Let’s start off with ideas and concepts from paper...

A complement to the majority of ‘central’ infovis; which is a focus on analytic tasks and analysts as the idealized user.

*Infovis for the everyday person*

Spend some time looking at the ‘edges’ of the infovis domain
Definition of casual infovis

Casual Infovis is the use of computer mediated tools to depict personally meaningful information in visual ways that support everyday users in both everyday work and non-work situations.

Changes to traditional notions

The user population
- Expand to include many more kinds of people and many more situations and scenarios.
- People who are not explicit or implicit analysts
- Non-professionals in general
- Low(er) motivation
Changes to traditional notions

• Usage pattern
  – New patterns of use that depart from the more traditional deep-dive explorations and sensemaking
  – In a word, more *casual*
  – Fleeting awareness and monitoring tasks
  – Could also include more substantial reflections
  – Mobile and ubiquitous, not just desktop

Changes to traditional notions

• Data types also change
  – Often personally relevant (*about 'me'*)
  – Tight coupling between user and the data
  – Tight coupling gets at what is *meaningful* about the data stream... not always what is *important*. Sometimes the most minute and boring detail is still very meaningful
Changes to traditional notions

- Insight
  - Gets a one of the fundamental questions of infovis
  - We all agree (?) that the purpose of infovis is insight... but the examples on the edges show different kinds of insights.
  - Maybe insights are not perfectly quantifiable in a way that’s rigorous (for an attempt see Saraiuya and North 2005)

Areas

- Artistic InfoVis
- Ambient InfoVis
- Social InfoVis
Artistic InfoVis

- Artistic expression using visualizations of data
- They are not just generative art – they still read data, represent it, and some are interactive
- Systems often depart from the central notion of infovis that first and foremost, a visualization should be easy to read.
- Also can ‘problemitize’ the data...
Many examples

Jason Salavon
The Top Grossing Film of All Time, 1 x 1  2000
Artifacts of the Presence Era

Wignell

Sorting (real time)
**TM Evaluation (it's hard)**

- 6-8 week deployments
- 3 houses
- Very different uses
- Games
- Printouts
- Discussion
- Reflection?

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**Feltron**

*Annual Report (2008)*
Flags as infographics

Foote Cone & Belding

Ambient InfoVis
Objectives

- Systems so far
  - What is their purpose or objective?
    - High-level purpose or task
  - Analysis, Exploration, Learning
- Are there other high-level tasks that infovis can assist with?
  - Awareness, monitoring

Central idea

- People interpret images well
- As they say, a picture’s worth thousand words ... so use visualization for information awareness
Calm Technology

- Mark Weiser
  - “A calm technology will move easily from the periphery of our attention, to the center, and back.”

Ambient Displays

- Conveys low- to medium-priority information to people, while residing in the periphery of their attention
- Other terms sometimes used
  - Peripheral display, notification system
**Ambient Displays**

- **Purpose:**
  - Information awareness, perhaps monitoring

- **Focus:**
  - Aesthetics
    - Visually pleasing enhancement to surroundings

**Other dimensions in the space**

- **Information capacity**
  - How much info can they transmit?

- **Notification level**
  - Are they subtle or more attention-grabbing?

- **Representational Fidelity**
  - Flexibility with regard to data mappings

- **Aesthetics**
  - Visually pleasing enhancement to surroundings
Other dimensions in the space

Ambient InfoVis

- InfoVis off the desktop
- Still visually encoding information, but not for analytic purposes
  - Presenting the information in places where you’re not doing “desktop computing”
Examples

- Let’s look at some examples of ambient displays or ambient information visualizations

Dangling String

- Plastic spaghetti wire hanging from ceiling
- Hangs from motor in ceiling
- Electrically connected to ethernet cable so bits going by cause it to jiggle
- Created by artist Natalie Jeremijenko
Ambient Room

- Use variety of physical objects in office to communicate the state of relevant information
- Hiroshi Ishii’s group at MIT

Wisneski et al
CoBuild ’98

Video

Karlsruhe Projects

Web awareness

Gellersen & Schmidt
Personal Technologies ’99
Lumitouch

- Touch one picture frame, the other lights up

Information Percolator

- Fish tank with bubble controller
- Various messages can be sent in bubbles
Busmobile, Weathermobile

Mankoff et al
CHI '03

Ambient Orb

Monitor stock market data, weather, etc.

www.ambientdevices.com
Information Visualizations?

