

(Moderately) Complex Information Visualizations for the Non-Programmer

ProtoWiz

Michael Cohen & Thomas Schluchter

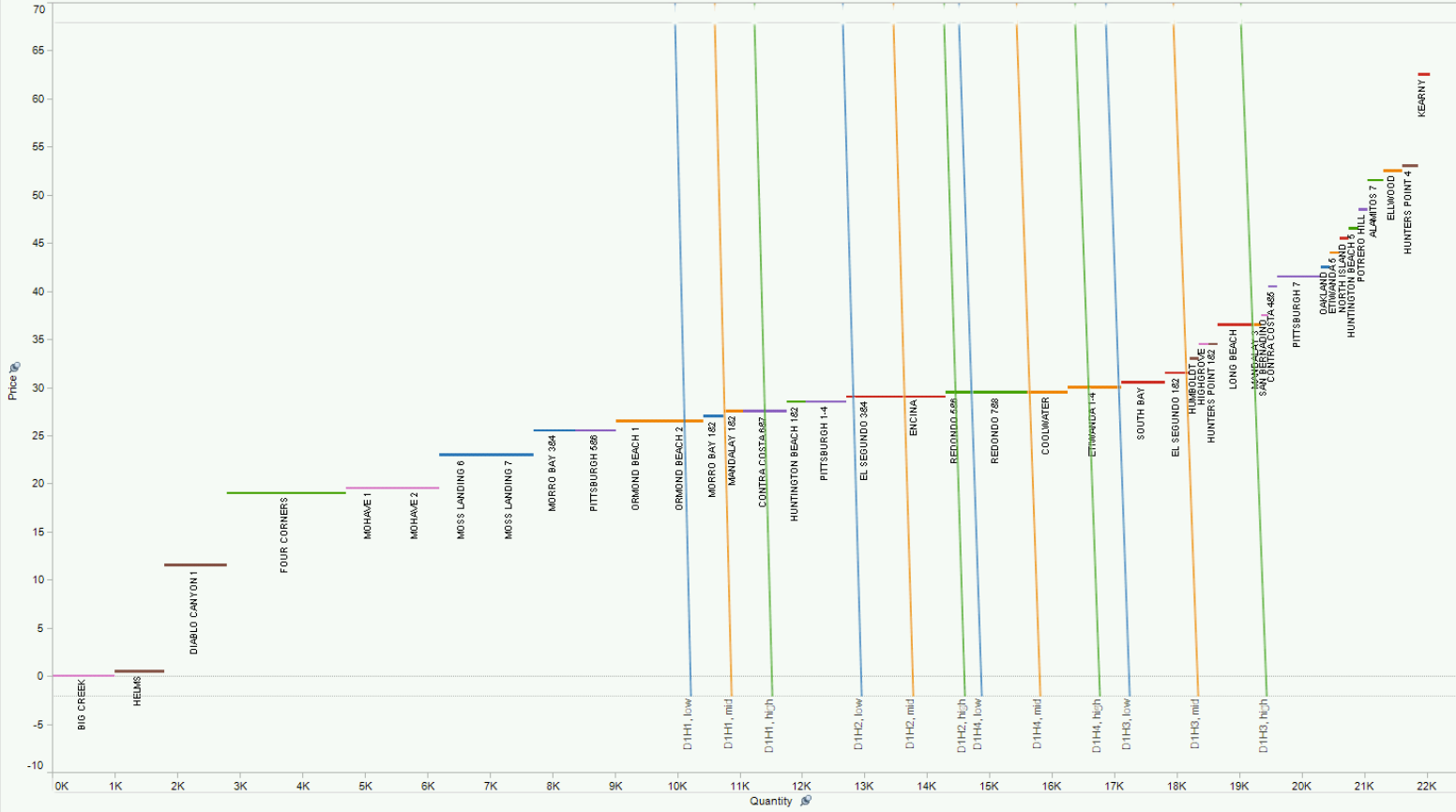
Motivation

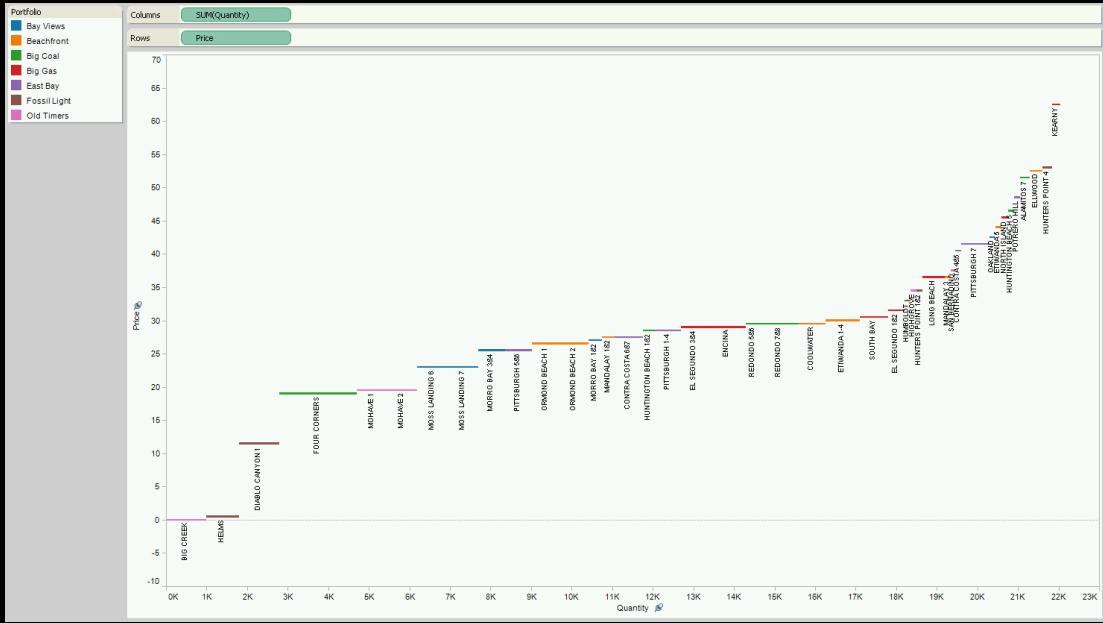
Portfolio

- Bay Views
- Beachfront
- Big Coal
- Big Gas
- East Bay
- Fossil Light
- Old Timers

