Exploratorium
New Media Studio

Data Visualization Workshop:
A Summary

June 11th, 2011

[Format]

- Breakfast / welcome
- Introduction to workshop (Bill Meyer, Eric Socolofsky, Lotte Meijer – Exploratorium New Media Studio)
- Visualization in modern science and in ISE (Jen Frazier – Exploratorium)
- Introduction to TOPP dataset (Randy Kochevar – Tagging of Pelagic Predators Program)
- Exhibit development and visualization in exhibits; workshop framing (Eric Socolofsky – Exploratorium New Media Studio)
- Break, form groups
- Technical walk-through of data (Lynn Dewitt – NOAA)
- Working session, from morning through afternoon; facilitation by presenters and NMS staff
- Presentations by participant groups, with invited discussants (Eric Rodenbeck – Stamen Design, Susan Schwartzenberg, Joyce Ma – Exploratorium)
- Drinks at Presidio Social Club

[Host Presentations]

Bill Meyer – Exploratorium New Media Studio
Introduction

Bill provided an introduction to the workshop, and presented the Exploratorium New Media Studio's goals in hosting it: to reach out to the new media community outside the Exploratorium, and to learn from people experienced in data visualization about their tools and processes for data visualization.

Jennifer Frazier - Exploratorium
Data visualization in modern science

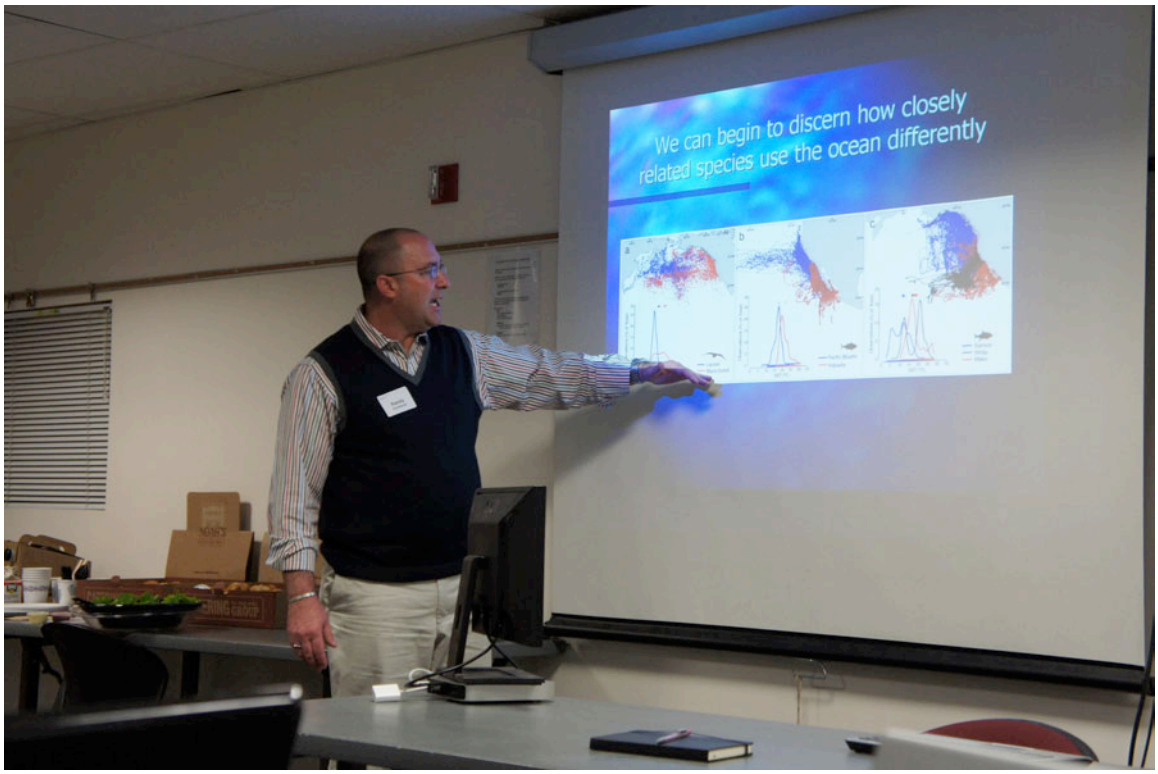
Jen provided an overview of the ways in which data visualization is used in modern science.

