

Information Visualization Using View & Data Distortion

Research Student Seminars

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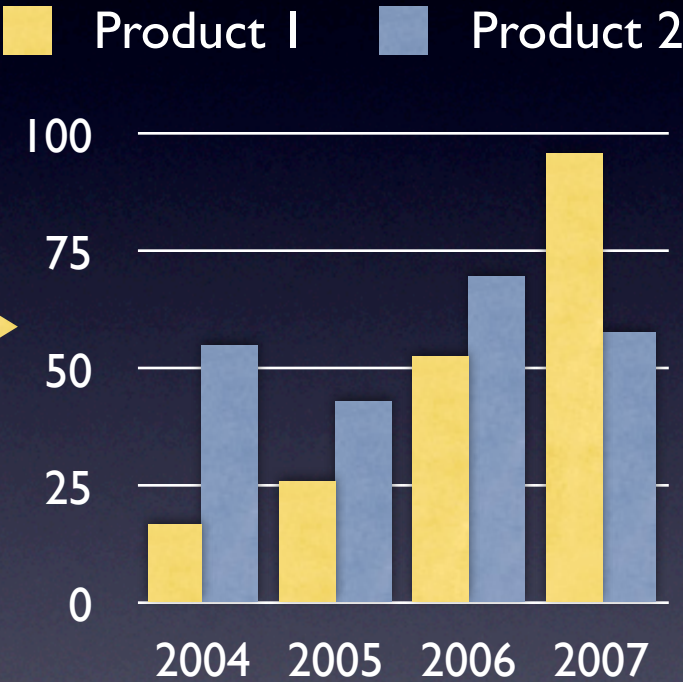
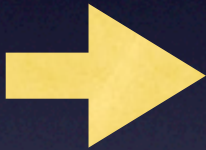
Information Visualization

- dates back to 2nd century
- relatively new research area
- why do we visualize?
 - to communicate
 - to expose patterns and trends
 - to find correlations and clusters

The Visualization Pipeline

0.1	4	0.3	0.5
0.3	45	3	0.1
0.4	5	1.1	0.58
0.89	0.9	0.3	0.6
11.0	0.6	9.5	0.7
1.0	9.01	2.1	0.9
4.32	0.5	3.3	0.5
0.11	0.4	3.33	0.9
0.98	0.7	1.12	0.99
0.54	7.5	2.5	0.8