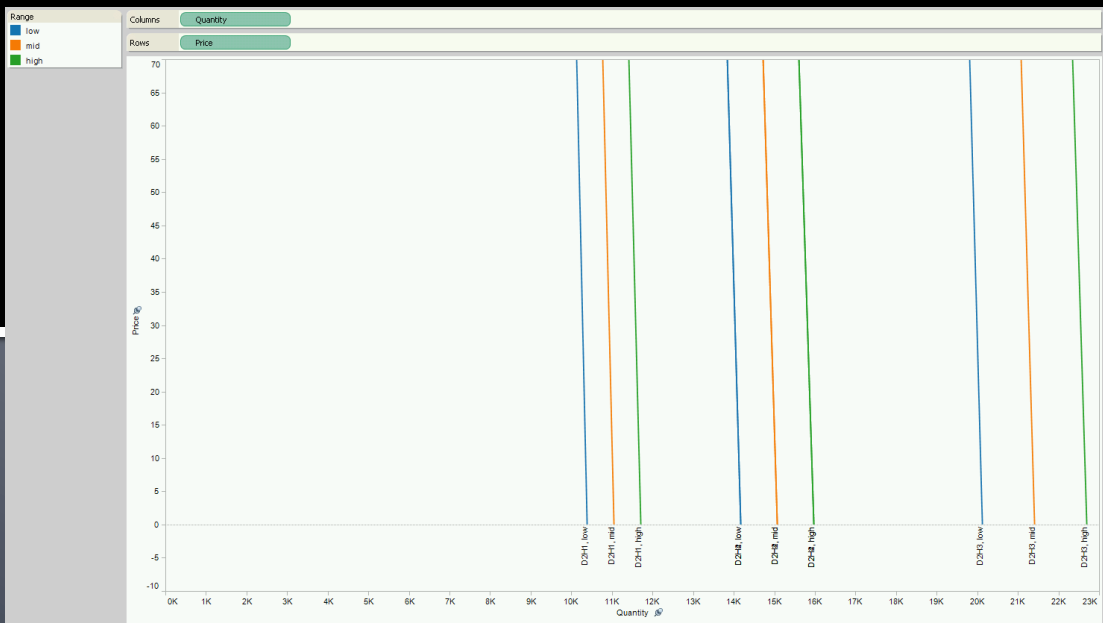
Range

- low
- mid
- high



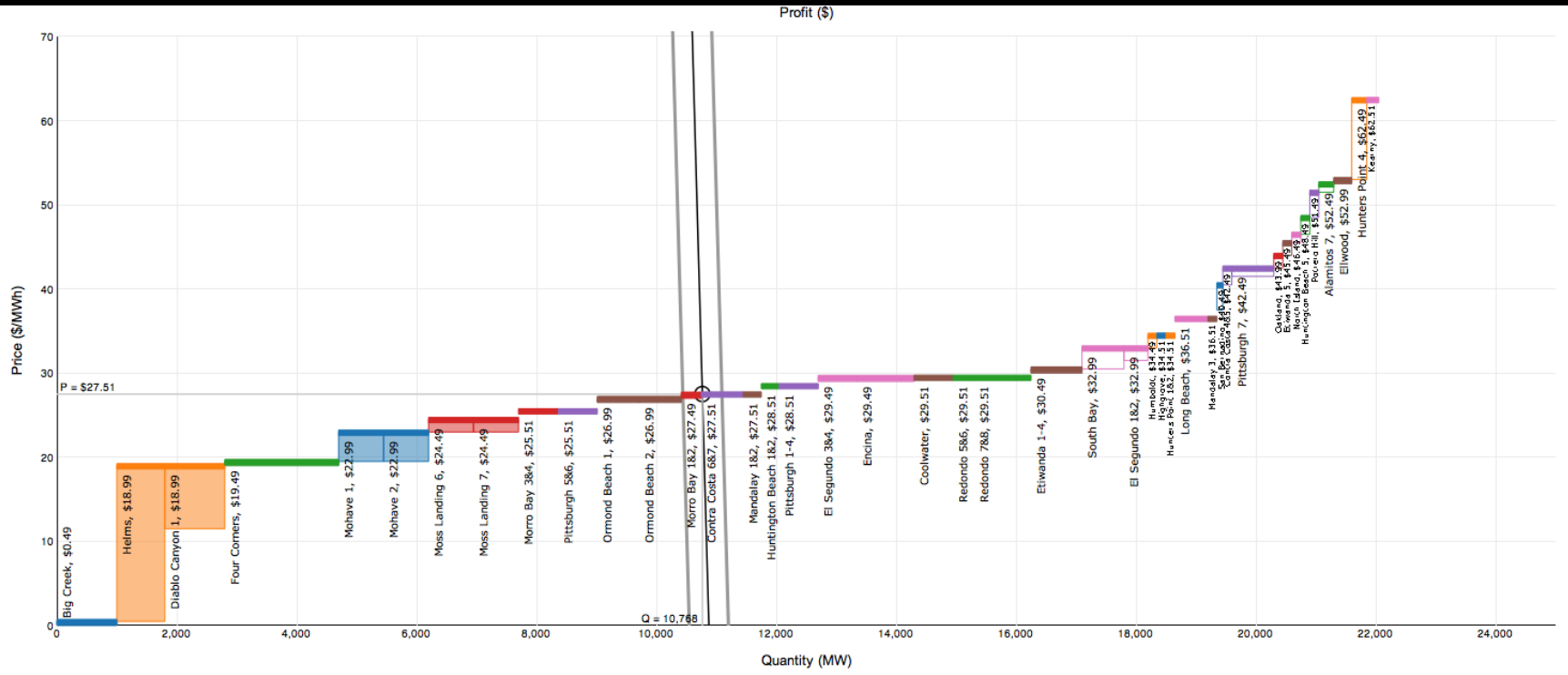


3h



+1h

=∞



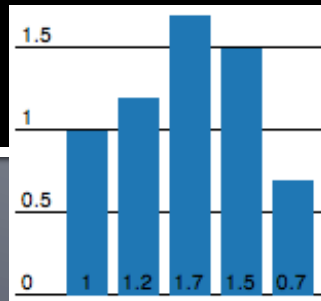
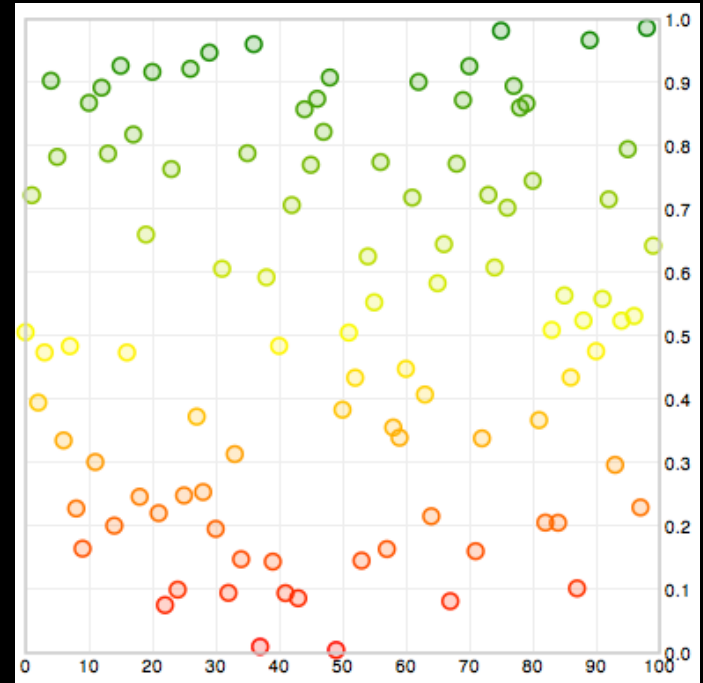
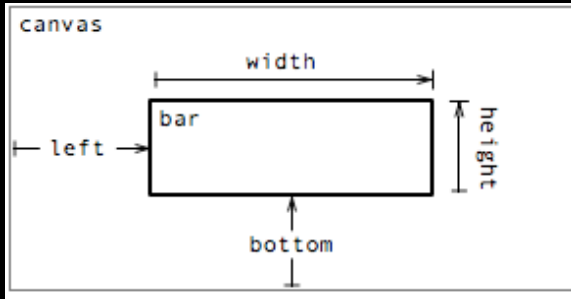
```

var sline = vis.add(pv.Panel)
  .add(pv.Bar)
  .data(supply)
  .left(function(d) x(d.start_q))
  .bottom(function(d) y(d.price))
  .height(function(d) y(d.bid - d.price))
  .width(function(d) x(d.capacity))
  .lineWidth(1)
  .strokeStyle(function(d) c(d.portfolio))
  .fillStyle(null)
  .title(function(d) d.name + ', ' + d.portfolio + "\nBid: $" + d.bid.toFixed(2) + ' MC: $' + d.price.toFixed(2) + ' Profit: ' + commas_with_sign(d.profit(D_MID)));
// and so on...

