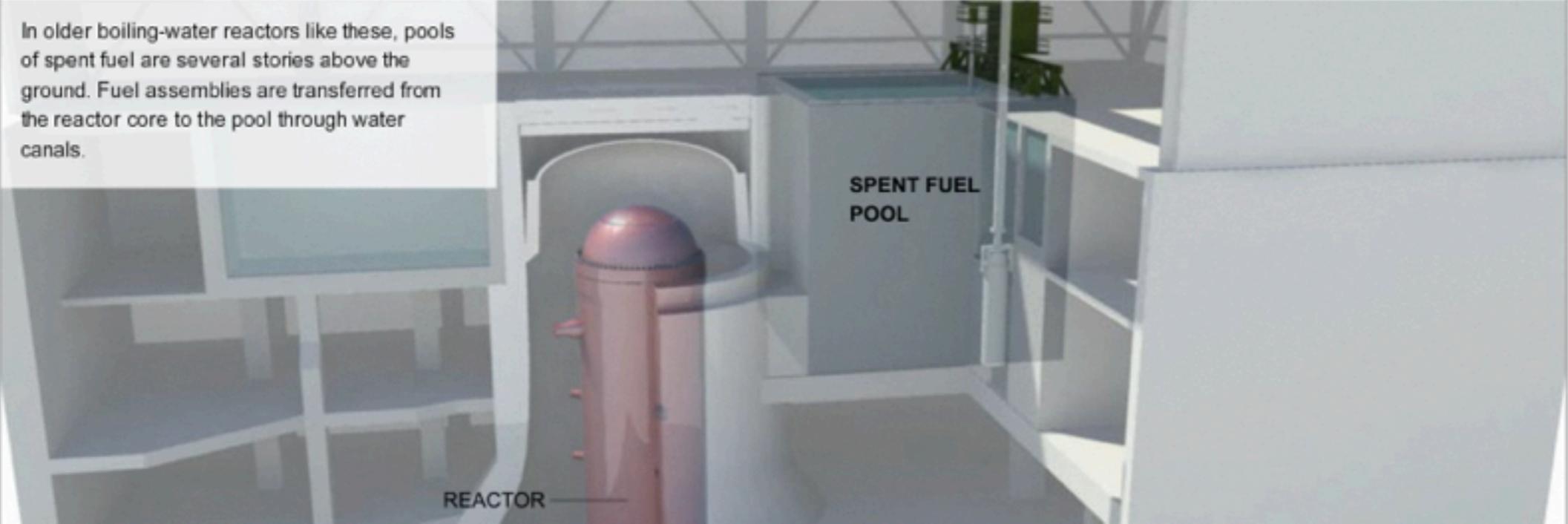
UPDATED March 18, 2011

Hazards of Storing Spent Fuel

Dangerous conditions can occur if water drains from pools storing radioactive fuel rods.

1 2 3 4 5 6 NEXT ▶

In older boiling-water reactors like these, pools of spent fuel are several stories above the ground. Fuel assemblies are transferred from the reactor core to the pool through water canals.