- Well, they are visually presenting information

- But perhaps not an emphasis on the *information*
  - More about peripherality, calmness, aesthetics

Other Styles

- Another set of techniques/systems focus less on aesthetics and more on the quality of information conveyance
Ticker Displays

- Animated text strings (ticker, fade, roll, blast) typically in periphery of person’s monitor

Fitzpatrick et al
CHI ’99 Extended Abstracts

McCrickard et al
IJHCS ’03

Spring 2009 CS 4460/7450

What’s Happening/The Buzz

Screen-saver or projected display using collages of images

Zhao & Stasko
AVI ’02

Eagan & Stasko
CHI ’08

Spring 2009 CS 4460/7450
**Sideshow**

- Sidebar on edge of monitor
- Provides info on weather, traffic, presence, project status, etc.
- Can author new items
- From Microsoft

Cadiz et al  
CSCW ’02

**Scope**

- Corner of the screen awareness widget to help with tasks, appts, etc.
- Glanceable awareness, more details on demand

van Dantzich et al  
AVI ’02
Encoding

Ambience
Redesign

Encoding
Round 3

Trade-off

Aesthetics  Utility
Kandinsky

- Generates aesthetic information collages
- Information Collage:
  Ambient information display of an object
- Aesthetic Template:
  Express Aesthetic concepts in visual form

Fogarty, Forlizzi & Hudson
UIST '02

System Architecture

Figure 2. Architecture of the Kandinsky System
Representative Images

- ImageConjure subsystem
  - Converts text into representative images
  - Selects from large photo/clip art collections
  - Uses a textual summary; prepared by a person
  - Scores the images; returns the best matches

ImageConjure Results

From: PhotoDisc Inc. (24,000 images) and Hemera Inc. (50,000 images)
Optimization Process

- Configuration of components (selection of information images, placement within collage)
- Uses aesthetic templates and “temperature” parameter
- 4-Layered Regions
  - Fixed visual elements-
  - Initial image selection and placement strategy
  - Evaluation criteria
  - Post-processing

Properties of Interest

Low-Level
- Color
- Texture
- Edges and Lines
- Direction
- Shape

High-Level
- Relative Contrast
- Dimensionality
- Balance
- Motion
- Stress
**Example Generation**

![Diagram of Example Generation](image)

**Summary**

- Less information conveying, more aesthetic appeal

![Summary Diagram](image)
Informative Art

- Electronic paintings—Flat panel LCDs hung on the wall
- Abstract art in which aspects of the picture change to signify underlying data values
- From Future Applications Lab, Viktoria Institute, Sweden

Redstrom et al  
DARE ’00

Skog et al  
InfoVis ’03

Design Criteria

- Communicate useful information
- Blend in with surroundings and be appealing to look at
- Minimize animation – Don’t want to draw the eye too much
Example

Mondrian

Central Station
Towards Högsbo
(final stop)
The river
(Göta älven)
Buses from
city center
Buses towards
city center

Example

Andy Warhol

Cans gradually change from asparagus soup to tomato soup to signify upcoming event
Lessons Learned

- Find info relevant to place where display is located
- Rate of change of info should be enough to promote relevance and draw interest
- Base visualization on artistic display, may support readability and promote comprehension
- Let features of info source affect visual encoding to improve memory of mapping

InfoCanvas

- Information Art—Similar approach as in Viktoria project
- Electronic painting deployed on LCDs in the environment
- Focus: User-driven views
- II group at Georgia Tech

Stasko et al
Ubicomp ’04
Revisit Trade-off

Aesthetics

Informative art

Utility

InfoCanvas

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Objectives

- Personalized
  - Display individual’s personal information
- Flexible
  - Variety of info sources and representations
- Consolidated
  - Present multiple data items on one display
- Accurate
  - Be clear, and highlight uncertainty
- Appealing
  - Fun to use, aesthetically pleasing

Hardware

LCD – bezel + picture frame
Transformations

- Slider
- Image swapper
- Appearance
- Scaler
- Populater
- Projector
Other Example Themes
Implementation

- Java application
- Data harvester classes
- Painting specified through XML file
- System establishes data->visual mapping and polls data sources to maintain current representation

```xml
<representation type="slider">
  <data get="weather" with="curtemp">
    <harvestdata>zip:30332</harvestdata>
  </data>
  <coordinate type="start">x=640</coordinate>
  <coordinate type="end">x=640</coordinate>
  <dimension>width=200/height=31</dimension>
</representation>
```