```

~1d ≡ years of software development experience

success success!



Dreamweaver File Edit View Insert Modify Format Commands Site Window Help

DESIGNER CS Live

index.html (DHTML)

Source Code spyMenuBarHorizontal_mod.css merindex.css spyMenuBar.js

Code Split Design Live Code Live View Inspect Title: Meriden Home

Address: file:///c:/command/Applications/MAMP/htdocs/local_mag/index.html

NEW STORY

2 WHEELS GOOD

What do architectural landmarks, transportation whiz kids, Friar's Market, local growers, the "Green Light" district, and Le Bon Mot have in common? They're Alexis K.'s favorite Meriden sights.

Join Urban Museum's Executive Director, Alexis K., as she fearlessly takes us on a fun, informative, and conscientious bicycle tour of Meriden.

- Organic Night Life
- Don't HUBT A Look into Meriden's Bike Sharing Program
- Meriden's Very Own Historical Hotspots
- The Water Debate

AU NATURELE

Excess convenience can take all of the fun and appreciation out of the process. Instead of heading to the convenient megastore for food, clothes, and every other little thing imaginable, Meridenians have taken to supporting local growers and artisans in commerce, and have also decided to appreciate the hard work that goes into producing and obtaining our daily necessities.

- Trash to Treasure
- Coffee Break
- Park Cleanup Concert Series
- Meriden's Top Spots for Awesome Ponies

ANIMAL LOVE

Uptown Sprouts founder proudly says, "If it had a face, this ain't the place." Yes, we are honored to serve you everything that never had a mother, a thought, or an instinct. We serve only vegan meals. Vegetables, fruit, and a delicious assortment of liquids are prepared with great care in this uniquely upscale restaurant.

Uptown Sprouts is located in the heart of downtown Meriden's Financial District. Our lunch patrons can be confident that even the most worldly client will be impressed by our menu.

- Ono for All!
- Fancy & Fancy Platter?
- What's so Fishy about Something Fishy?
- Gettin' Down with Gabel and Lofel!

DESIGN

3 local designers shed a progressive light on the remodeling of South Square.

LOCAL

SUBSCRIBE TODAY AND SAVE 75%

CLICK HERE

LOCAL

75% OFF

SUBSCRIBE TODAY AND SAVE 75%

CLICK HERE

ADOBE BROWSERLAB INSERT

Preview LOCAL

Not Connected to BrowserLab

CS3 STYLES ALL ELEMENTS

All Current

Summary for Selection

color #000

margin-top 0

padding-right 15px

padding-left 15px

font-size 3em

text-transform uppercase

margin 0 15px 15px

padding 10px 0 5px

border-top 7px solid #198AE7

border-bottom 4px solid #198AE7

Rules

body <body>

html, body <body>

.container <div>

.content <div>

.colthree <div>

.colthree_inner <div>

#1, #2, #3, #4, #5, #6, p <#2>

#2 <#2>

.colthree #2 <#2>

col_rest #2 <#2>

Properties for ".col_rest #2"

border-bottom 4px solid #198AE7

border-top 7px solid #198AE7

Add Property

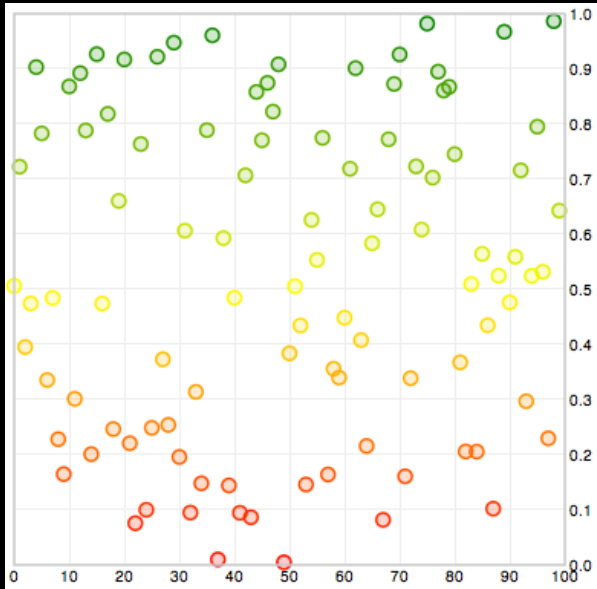
LOCAL | Green Local Blog | All rights reserved | Home | Features | Design | Archive | City Guide | Resources | Good Vibes

<body.html> <div.container> <div.content> <div.colthree col_rest> <div.inner> (#2)