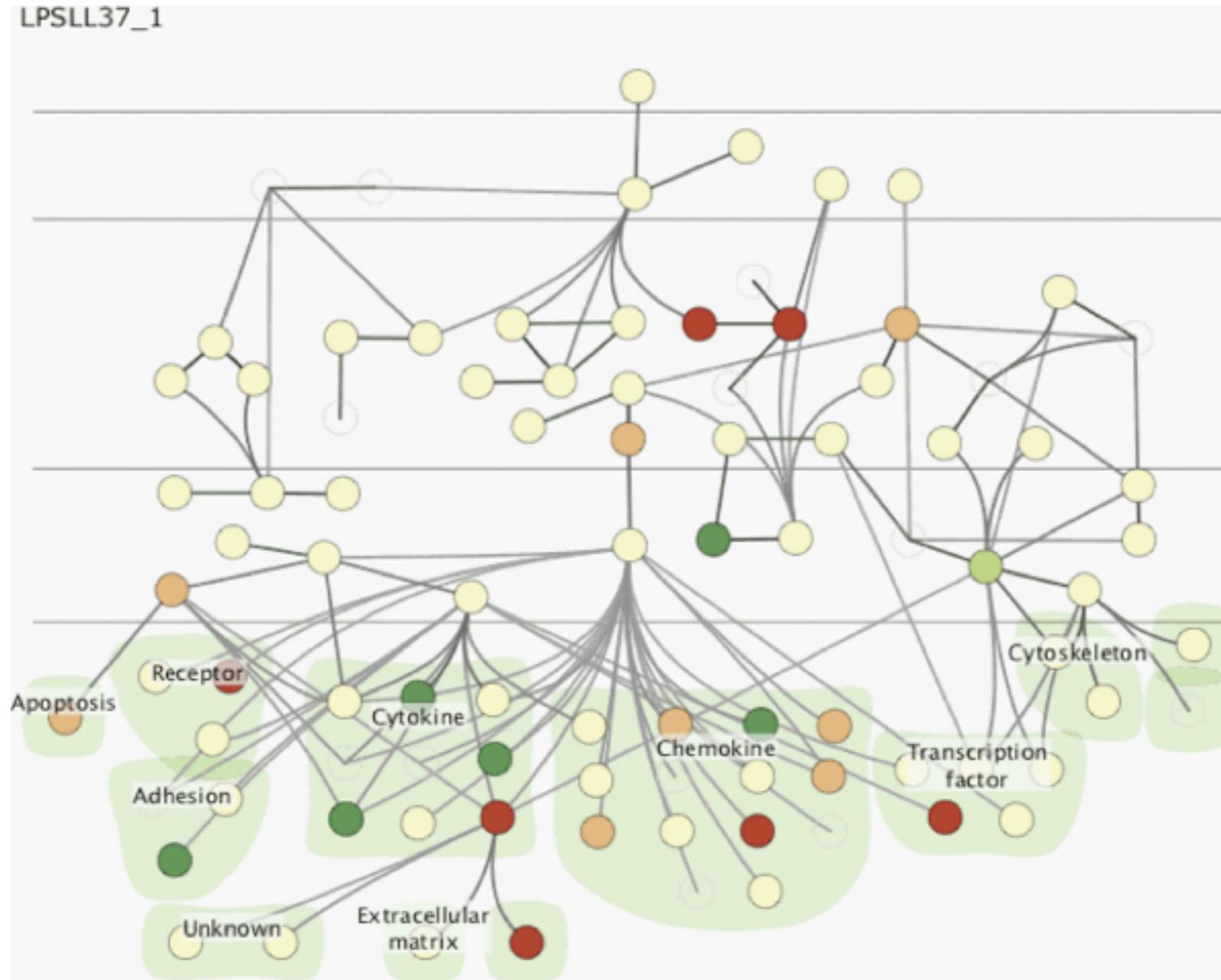
REACTOR

SPENT FUEL POOL

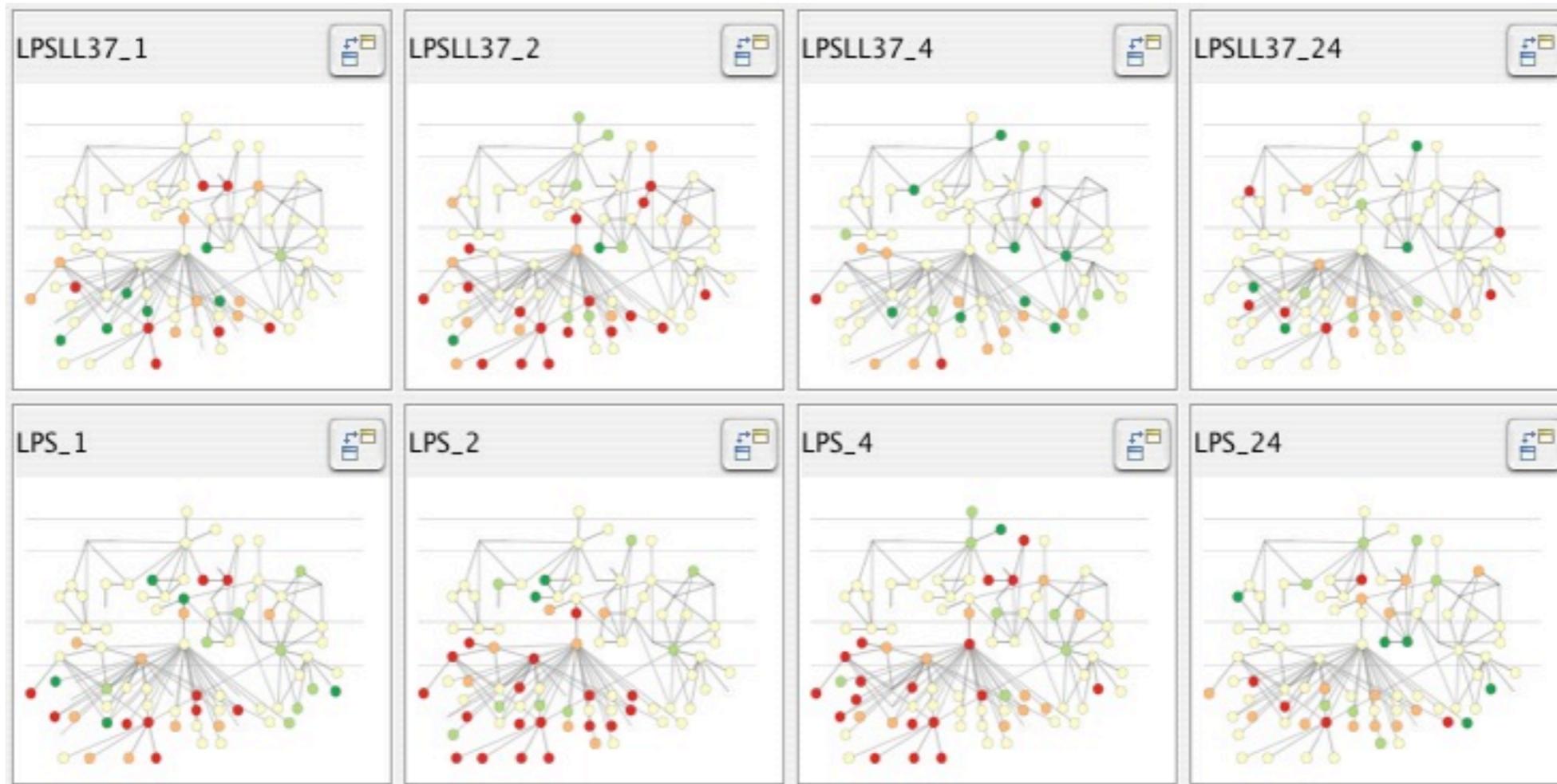
GOOD: TRANSITIONS



BAD: MULTIPLE STATES WITH MULTIPLE CHANGES



BAD: MULTIPLE STATES WITH MULTIPLE CHANGES **alternative: small multiples**



questions?

THE PANCAKE CHALLENGE

target



translate



design



implement



validate

L7: Data and Task Abstraction 1

REQUIRED READING

What is a Affinity Diagramming?

Affinity Diagramming is a very simple but powerful technique for grouping and understanding information.

In particular, affinity diagramming provides a good way to identify and analyze issues. There are several variations of the technique.

When is affinity diagramming appropriate?

Use affinity diagramming in a workshop environment when you want participants to work together identifying, grouping and discussing issues.

You can also use affinity diagramming when you have a large amount of information—for example, at the end of a contextual enquiry, when you may have hundreds or even thousands of individual notes.

How is affinity diagramming conducted?

Affinity diagramming simply consists of placing related items together.

Although this can be done electronically for very small sets of data (using a word processor or spreadsheet program), it is better to work with paper. In group situations, always use paper.

Give participants some minutes for this activity, ask them to stop when a large majority of participants have stopped.



Get all participants to gather at a vertical surface suitable for Post-It notes. Windows are appropriate.

Encourage participants to place notes, one at a time, on the surface. As each note is placed, participants may add similar notes in close proximity.