Many areas of modern science use visualizations for experimentation and research, not just for presentation. Visualization allows us to express complex relationships and causalities.

Randy Kochevar - TOPP
The Tagging of Pelagic Predators program

Randy described the TOPP program and explained how the data are collected.

The TOPP program is a collaboration among many international partners. Data are collected on many different animals at the top of the food web, from mammals to fish to birds. Predatory activity is in direct relationship to all other parts of the ecosystem. TOPP data allow scientists to understand patterns within, and develop predictions of, animal movement, and to craft programs and policy to support and protect their ecosystem.



Eric Socolofsky – Exploratorium New Media Studio
Visualization in exhibit development

Eric described the exhibit development process at the Exploratorium, and considered how visualization may fit within that process.

Historically, Exploratorium exhibits allow direct interaction with physical phenomena; here, visualizations are ideally as manipulable as phenomena. Visualizations in an exhibit are set apart from visualizations on the web and in science by their simple interfaces. A visualization exhibit should offer both immediate interest for casual visitors and prolonged engagement for more curious visitors.

To frame the work for the day, Eric suggested the following guidelines:
1) Develop visualization sketches for deployment as exhibits, not finished pieces
2) Start with a story and use data to outline it, or find a story within the data
3) Focus on one primary interaction

Lynn Dewitt - NOAA
Using TOPP data within ERDDAP

Lynn took participants on a tour of the TOPP data and the interface through which they would access it, ERDDAP.

TOPP data can be browsed here:
http://las.pfeg.noaa.gov/GTOPP
TOPP data can be accessed via ERDDAP here:
http://coastwatch.pfeg.noaa.gov/erddap2/tabledap/gtoppAT.graph

[Participant Presentations]

Group 1: Daniel Barcay, Nick Rabinowitz, Paige Saez

Group 1 positioned the visitor as prey/cursor, within a floor projection of the Pacific Ocean. Visitor 'health' is represented as fish schooling around visitor's feet. As the visitor intersects predator paths, the school size decreases; as the visitor moves into areas with more optimal environmental conditions, the school size increases. An interface projected into the visitor's shadow allows for finer control. The experience is intended to be an environmental element as much as it is an exhibit.

Group 2: Camillia Matuk, Denise King, Jennifer Wang, Michael Ang

Group 2 prototyped *Race Across the Pacific*, which physicalizes the transoceanic journeys of predators. Visitors pedal a stationary bike modified with a rotary encoder and microcontroller, and see their speed compared with that of pelagic predators such as tuna, sharks, and turtles. Visitors can cumulatively engage in a long-term race against predators: the 'travels' of all visitors to-date are compared with the journeys of individual predators. Audience suggestion: a mobile app that tracks your distance traveled in everyday life and compares that to predator journeys.

Another idea floated, but not prototyped, by Group 2 imagined an immersive environment whose physical and spatial parameters change in concert with a time-lapse journey of a pelagic predator. TOPP data for some species include dive depth; combining this with diurnal and annual environmental data for the location of the animal could generate a space whose light, sound, and even air pressure change in response to the data.