1170 x 870 px | 42K / 9 sec | Unicode 5.1 UTF-8

PROPERTIES

FILES RESOURCES



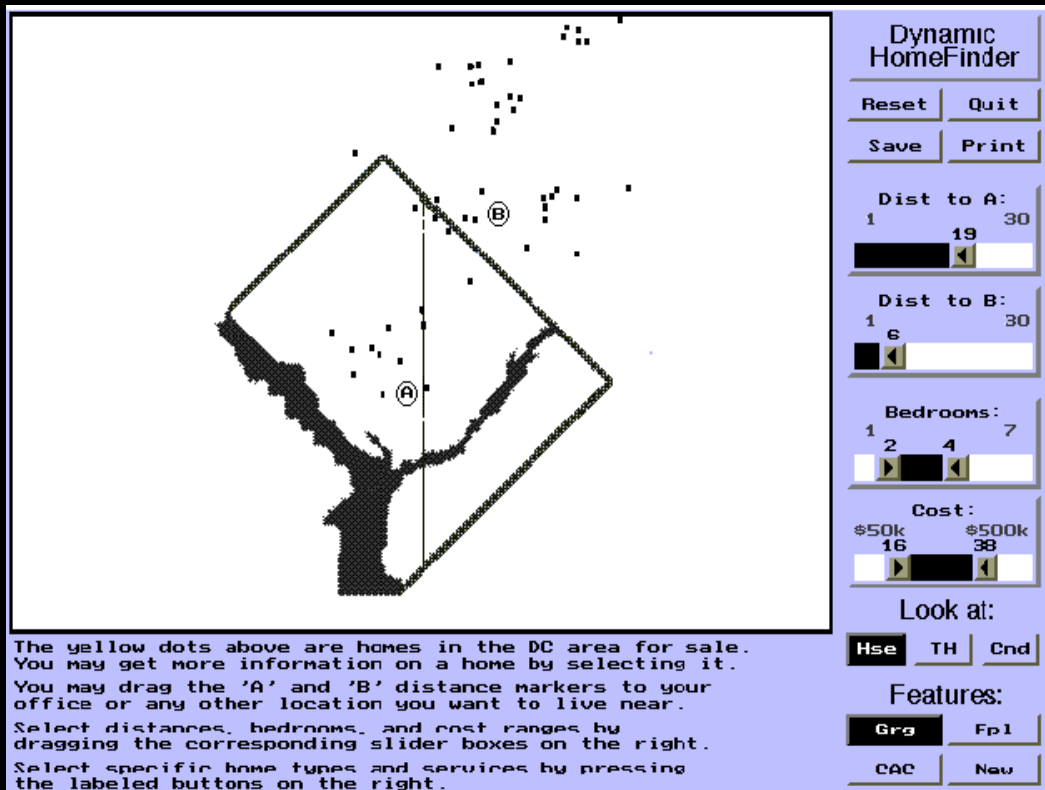
+



→ more expressive success for more people

Prior Work

Dynamic Queries

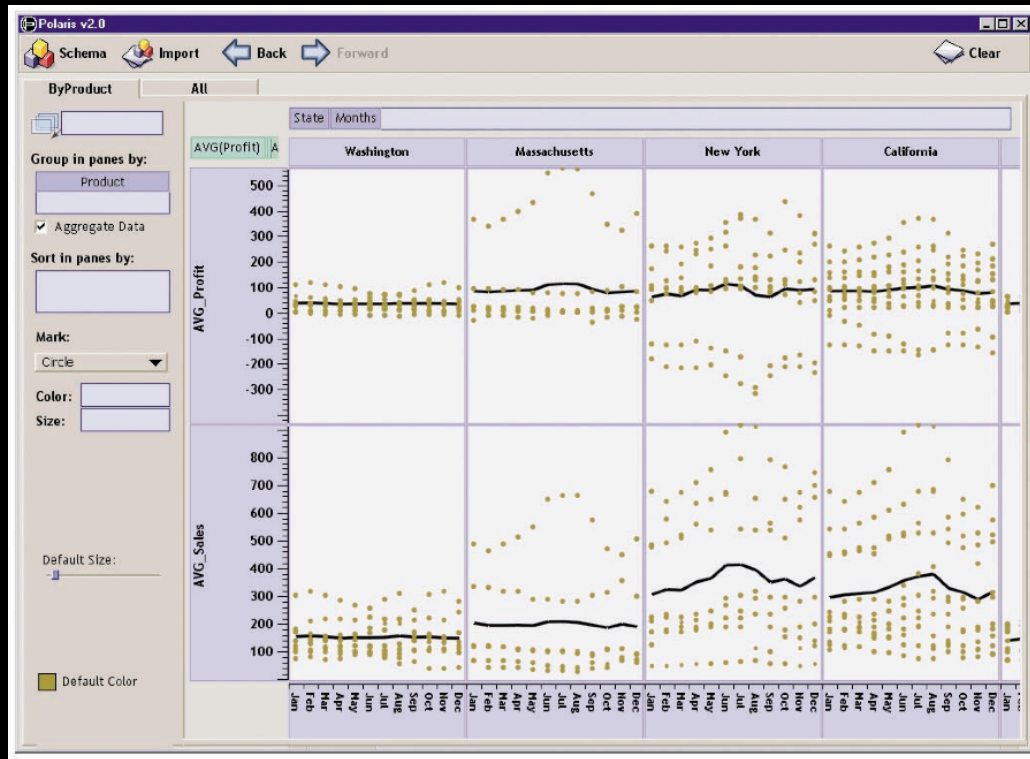


The screenshot shows a software interface titled "Dynamic HomeFinder". On the left is a starfield display of yellow dots representing homes in the DC area. A diamond-shaped region is highlighted, and two distance markers, 'A' and 'B', are placed within it. On the right is a control panel with several sections: "Dynamic HomeFinder" title, "Reset" and "Quit" buttons, "Save" and "Print" buttons, "Dist to A:" slider (range 1 to 30, value 19), "Dist to B:" slider (range 1 to 30, value 6), "Bedrooms:" slider (range 1 to 7, value 4), "Cost:" slider (range \$50k to \$500k, value 16), "Look at:" buttons (Hse, TH, Cnd), and "Features:" buttons (Grg, Fr1, CAC, New).

The yellow dots above are homes in the DC area for sale. You may get more information on a home by selecting it. You may drag the 'A' and 'B' distance markers to your office or any other location you want to live near. Select distances, bedrooms, and cost ranges by dragging the corresponding slider boxes on the right. Select specific home types and services by pressing the labeled buttons on the right.

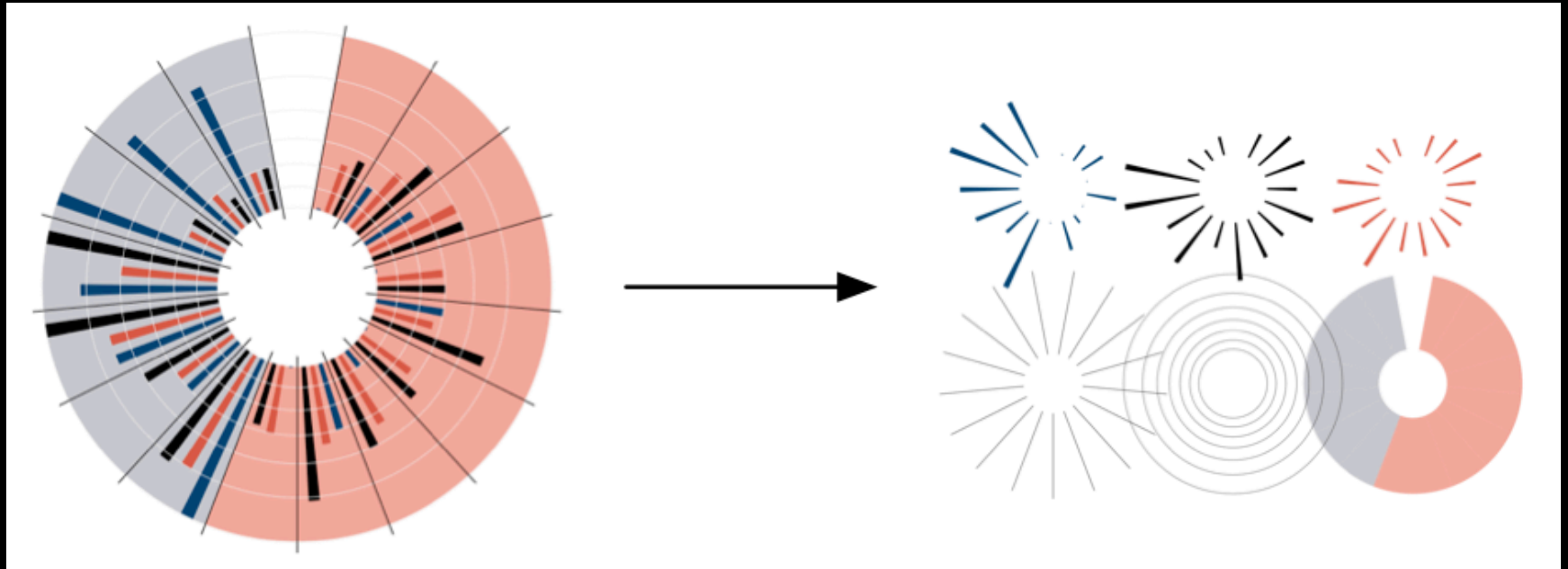
C. Ahlberg and B. Shneiderman, "Visual Information Seeking: Tight Coupling of Dynamic Query Filters with Starfield Displays." [Online]. Available: <ftp://ftp.cs.umd.edu/pub/hcil/Reports-Abstracts-Bibliography/3131html/3131.html>. [Accessed: 06-Apr-2011].

