Overview

CMSC 436/636
Data Visualization

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The purpose of computing is insight, not numbers.

Richard Hamming
**What is Visualization?**

- Def: visual representation of data
- Connotations:
  - computer generated
  - LOTS of data
- Transforms the abstract and symbolic into the geometric
- Harnesses the human visual perception system

**Text Representation**
Why Visualize?

- Harness power of human visual system
- Presentation
  - communicate concept to peer, student, policy-maker
- Exploration
  - rapidly construct and test many informal hypotheses

Lots of Numbers

- Sensors
- Scanners
- Surveys
- Simulations
- Equations
Visualization Tasks

- See values
  - extrema
  - anomalies
  - boundaries/thresholds
  - distribution / structure
- See multiple variables
  - relationships
- See flow/change
- Understand process
Visual Vocabulary

- Position
- Shape
- Color
- Density
- Glyphs
- Motion
- Interaction
The Visualization Process

- Data
- Simulations
- Sensors
- Scanners
- Process
- Refine
- Map
- Model
- Render
- Image
Categories of Visualization

- Data Visualization
  - Spatial
  - 2D / volume
  - scalar / multivariate
  - flow
- Information Visualization
  - non-spatial
  - hD data
  - structures
- Program/Performance Visualization
Some Application Areas

- Environmental Modeling/Monitoring
- Computational Fluid Dynamics
- Medical Diagnosis/Treatment Planning
- Drug Design
- Basic Science
- Public Health
- Social and Economic Justice
- Urban Planning
- Education

- Olson ‘97, fig. 11-8.
Administrivia

- Pre-reqs
  - Graphics, statistics, design helpful but not expected
  - strong programming skills or domain expertise
- Web page
  - www.cs.umbc.edu/~rheingan/636
- Piazza – sign up at
  - https://piazza.com/umbc/fall2017/cmsc436636
- Readings
  - Information Visualization 3rd edition, Colin Ware
  - Visualization Analysis & Design, Tamara Munzners
  - Reading from current research papers
  - All available online (some require DL)
- No final
Administrivia (cont)

- Office hours
  - Tues 8:30-10am (ITE 355), by appt
  - drop in when door’s open (ITE 355,452)
- Grade components -- something due most weeks
  - Quizzes (10%)
  - Visualization Construction (10%)
  - Critical Reviews (5%)
  - Analysis of Technical Papers (5%)
  - In class exercises and participation (10%)
  - Project (50%)
  - Peer evaluation (10%)

Assignments

- Construction: Oct 17
- Vis Critiques: Sept 25
- Implementation: Oct 26 (636 only)
- Paper Analysis (multiple dates)
  - Write blog post on each group of papers
  - Comment on other’s posts
- Project (multiple dates)
Project Mechanics

- Group development of new visualization technique or application
- Phases
  - Proposal
  - Annotated Bibliography + Revised Proposal
  - Alpha, Beta, Final Releases
  - Presentation
  - Poster
  - Paper draft and final
  - Beta review; draft review (636 only)

Project Topics

- Data as Art, Kathy Marmor, Visual Art
- Visualizing Focus Group Transcripts, Danyelle Ireland, CWIT
- Revisiting the Conquest of Pestilence, Terry Yoo, NIH
- Visualization of Applicant Pool, Erica D’Eramo, CWIT
- Visualization of Biological Outcomes, Greg Szeto, CBEE
- Major-changing in Context, Penny Rheingans, CSEE & CWIT
- Visualizing COEIT Data, Marie desJardins, COEIT & CSEE
- Exploring CSEE Capacity, Richard Chang, CSEE
- VR Exploration of Research Funding, Don Engel, OVPR
- Choice Program Pattern Discovery, Shirey Baig, Shriver Center