Group 3: Amy Martin, Chach Sikes, Isaac Liao, Sha Hwang

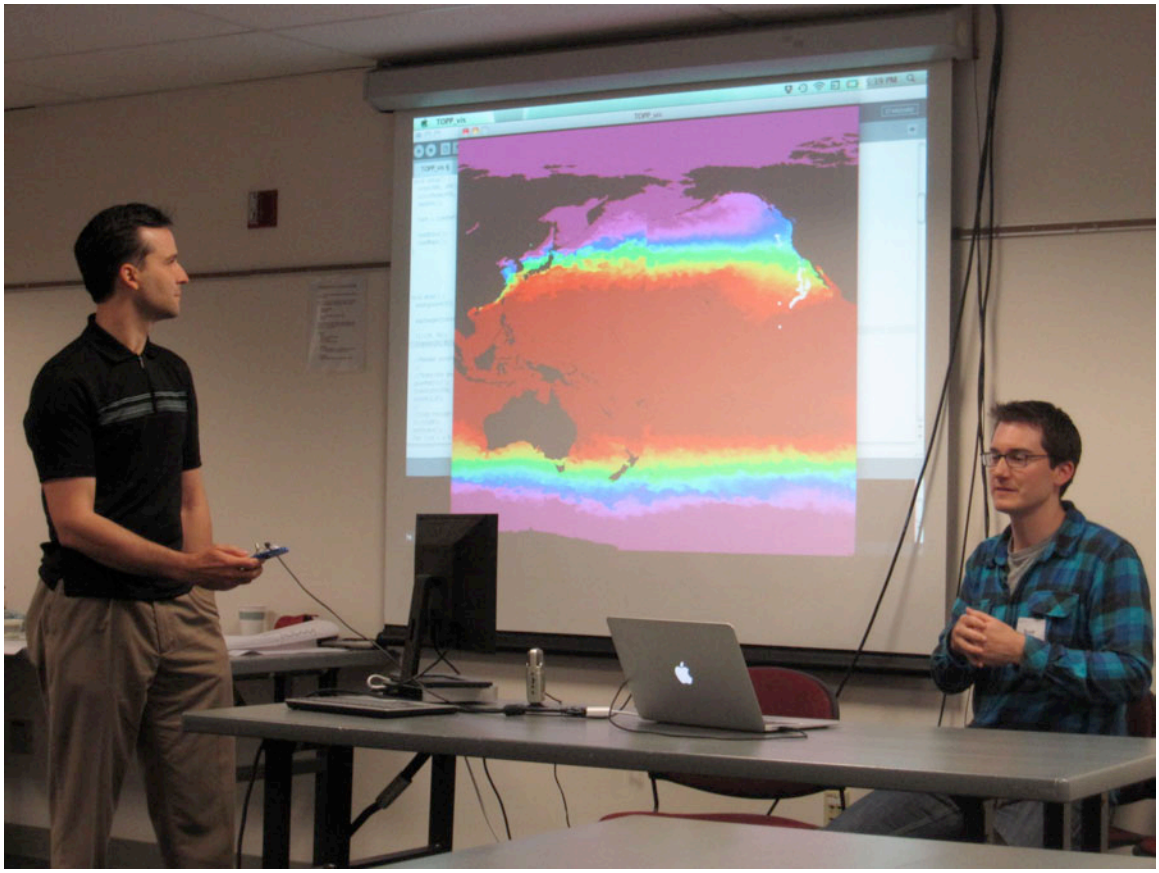
Group 3 focused on predator-prey interaction among TOPP animals, specifically white sharks and northern elephant seals. The group performed an investigation into TOPP data via visualization, to answer the question: Do sharks and seals come together when conditions (specifically sea surface temperature) are optimal for both, off of the northern California coast?

The investigation proved inconclusive in the short time of the workshop, but some ideas were generated along the way: Seals could perform automated Foursquare check-ins at their favorite beaches, and visitors could track their travels. In a game-like exhibit, visitors could take the role of sharks, with a goal of remaining within acceptable environmental conditions while hunting seals.

Group 4: Elijah Meeks, Scott Murray;
Belmer Negrillo, Dina Herring, Erin Elliott

Group 4 split work across their developer and designer talent. The developers focused on generating visualizations, and the designers brainstormed future extensions of these visualizations.

Developers (Elijah, Scott):
Elijah and Scott created a visualization whose playback (over time) is controlled by pressure on a force-sensitive resistor (FSR). A simple switch allows the visitor to transition from whole-system to individual-animal view. Future development would allow a visitor to friend/follow an animal via social networking software and receive alerts of its activity. Elijah and Scott's work focused on finding human analogies, interactions between animals, and human and natural impacts on animal patterns. Audience suggestion: each animal is given a twitter feed.