Polaris/Tableau



C. Stolte, D. Tang, and P. Hanrahan, “Polaris: A system for query, analysis, and visualization of multidimensional relational databases,” *IEEE Transactions on Visualization and Computer Graphics*, p. 52–65, 2002.

Protovis



Michael Bostock, Jeffrey Heer, "Protovis: A Graphical Toolkit for Visualization," IEEE Transactions on Visualization and Computer Graphics, vol. 15, no. 6, pp. 1121-1128, Nov./Dec. 2009

Scratch

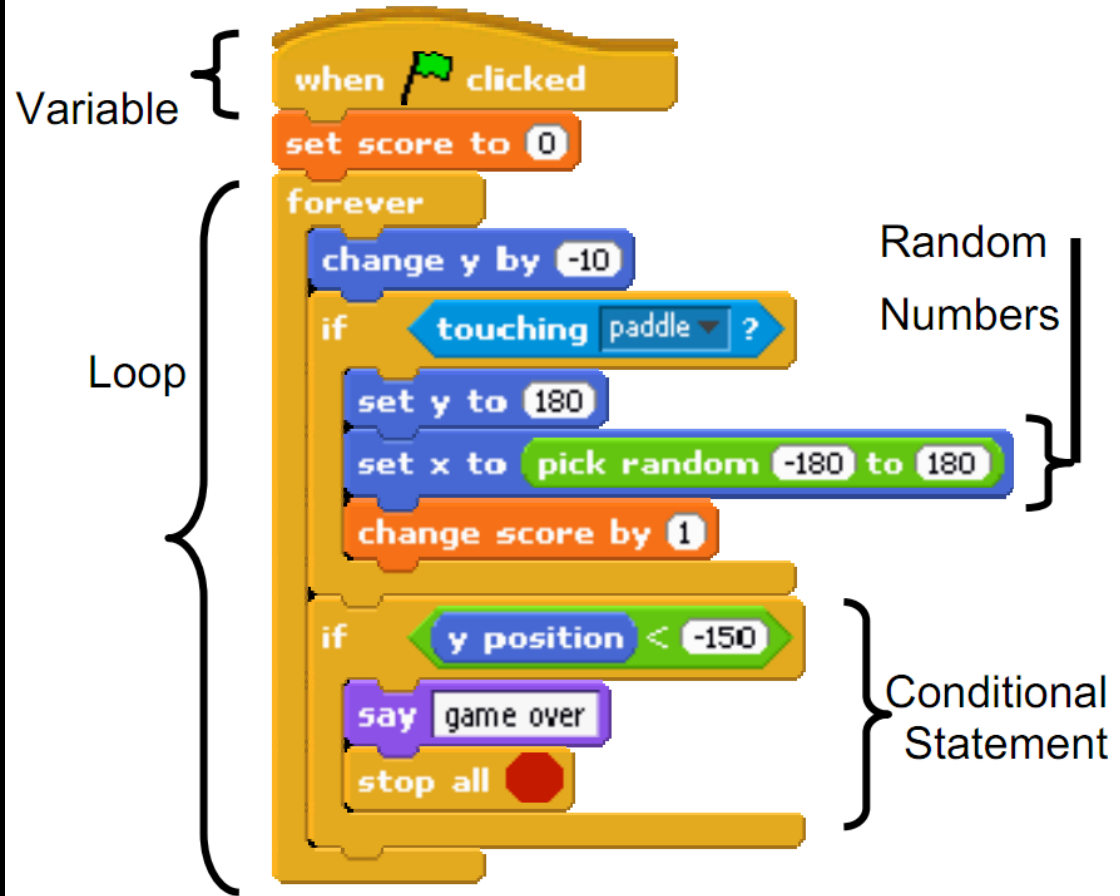


Figure 4: Scratch Script for Ball in a Simple Paddle Game

J. H. Maloney, K. Peppler, Y. Kafai, M. Resnick, and N. Rusk, "Programming by choice: urban youth learning programming with scratch," ACM SIGCSE Bulletin, vol. 40, no. 1, p. 367–371, 2008.

Supporting a graphical approach

- Protovis visualizations consist of marks
- Graphical decomposition is the way Protovis “thinks”.

