

Applying Visual Design Principles

Jeff Offutt

<http://www.cs.gmu.edu/~offutt/>

SWE 632

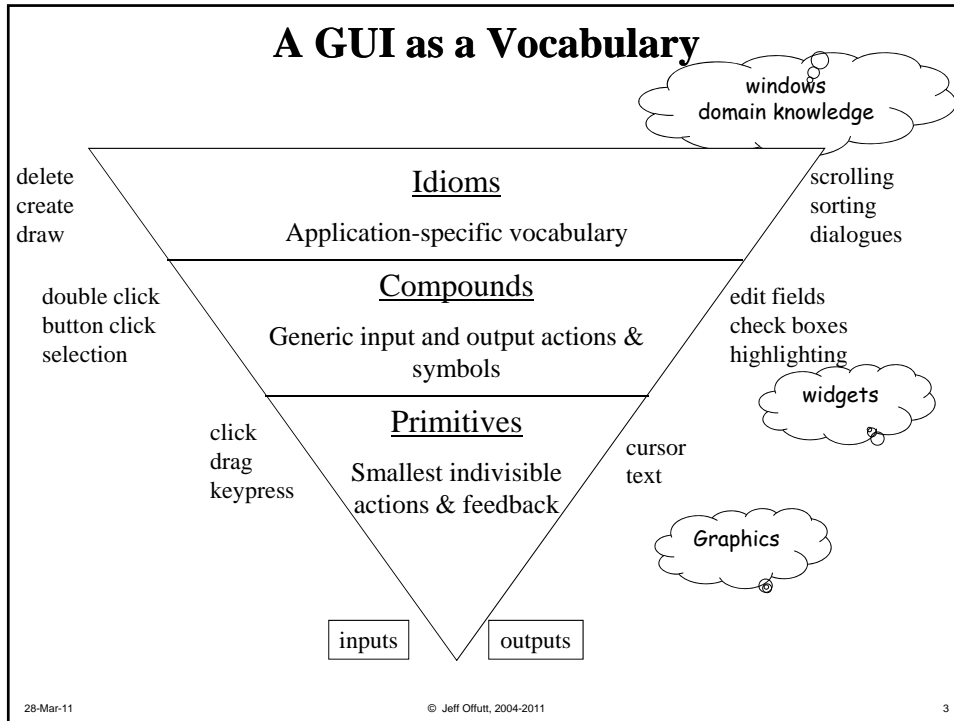
User Interface Design and Development

Cooper, Ch 13-14

Ch 13 : Metaphors, Idioms and Vocabulary

GUIs provide vocabularies

The vocabularies represent syntax that must be connected to the users' mental model



- ## Three Design Strategies
1. Implementation-centric
 2. Metaphoric
 3. Idiomatic
- Okay, a 4th ...
“idiotic”
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Implementation-Centric Design Strategy

- The interface reflects how it is built
- Natural for engineers – easiest to design
- User must understand how the software works
(high comp-semantic knowledge)
- Common in immature technologies
- Examples :
 - Early mobile phones
 - Many command languages
 - Early 20th century prediction : By 1975 80% of the people in the USA will have to work as switchboard operators
 - 1980 : By 2000 75% of the people in the USA will have to work as programmers

Both came true!
In a way ...

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Metaphoric Design Strategy

“A figure of speech in which a term or phrase is applied to something to suggest a resemblance.”

- Hit a home run
- Take that discussion off line
- A new person came on board today
- The algorithm uses divide and conquer
(For some reason, Americans love sports and war metaphors)

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Advantages and Disadvantages of Metaphors

Advantages

- Enhances learning
- Reduces errors

Disadvantages

- Reduces creativity
- Hard to come up with!
- Do not always scale well
- Some people may not get it

Cooper is much more negative than I am – I think he's trying to overcome a perceived bias in favor of metaphors

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Metaphorical Design Strategy

- The first strategy for building GUIs
- Examples :
 - Files
 - Wastebaskets
 - Desktops
- File managers work well with 3 to 4 hundred files, but not for 30 to 40 thousand (over 100,000 in my account)
- Metaphors work by subjective associations ...
but they are not always universal!

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Metaphorical Design Strategy (2)

His discussion of instinct and intuition is shallow and uninformed, but he is working very hard to get rid of a bias

Idiomatic Design Strategy

“An expression whose meaning cannot be derived from its parts”

- We learn and remember idioms easily and often enjoy it
- Examples :
 - “Kick the bucket”
 - “Cut the mustard”
 - “Bought the farm”
 - “Haste makes waste”
- As opposed to metaphors, we do not recognize and understand them immediately

Idiomatic Design Strategy (2)

- Technological designs use a very objective philosophy – we understand the whole by understanding the parts
- Idiomatic designs use a subjective philosophy – we don't really understand, we know
- Examples :
 - Windows
 - Drop down menus
 - Mouse

Use metaphors when they fit, but don't change your interface just to use a metaphor

Vocabulary Summary

Users would rather be successful than knowledgeable

Ch 14 : Visual Interface Design

- Visual elements are “words” in the language that computers use to communicate with users
- Visual elements are powerful communication devices
- But also very difficult to design well !
- Requires lots of skills :
 - Computing
 - Communication
 - Knowledge of language
 - Graphical design

Don't expect to find all those skills in one person !!

