Chernoff faces of visualizations

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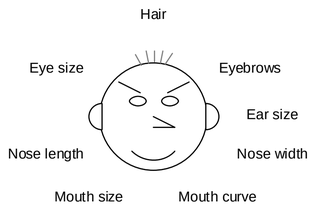
May 6, 2008

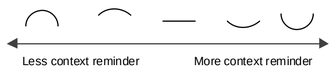


One unorthodox view to visualize data is a Chernoff face (Chernoff 1973). These computer-generated drawings manipulate facial attributes to compare multivariate data sets. Humans have evolved to recognize and classify people by their faces, so this is a powerful perceptive technique to exploit (Yang & Trewn 2004). With one record to a face, Chernoff faces are well-suited to quickly grouping large numbers of records, especially when the data clusters in roughly equal sizes with few borderline cases (Sayena & Navaneetham 1991).

Chernoff faces are a type of **glyph**, a device which attempts to combine multiple dimensions of data into a single symbol. Good glyph design involves selecting each aspect carefully so that they all are available perceptively for pattern search (Wong & Bergeron 1997). Nevertheless, glyphs require complex perceptive and cognitive operations to comprehend, so applying them involves a tradeoff between comparing data in multiple simple visualizations, versus puzzling over information combined in one display (Cleveland & McGill 1984).

Context

Mouth curve



Overview

History

Distortion

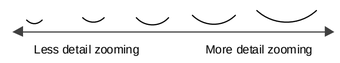
Views

Labels
- Axes
- Title
- Legend

Framework
- Context
- Metadata

Details

Mouth size



Cognitive load

Parallel processing
- Propositional
- Dual-coding

Filter
- Pruning
- Zoom
- Data brushing
- Focus

Queries

User

Match a visualization to its users' cognitive needs

Cognitive fit

Hair

Training

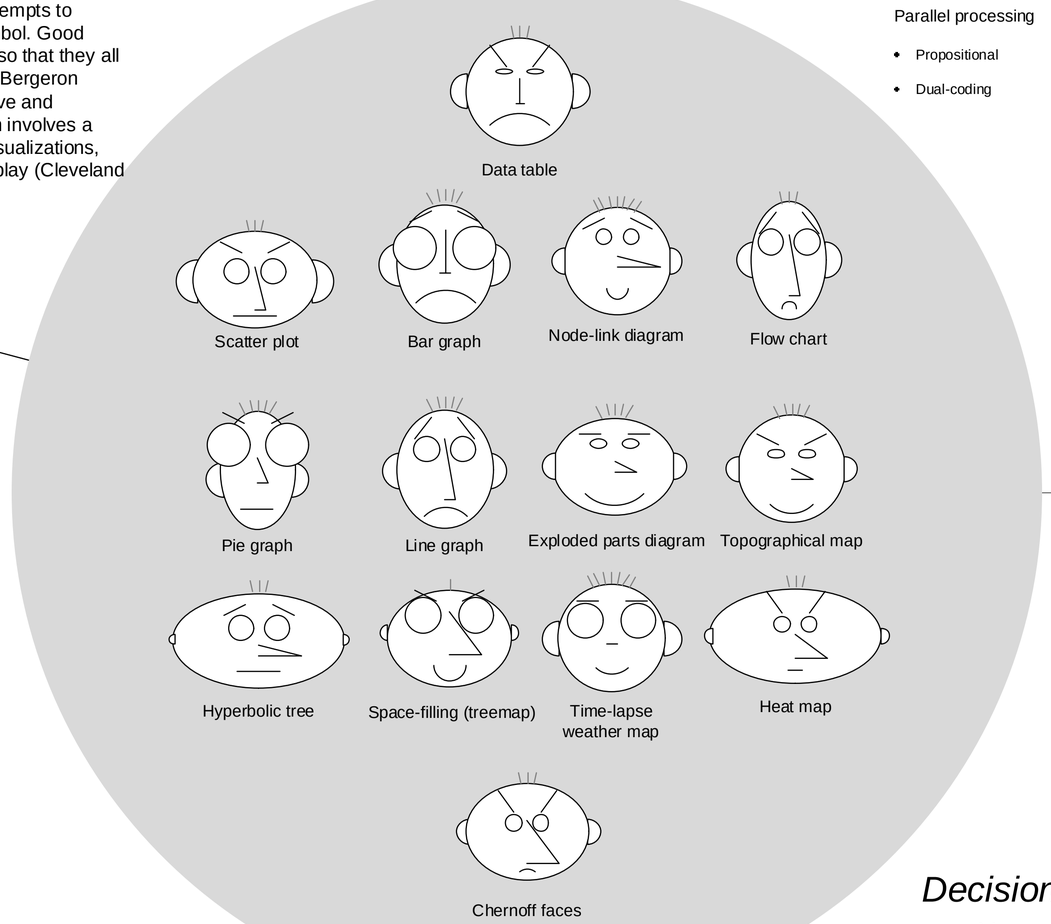
Expectations

Schema

Top-down

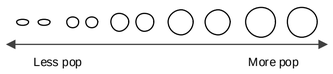
Domain
- Novice
- Expert

Cognitive styles
- Visual
- Verbal



Pop

Eye size



Preattentive Processing

Search
- Conjunctive
- Preattentive
- Scanning

Encoding
- Differentiation
- Just Noticeable Difference

Retinal Variables

Color
- Hue
- Saturation
- Brightness

Luminance contrast

Size

Shape

Orientation

Texture

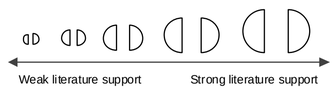
Motion
- Velocity
- Direction

Flicker
- Frequency
- Phase

Depth

Evaluation

Ear size



Measuring
- Studies
- Task results

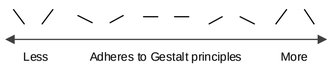
Iterating based on user feedback

Intuition
- Bertin
- Tufte

Models
- Shneiderman
- Green

Gestalt

Eyebrow angle



Path
- Continuity
- Shortest
- Edge crossings
- Connectedness

Shape

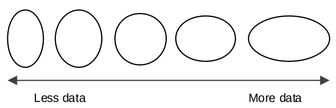
Closure

Symmetry

Grouping
- Proximity
- Similarity
- Common fate

Large data sets

Face shape



Data types
- Nominal
- Associative
- Selective
- Ordinal
- Ratio
- Quantitative

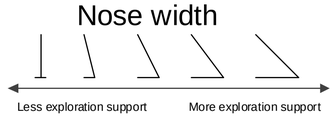
Mapping to visuals
- Special planar aspects
- Length
- Real-time updates

Views
- Separate
- Linking

Animation
- Controls
- Updates

Exploration

Nose width



Explore data
- Scenario casting
- Compare multiple views

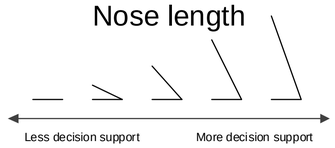
Creative thought
- Radiant thinking
- Non-linear thinking

Learning

Comparison

Decision making

Nose length



Priming

Expected utility

Risk

Emotions

Uncertainty
- Time pressure
- Bias
- Decision support

Parties involved
- Individual
- Group

Mindlessness

Image

Select a visualization by its perceptual characteristics.

Task

Choose a visualization based on data analysis goals