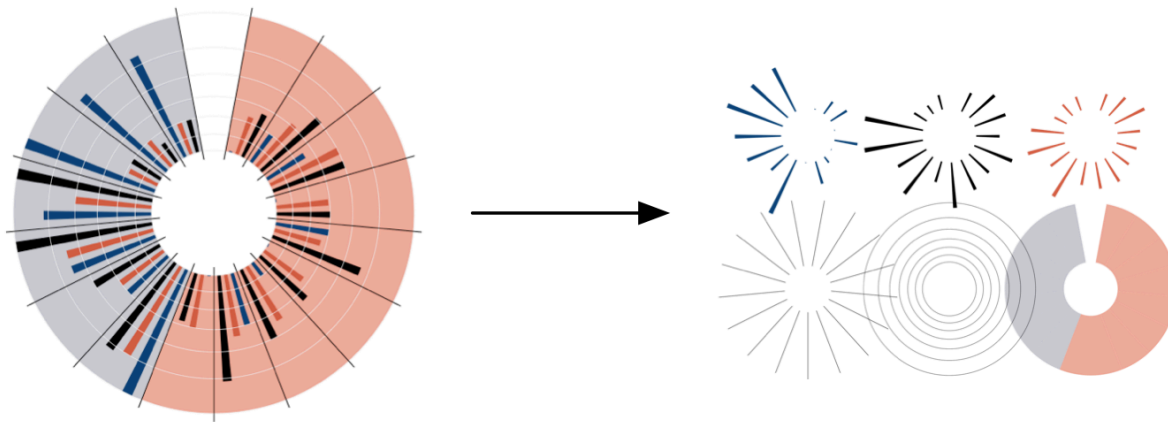
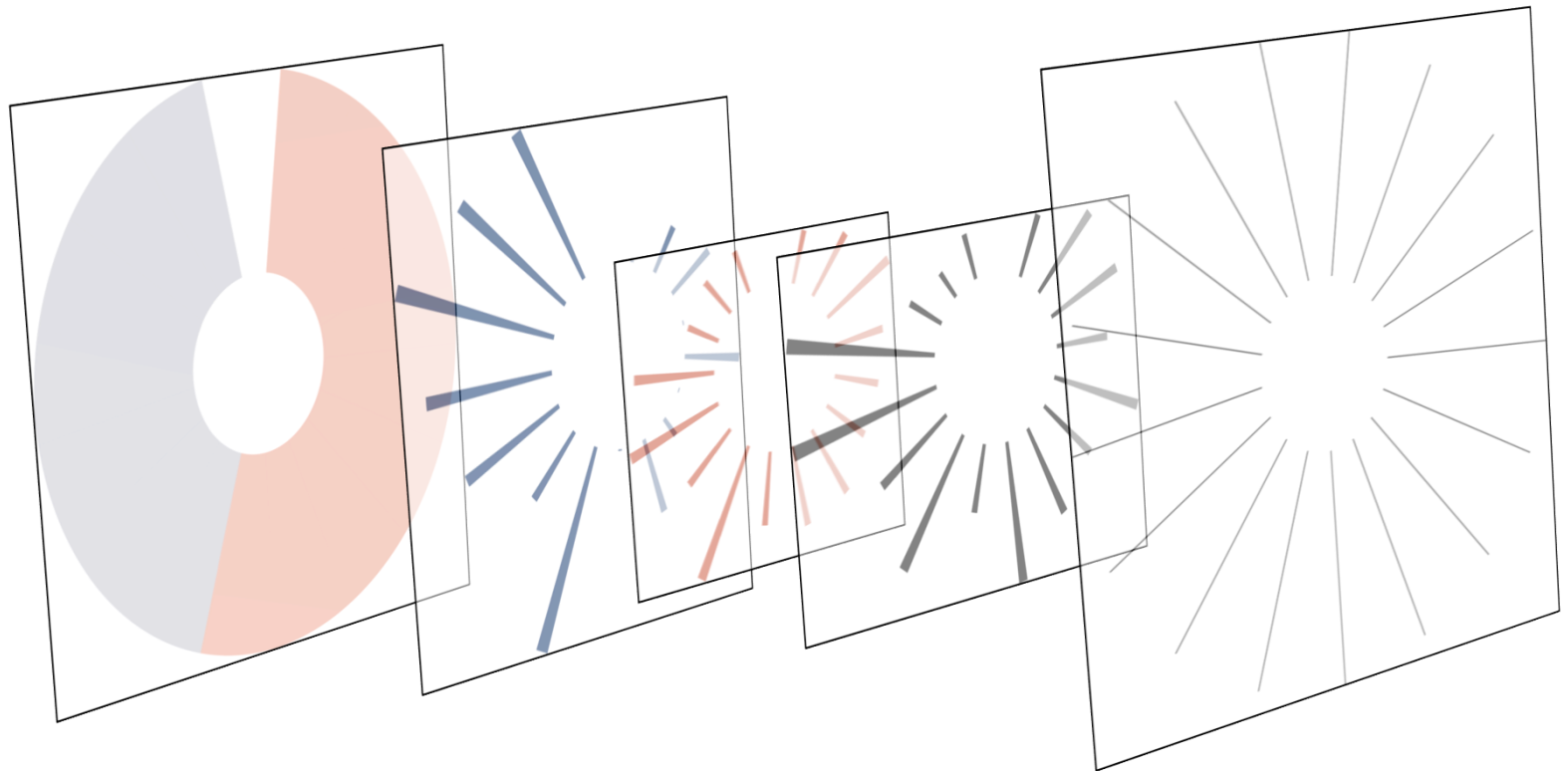


Fig. 1. Decomposing a visualization into marks.

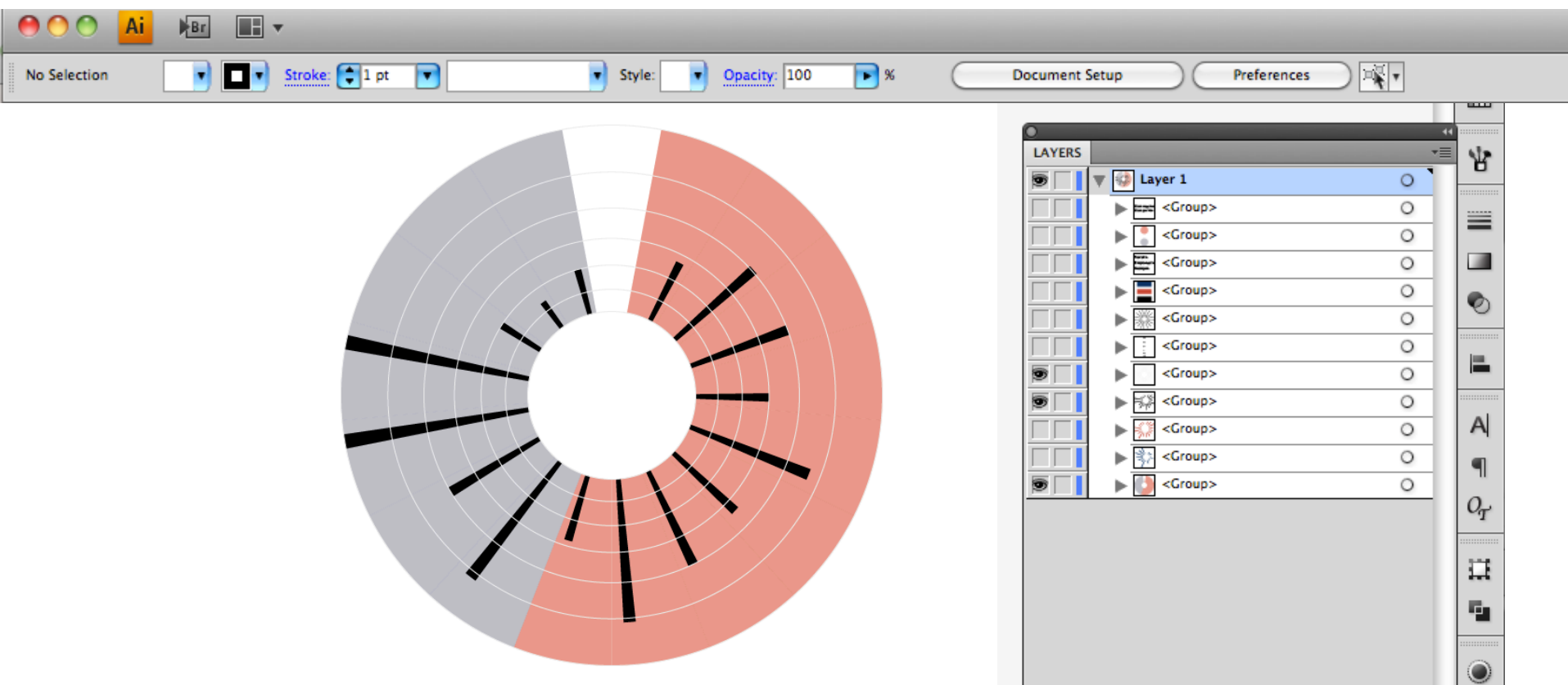
Supporting a graphical approach

- We can think of graphical decomposition as exploding a graphic into layers...