Data



Information



Knowledge

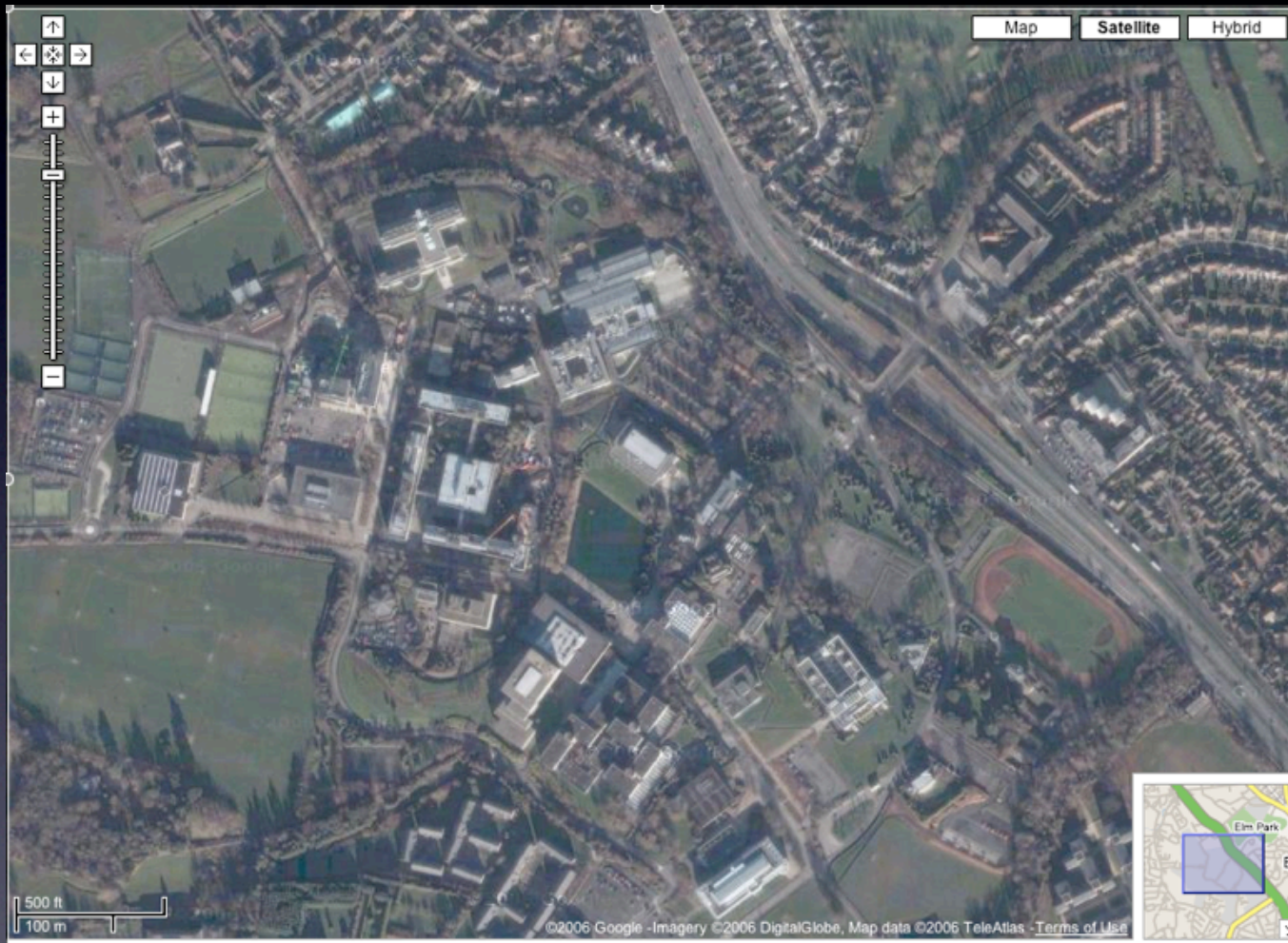
Challenges in Visualization

- technology for generating and viewing is continually improving
- but data sets are getting ever-larger!
 - databases, maps, text repositories, software
 - there is too much to show

Visualization Paradigms I

- *Overview + Detail*
 - ‘zoom lens’ approach
 - large detail view & small overview
 - side-by-side aids comparison
 - simple, and ubiquitous
 - still easy to get lost in the data

Examples



- as detail increases, context is lost

Visualization Paradigms 2

- *Focus + Context*
 - intuitive: show focused data in detail, and show a compressed view of global context
 - dynamically re-focus on data elements
 - allows a balance to be found between local detail and global context, while keeping the size of the data set manageable

Papers to Discuss

- George Furnas wrote both papers, 20 years apart
 - Generalized Fisheye Views, CHI 1986
 - A Fisheye Follow-up: Further Reflections on Focus + Context, CHI 2006

Fisheye Visualization

- technique designed for small screens
- natural way to view the world
- focus + context
- finding a *balance* between detail and context
- (see the forest *and* the trees)

Degree of Interest Function

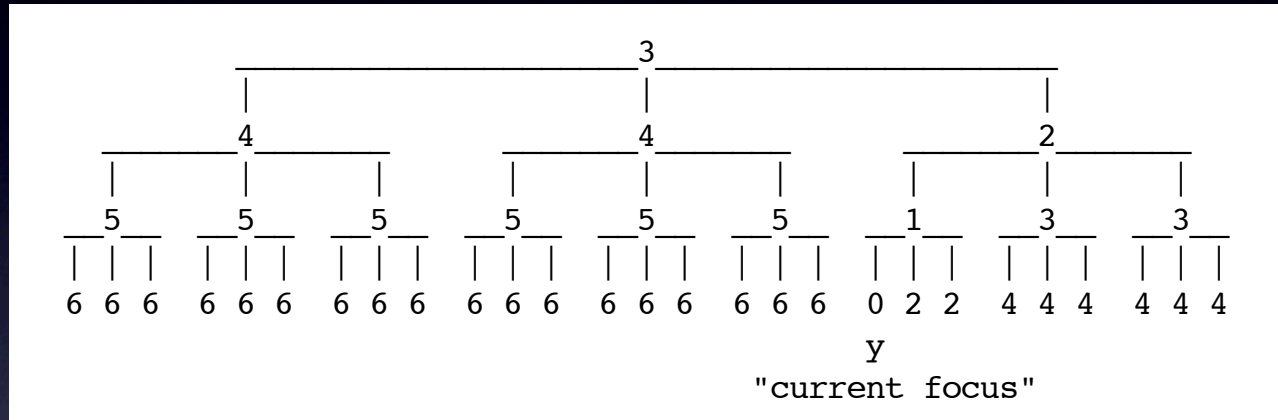
- given the currently focused data node, every other node is assigned a number
- dependent on two factors:
 - *a-priori* importance
 - distance from currently-focused node
- general form:
 - $DOI_{\text{Fisheye}}(x | \cdot = y) = F(API(x), D(x, y))$