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```
42
```
Evaluation

- Information Conveyance
  - Compare InfoCanvas to web portal to text display for acquisition and memory of different information sources
  - Evaluate viewing “at a glance”
  - Empirical study with 49 participants

Plaue, Miller & Stasko
GI ’04
Displays

Web portal

InfoCanvas

Text

Information Nuggets

time of day
weather forecast

temperature forecast
traffic forecast

stock update
traffic conditions

website updates
airfare prices

baseball score update
new emails

new emails
news headline
Methodology

- Within subjects
- Participants view display for 8 seconds then receive questionnaire about state of 10 items
  - Vary order of topics on questionnaires
- Three trials with each display type

Recall Questions

What is the current time of day?
- 4:32 AM
- 7:40 AM
- 3:20 PM
- 7:55 PM

What is the lowest airfare price from Atlanta to Los Angeles?
- $330
- $292
- $160
- $99

What is the current news headline?
- Pair pleads not guilty to embezzlement
- Pair pleads guilty to obstruction charges
- Jury hung on money launderer
- Couple found not guilty on conspiracy charge

How many new emails were present?
- 22
- 16
- 1
- 0
## Results

<table>
<thead>
<tr>
<th></th>
<th>1st Trial</th>
<th>2nd Trial</th>
<th>3rd Trial</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Trial</td>
<td>5.14 (1.59)</td>
<td>5.12 (1.33)</td>
<td>5.02 (1.57)</td>
</tr>
<tr>
<td>2nd Trial</td>
<td>5.67 (1.61)</td>
<td>5.65 (1.54)</td>
<td>5.29 (1.89)</td>
</tr>
<tr>
<td>3rd Trial</td>
<td>6.27 (1.80)</td>
<td>6.22 (1.79)</td>
<td>6.31 (1.76)</td>
</tr>
</tbody>
</table>

Statistical Significance for:
- InfoCanvas over Web Portal
- Web Portal over Text-Based
- InfoCanvas over Text-Based

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**Results**

- Statistically significantly more information recalled with InfoCanvas than portal and more with portal than text
- Pictures helped
  - Participants were able to rapidly learn mappings
  - Strange mappings didn’t hurt
Evaluation

- Usage Study
  - Eight trial users ran system for a month
  - Selected own information to monitor and designed own scene from an existing theme
  - We implemented the view
  - Picture frame monitor deployed in office

Evaluation Dimensions

- Usefulness
- Personalization and flexibility
- Aesthetics
- Distraction
- Novelty and fun
- Summary impressions
Results - General

- 6 themes chosen
- 6 – 17 visual elements
- Participants easily remembered mappings
- Swapper, slider, and image display were primary transformations
- More direct than abstract mappings, but significant amount of each
- Felt it was fun and useful

Usefulness

P1: “I could just glance over and check out something without searching for it like going to Yahoo weather. It saved me time. It was quick. It was easy to learn for me, what things meant, kind of quick.”

P6: “I like the fact that I can look at it in one quick glance and get it OK, then return to what I’m doing. With a website, I can take a half hour there.”

P4: “It’s useful without being irritating...this doesn’t feel heavy. Now of course one of the reasons it doesn’t feel heavy is because it’s sort of out of my normal line of sight. It’s in a sort of natural place where when I lean back and I’m staring off so I can kind of get it. So my eyes kind of drift there through the natural course of things when I’m not particularly concentrating on something else. So it’s been positive—it’s been useful without being terribly distracting. It hasn’t been distracting at all. It’s there when I need it, but doesn’t require me clicking and mousing.”
Lessons Learned

- Ubiquitous computing technologies can operate effectively in the field
- Consolidating information is valuable
- Abstractness/symbolism can be beneficial
- “Push” technology merits reconsideration
- Personalization is important
- Better customization tools are needed

In sum...

- Info Vis is moving into lots of life, not just desk work and data analysis by experts
  - News, commerce, story-telling, sociality
  - Self-reflection
  - One way to help manage information overload
- Requires a change to evaluation techniques (what matters is changing)
- Opens new design spaces
Social InfoVis

• Whole next class on that topic

Upcoming

• Thursday
  – Social InfoVis
  – Reading
    Viegas
    Wattenberg

• Next Week
  – Project presentations
  – Will set up on Thursday