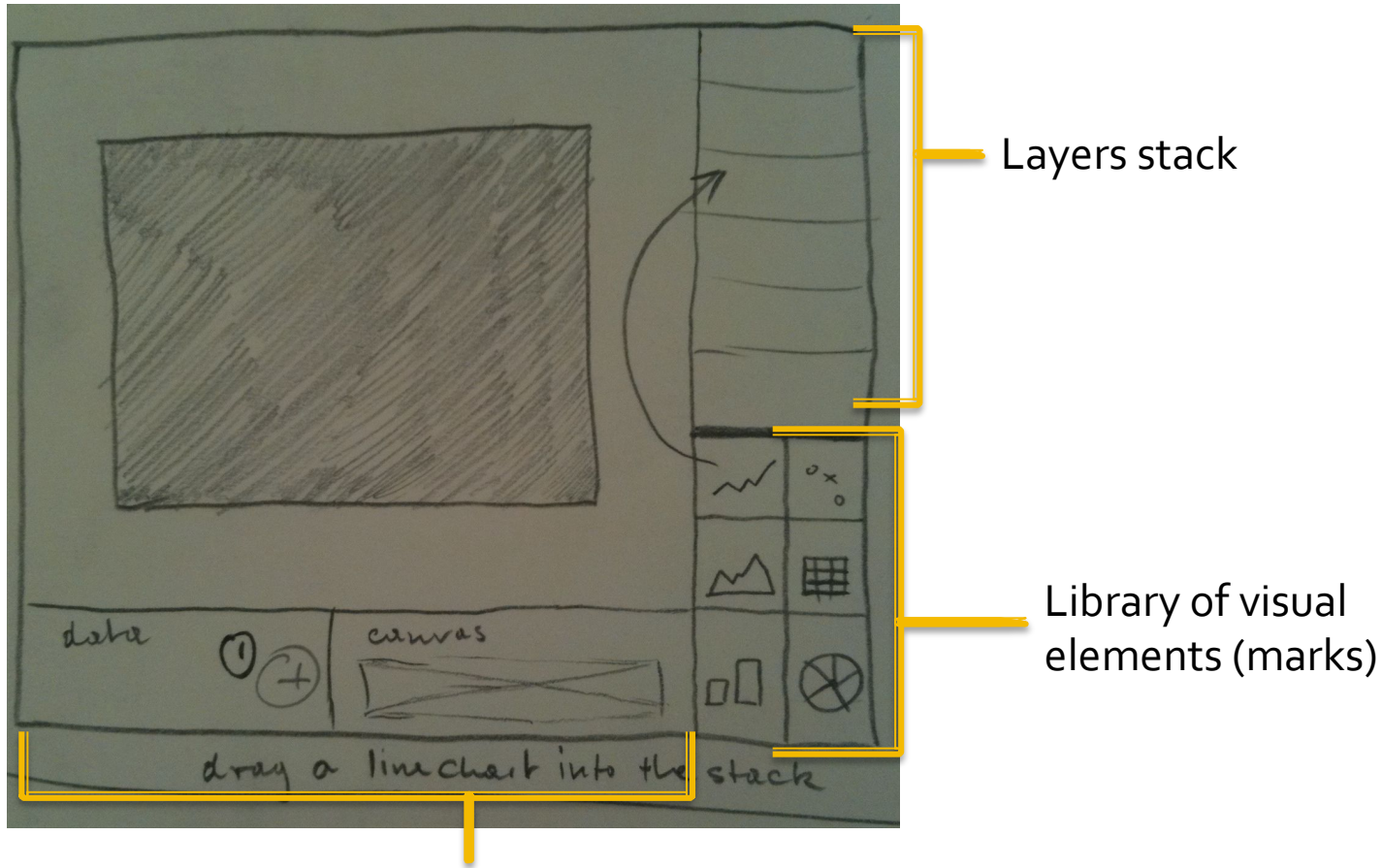


Supporting a graphical approach

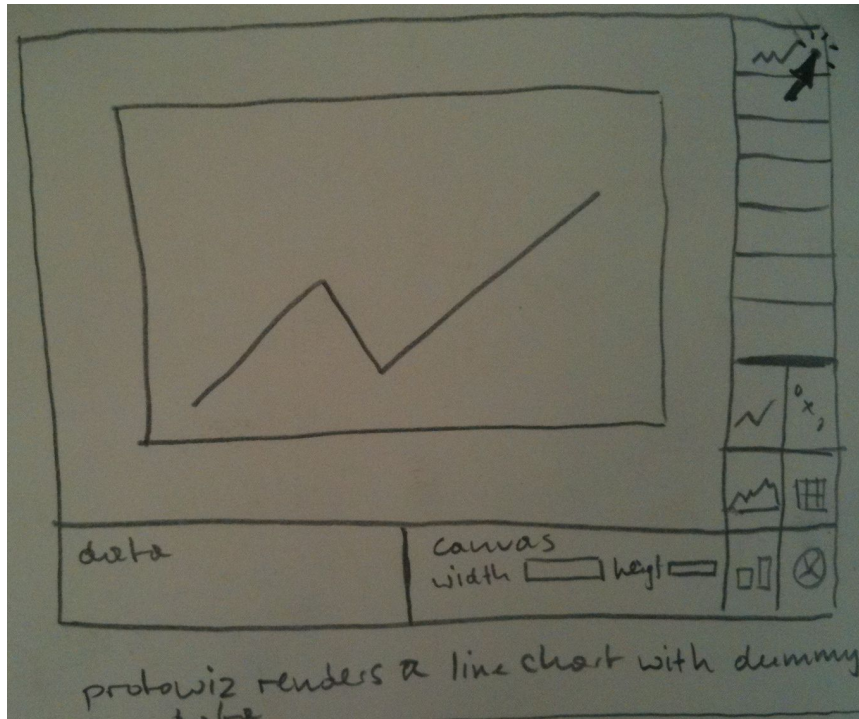
- We can think of graphical decomposition as exploding a graphic into layers...