Designers (Belmer, Dina, Erin):
Belmer, Dina, and Erin focused on developing the following three exhibit ideas:

God Hand!
A visualization of TOPP data is projected into a tabletop tank containing a model of the Pacific. Visitors can create environmental phenomena (e.g. quake, eruption) and see the impacts on the tracks; this would be implemented by jumping to a recorded point in time when the selected phenomenon actually occurred.

From Cafe Trieste to Shark Café
A visualization allows visitors to compare the speeds of an airplane, a ship, a TOPP animal, and Michael Phelps, along a journey from San Francisco to the 'Shark Cafe' off of the Hawaiian coast.

Shark Immersion
A visualization of TOPP data is projected onto the floor. Visitors can select animal with their feet, and see metadata of the animal in the projection.

[Things We Learned]

Some miscellaneous things we learned…

About running workshops:

- One day is enough time to generate ideas, but not enough to develop functional prototypes (at least, for visualization).
- It's good to have a variety of tools on-hand to aid idea generation and prototyping. For example: data parsers, exercise bike, sensors/buttons.
- A focus on exhibit development might be more successful with a seasoned exhibit developer on each team to provide context and guidance.
- It may be better to try a whole-workshop brainstorm session, then allow participants to choose groups based on these ideas.
- When sketching, allowing (but not requiring!) designers and developers to work separately might be more productive than keeping them together.

About data visualization in exhibits:

- Manipulating data to outline a preconceived story is much harder (and ultimately less truthful) than finding stories within the data.
- Focusing on one element within a complex system can be a good way to engage visitors.
- It is important to provide a simple entry point for visitors to engage with an exhibit that uses visualization, but moving from there up to a larger system understanding is also important (and difficult!).
- Experientialize the data. Allow the visitor to play an active role in the system. On the other hand…
- Collected data can be difficult to make interactive – unlike with model output, with collected data the visitor cannot affect the functioning of the system. Visualizations of collected data stand in contrast to traditional Exploratorium exhibits, in which the phenomena can be directly manipulated.

About working with TOPP data specifically:

- Participants spent a lot of time looking for correlations and causal relationships that may not exist. The physical / environmental / biological system described by TOPP data is quite complex, and presents a significant challenge for an informal science education exhibit context.

- There is little obvious and reliable causality in the TOPP system, largely because animals this high up the food web have more independent thought than animals further down. This presents difficulties in describing the system to museum visitors.

[Miscellaneous Participant Feedback]

- Enjoyed working with and meeting others in similar fields

- Teams and overall workshop size were appropriate

- Appreciated the focus on brainstorming over pressured development

- Not enough time, but pacing within that time was good

- The dataset was a bit too technical / focused to get the most out of it in a limited time

- Having a mix of skills within groups was generally beneficial, but sometimes resulted in too much division of labor, with developers heads-down and designers unsure how to implement

- Didn't anticipate the tangible interface / exhibits focus, expected more traditional screen-based dataviz (this was both positive and negative)

[Attendees]

Participants:

- Amy Martin
- Belmer Negrillo
- Camillia Matuk
- Chach Sikes
- Daniel Barcay
- Denise King
- Dina Herring
- Elijah Meeks
- Erin Elliott
- Isaac Liao
- Jennifer Wang
- Michael Ang
- Nick Rabinowitz
- Paige Saez
- Scott Murray
- Sha Hwang
- Laura Schwartz (volunteer)

Presenters:

- Jennifer Frazier - Exploratorium
- Randy Kochevar - TOPP
- Eric Socolofsky - Exploratorium
- Lynn Dewitt - NOAA

Discussants:

- Eric Rodenbeck - Stamen Design
- Susan Schwartzenberg - Exploratorium
- Joyce Ma - Exploratorium

Exploratorium New Media Studio:

- Bill Meyer
- Lotte Meijer
- North Pitney
- Chris Cerrito
- Eric Socolofsky