Rooted Trees

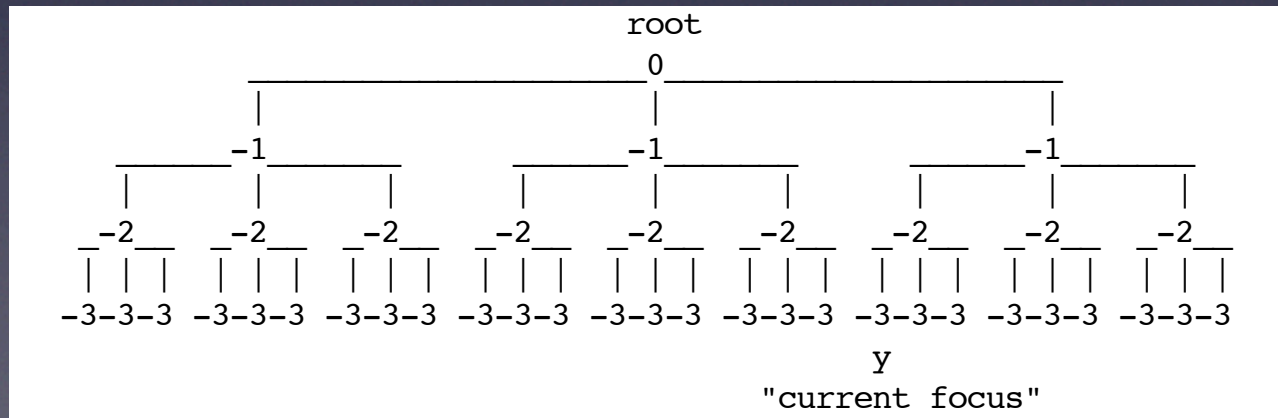
- many large structures are represented as trees
 - structured programming languages, file systems, taxonomies
- using thresholds we can display different subsets of the original tree, efficiently
- trees can be logarithmically compressed

Applying DOI function

- distances from y

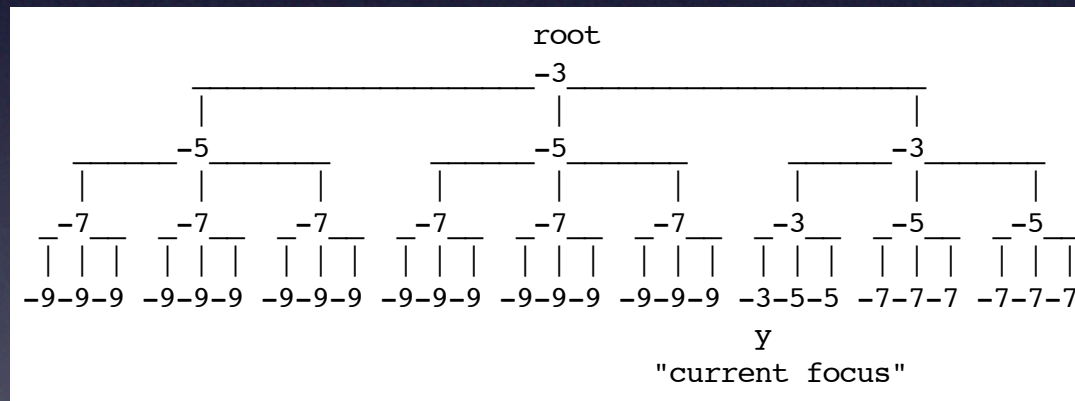


- a-priori* importance



Applying DOI function

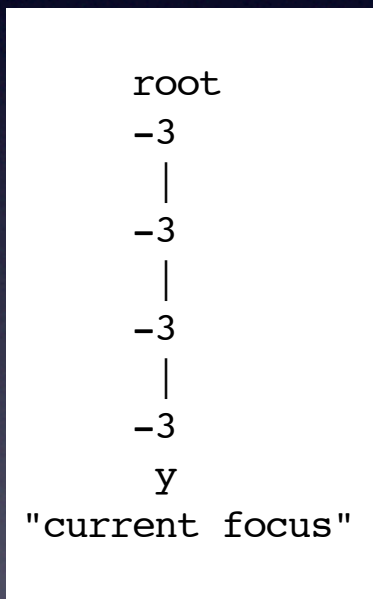
- Composing these calculations using simple subtractive metric...
- $DOI_{\text{Fisheye}}(x \mid \cdot = y) = API(x) - D(x, y)$