Storyboard

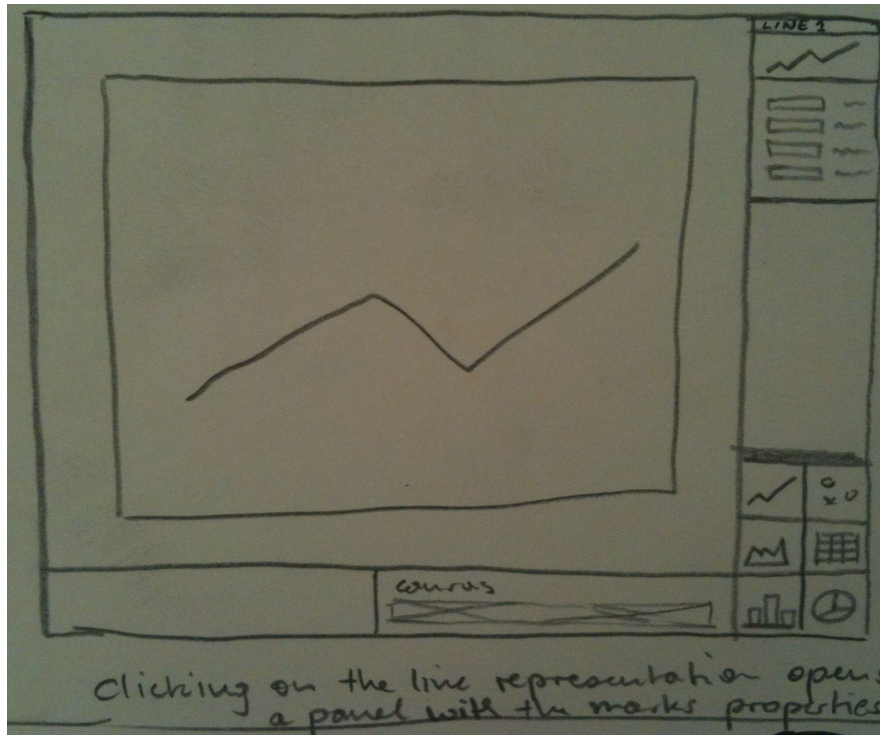


Storyboard



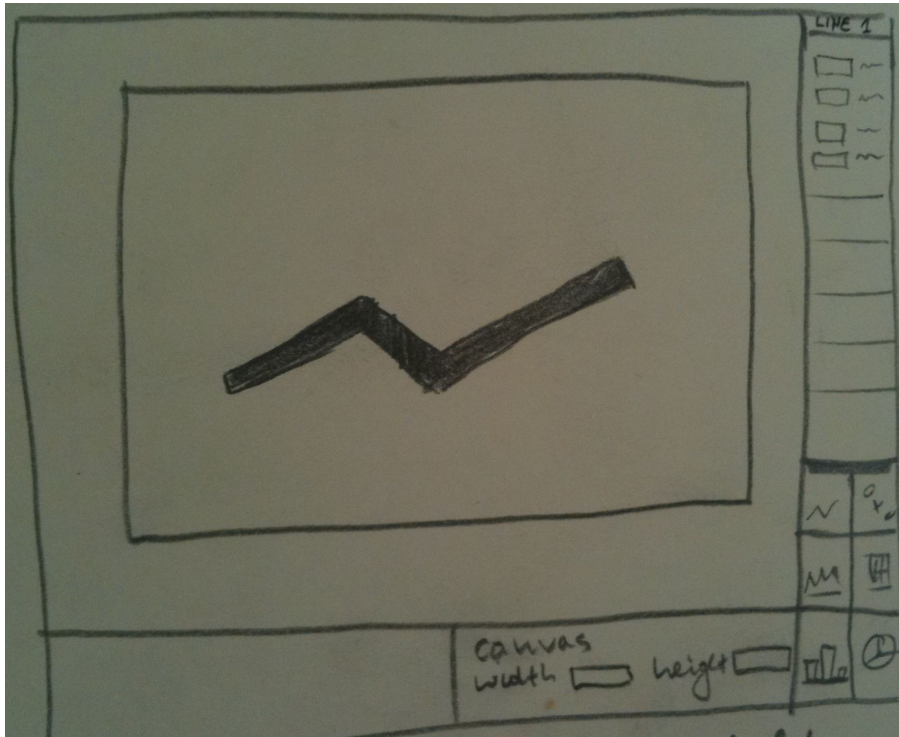
- Mark is immediately drawn
- Fed with dummy data
- Using all defaults

Storyboard



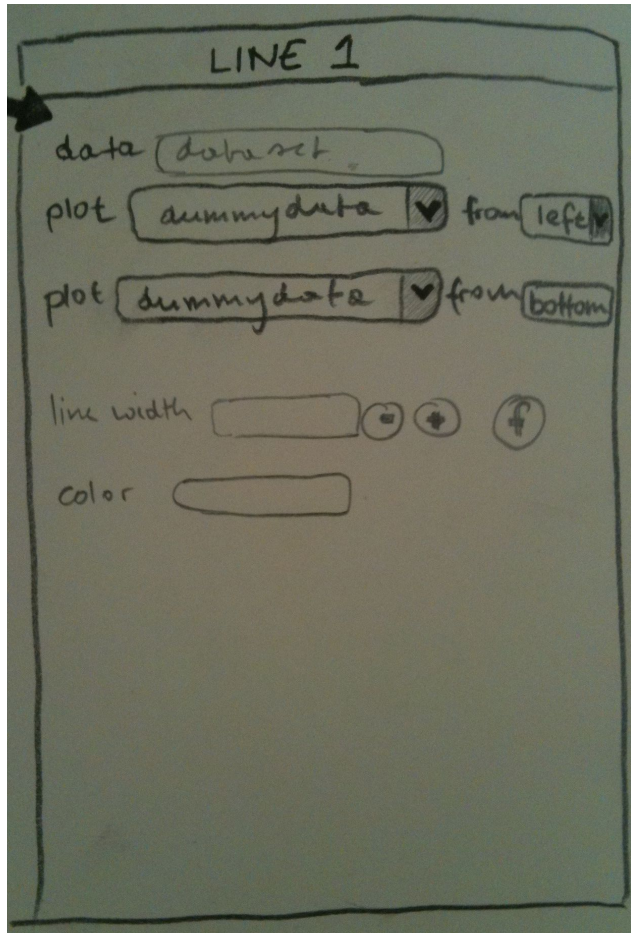
- Clicking a mark's layer entry reveals the mark's properties
- Each mark has different properties associated, the form reflects this

Storyboard



- Properties are immediately editable

Storyboard



- Data sources can be hooked up from within the editing panel
- Mark type determines which properties are available to be generated from data

Non-graphical elements

- Scales
 - Scales are generated separate from marks
 - Reusable and editable
- Functions
 - Excel-style formula editor for creating simple functions to transform values
 - Writing code directly should also be supported

Open Questions

- Can we help users understand how Protovis works?
- How to support interactions/behavior?
- What are the limits of GUIs for this kind of programming task?

Milestones

- Problem definition and mockups (done)
- Complete Protovis code generator (in progress)
- Develop UI in HTML/CSS (to be done)
- Test with users (to be done)
- Write paper (to be done)