Biological Data Visualization Design Portfolio

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Beginning in September of 2006, I was employed by Tacitus, a technology firm based out of Philadelphia. We had undertaken the conceptualization and design of a cutting-edge data visualization application, specifically in the realm of pharmaceutical research. Our aim was to bring a beautifully crafted piece of software to the world of Bioinformatics and Computational Biology. The project forced us to fuse elements of typography, metabolic pathway analysis, information graphics and video game design into our design process. This document represents a brief overview of my responsibilities and design output.

Comparative Application Overview

Interface Feautures & Functionality

1) Toolset Design Types

2) Workflow/Interaction Styles of Design

Macro Conceptual/

Design Concerns

3) Interface Design

4) Conceptual Design



Navigate

Interact

View

Content Styles

Textual

Graphical

Spatial

Application Types

Video Games

Design Applications

Micro Level Emphasis



The first stage of design consisted of functionality analysis documents. Weeks were spent creating component by component break downs of a variety of software platforms from video games to design applications.

Simultaneously we began exploring the design and layout of genetic networks in 3-Dimensional space, taking into account color, typography, legibility and depth of data resolution.



















As we refined our design all of our visual research was regularly supplemented by input from our biosystems team and project managers





Eventually a team of designers and programmers began building simple application prototypes in VirTools demonstrating basic functionality and integrating more balanced visual design priniciples.



Subsequently, on a more granular design level, I began developing 3D objects to represent individual data-points. Each node represented any number of biological entities from protein to nucleotide strands. As each node had to contain an dynamic degree of data resolution they were conceived as a series of symbolic grammar that contained rich 3D functionality.





TO NODE



Several months down the road we began work on a video demo and promotional package. Based on use-case narratives written by our Biosystems team I designed and rendered the following storyboards. They served as concise samples of valueadded functionality above our competitors and became central documents in our design brief within the company. They also acted as the central narrative structure for our demo animations.*

* (see included CD for quicktimes)



1. Splash screen loads. Users will view and annotate Personal and Project network data.



- 1. User chooses continue collaborative session 2. Browser opens to view available users from
- project (Sub-Headings: location, local time, date of last login)

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- 1. Collaborative workspace loads
- 2. Navigation palette loads.
- 3. Network Inventory minimizes
- 4. User browses Network, toggles Network Annotation
- 5. User drags Personal experimental network into workspace

Collaboration Workflow



- 1. Personal experimental data overlays Project Network
 - 1a. Network shifts 3-Dimensionally
 - 1b. Initial Project Network grays out
 - 1c. Network Inventory minimizes
- 2. User C initiates command over workspace



- Other users are logged in
 1a. Menu bar shows logon status
 1b. Also displays who controls workspace
- Personal and Project Network Inventory loads
- 3. User A drags network to workspace, chooses axes



- User C claims workspace
 Network Inventory updates accordingly
 User C drags Project Network to desktop
- 2. User A Network minimizes to history snapshot Inventory
- 3. User C browses network (makes notations, initiates sort query)



1. Splash screen loads. User will load multiple, rich data objects and see their interrelationships



- 1. User loads pre-built networks.
- 1a. User selects 2D Snapshots
- 1b. Drags selected networks to workspace
- 2. 2D graph layouts collapse 3-Dimensionally



- 1. 3D network builds
- 2. User browses selection of networks dynamically
- 3. 3D View of selected Network updates accordingly



User loads meta-ontology browser
 Drags selection of ontologies to desktop



- 1. User loads "My data", a browser of experimental data types
- 2. Drags heat map of genes to Desktop



- 1. User expands Desktop
- 1a. Selects ontology terms, across ontologies
- 1b. Heat map automatically auto-selects corresponding genes
- 1c. Network reorganizes dynamically and pivots to present corresponding genes

Simultaneous Data Views Workflow



1. Sequence opens with Biosprockets 2D Graph layout



1. 2D Graph Window minimizes to corner of screen

2. User chooses build 2D graph into 3D network



- Network forms within "Project Container box"
- 2. Use initiates "trace pathway" command
- 3. User uses zoom select tool to choose focal point within arrangement



1. Relevant annotation toggles around central node



- 1. View zooms to closer view
- 2. User makes cluster selections to reduce visual density.

Macro Micro Workflow



- 1. Node clusters gather revealing central node (force repulsion)
- 2. User toggles annotation specific to nodes along pathway
- 3. Initiates zoom on specific node of interest



- 1. User browses Network B w/cellular process Tray Arrangement
 - 1a. Network Inventory minimizes as user activates central workspace
- User selects Tray Grouping and drags to Bucket Inventory
 Bucket Inventory slides open on drag-n-

drop mouse rollover



- 1. User chooses Combine/Build new network from Buckets Inventory
 - 1a. Buckets Combine

- 1b. Load combined Bucket/Network C in workspace
- 2. Network B minimizes into Inventory 2a. Network Inventory opens/closes to accept Network B



- 1. Network C expands to fill workspace 1a. Buckets Inventory completely closes
- 2. User browses Network C
- 3. User Selects Old Networks (A + B)
- 4. Drags Network Containers to workspace



- 1. Network Containers scale and shift onto workspace
- 2. Network Inventory slides closed
- 3. User chooses "view" Inter-Network linking styles



1. User initiates inter-Network grouping style 1a. Wave-form grouping



1. User toggles edge-free view type 2. User toggles inter-network edges

Dynamic Manipulation Workflow 2



Splash screen loads. User will create and compare different views of a network.



- 1. User loads network from menu bar
- 2. User chooses Build parameters
- 3. Loads 2D Graph Layout to workspace



- 1. User browses 2D network
- 2. Overlays expression data
- 3. Chooses 3D build algorithm for Cellular Localization
- 4. 2D Network collapses to perspectival plane



- 1. Plane expands to 3D Network inside of Network Container based on quantitative expression
- 2. Quantitative Expression gradient appears at edge
- 3. Localization graphic appears at bottom of container
- 4. User makes Node selection based on Expression extremes

Dynamic Manipulation Workflow 1



- User browses network
 1a. 3D Network updates while rotating
 1b. Gradient remains stationary
- 2. User selects Nodes
- 3. Drags selection Bucket to Inventory bar
- 3a. Inventory opens on mouse rollover to edge area



- 2. Network B Builds in Tray Network Container on central workspace
- 3. Network A minimizes automatically to Network Inventory
 - 3a. Network Inventory Slider opens
 - 3b. Bucket Inventory slider closes & grouping minimizes

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