- we can now extract subsets of this tree

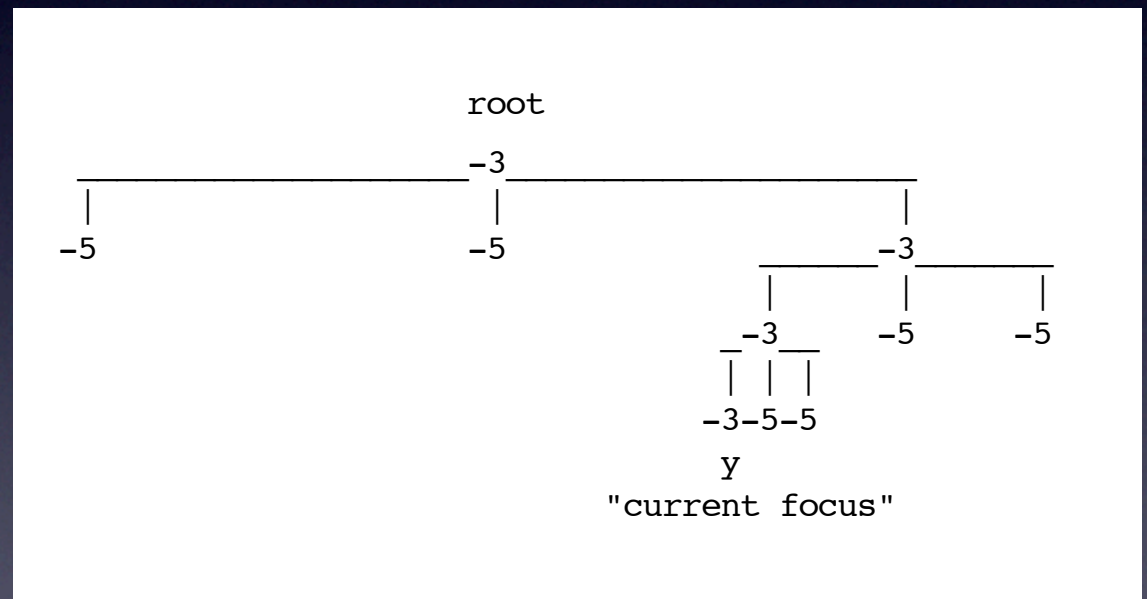
Example subsets

zero-order
fisheye view



$$\text{DOI}(x) \geq -3$$

first-order
fisheye view



$$\text{DOI}(x) \geq -5$$

Two Types of Distortion

- Visual Distortion
 - use DOI metric to decide how much *space* an element should take up
- Data Distortion
 - *selection* of which data to include
 - agnostic about geometry
 - useful for non-visual fisheye views

Problems with Visual Distortion

- size/resolution reduction
- aspect ratio preservation
- simultaneity
- topological discontinuity
- ...so, data filtering is generally superior

Application: FE-DOI Calendar

24	25	26	27	28	29	30
17:00 Lero Automotive 17:00 Networking writ +2 more	Due: Bay Street SEO 12:00 Networking lect +2 more	11:00 TA for COMP 10 15:00 Networking lect	14:00 Talk by Julien C 15:00 Graphics mit Ha 21:00 Aoife's birthday	Aoife's Birthday Dinn Aoife's Birthday Dinn +4 more	15:00 Aoife's Birthday 20:45 Lennie's gig	19:30 Meet JD 21:00 16 blocks in dur
SoC applications open May Day	Give a Seminar! Due: Net2 11:00 Seminar practice 14:00 Research Student Se 14:00 Student Seminars wi 21:00 Albert Niland gig at V 21:00 Albert Niland gig at V	Due: Casino Check	14:30 Pervasive Organisati 15:00 Graphics mit Hamish 17:00 Emmanuel arrives in 22:20 Kenghao arrives in C	DEADLINE for camera-rea Due: Bravenet Siobhan's Birthday 08:00 Fred arrives in Dubli 09:00 Courier picks up pos 16:30 Fred arrives in Dubli 17:00 'Soccer' 18:00 Danny leaves for Oz	10:20 Foo Yee Loo Arrives 11:00 Nick Arives at Dublin 11:00 Lillie arrives in Dubli 13:20 Phil arrives at the air 14:30 Pre-conference meet 14:30 Pervy volunteers me 15:30 Alex is arriving	Workshops Pervasive 2006 09:00 Workshop 3: PERMIC 09:00 Registration 09:15 W2 Workshop 2: Per 09:50 Workshop 7: Interna 10:30 Michael - Workshop 16:00 W2 poster session
SoC applications close! Keynote, Research Pres 07:00 Registration 09:00 Introduction 11:00 Morning Tea/Coffee +4 more	Keynote, Research Pres 05:30 Registration 10:40 Morning Coffee Bre 12:30 Lunch Break 14:00 Research Student S +8 more	Seminar for the Student Doctoral Colloquium +2 more	Due: Email tutorials +1 more	17:00 'Soccer' +1 more		
Due: Nitro Ventures	14:00 Research Student S					WAC Deadline

Conclusions

- fisheye views are a natural way to present data
- fisheye views allow a data set to be simplified using nested subsets
- understanding of data is improved by balancing detail and context

Thanks.

- Any questions?