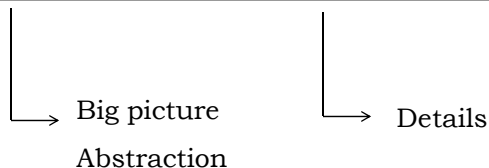
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Use of Visual Elements

Visually show what – Textually show which



- Graphic design is too much to teach in this course
- Some knowledge of visual interface design is necessary to GUI designers

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Use of Visual Elements (2)

- A visual interface is based on visual patterns
 - Icons
 - Organization
- GUIs succeed mainly because they force designers to design for the user

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Visual Interface Suggestions

- Avoid too many visual elements
- Users need to distinguish and organize elements
 - Contrast
 - Similarity
 - Layering
- Provide structure and flow
- Imagery that is cohesive and consistent
- Integrate style and functions

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Clutter

- Clutter uses up mental energy
 - Both in messy rooms and in messy UIs
- Avoid complicated visual elements
- Smaller and simpler is usually better
- Leverage: A visual element that has multiple purposes
 - An icon that indicates type **and** that can be opened

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Contrast and Layering

- Contrast helps users
 - Distinguish among active interfaces elements
 - Distinguish among passive elements
- Don't include contrast that does is not meaningful
- Active, or manipulable, controls should stand out clearly
- Spatial contrast : Put related items close to each other
 - Remember people read left-right and top-bottom
 - Users make assumptions about shape
- Layering : Putting visual elements on top of other elements
 - Use contrast to separate layers

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Provide Visual Structure and Flow

- GUI organization
 - Visual elements in groups (*PPT: icons in toolbars and screen*)
 - Groups organized into panes (*PPT: several panes*)
 - Panes organized into screens or pages (*PPT: each page in file*)
- Line things up
 - Align labels with each other: left justify
 - Line sets of controls up
 - Line up controls even across different panes
 - Follow a grid structure (GUI development tool should help)
- The flow should support the user's mental model

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Visual Structure and Flow (2)

- Elements should be symmetrical and balanced
 - Users learn faster
- Golden Section ratio: **1.6180339887...**
 - By Euclid: www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/phi.html
 - This is a balanced ratio that people feel comfortable with
 - Difficult with current computer screens
- Square proportions are not very comfortable

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Imagery

- Icons are part of a language that communicate information to users
- Function or active icons :
 - Represent both action and object
 - Metaphors may mean different things to different users
 - Don't make icons too detailed
 - Reuse icons in different parts of the interface
- Elements that behave differently should look different

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Style and Functions

- All stylistic elements should be designed together
 - Otherwise you will get a consistency nightmare
- Communication is more important than beauty
 - What's better, a well-dressed professor with a poor lecture, or a poorly dressed prof with a good lecture?

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Visual Information Design

- Tufte : Good visual design is “clear thinking made visible”
- Two problems :
 1. It is hard to display multidimensional information on a screen
 2. Screens cannot show as much information as paper

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Seven Grand Principles

1. Enforce visual comparisons
2. Show causality
3. Show multiple variables
4. Integrate text, graphics, and data into one display
5. Ensure the quality, relevance and integrity of the content
6. Show things adjacently in space, not stacked in time
7. Do not de-quantify quantifiable data

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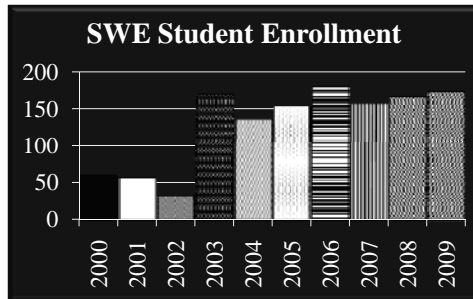
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1. Enforce Visual Comparisons

Users should be able to compare variables visually, not just textually

- Related variables
- Trends
- Before and after scenarios



2000	58
2001	55
2002	31
2003	168
2004	134
2005	142
2006	179
2007	155
2008	165
2009	171

SWE Student Enrollment

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2. Show Causality

- Show relationships between cause and effect
- Three mile Island (1979)
 - A valve was open that needed to be closed
 - Red indicated closed, green indicated open
 - The operator saw green, thought “okay,” and didn’t close the valve for several crucial seconds ...
 - Current control stations show a picture of the valve
- Challenger disaster (1986)
 - O-rings failed, causing the shuttle to blow up on launch
 - O-rings failed because of a deep freeze
 - Better charts could have clarified the causality of temperature and O-ring failures

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3. Show Multiple Variables

- If data is affected by multiple variables that are related, they should all be visible
- Users should be able to hide some of the variables

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4. Integrate Text, Graphics, and Data

- Pictures give an overview, but text and data give precision
- Simply sticking both on-screen isn't enough, because users may have a hard time connecting them

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5. Ensure Quality, Relevance and Integrity

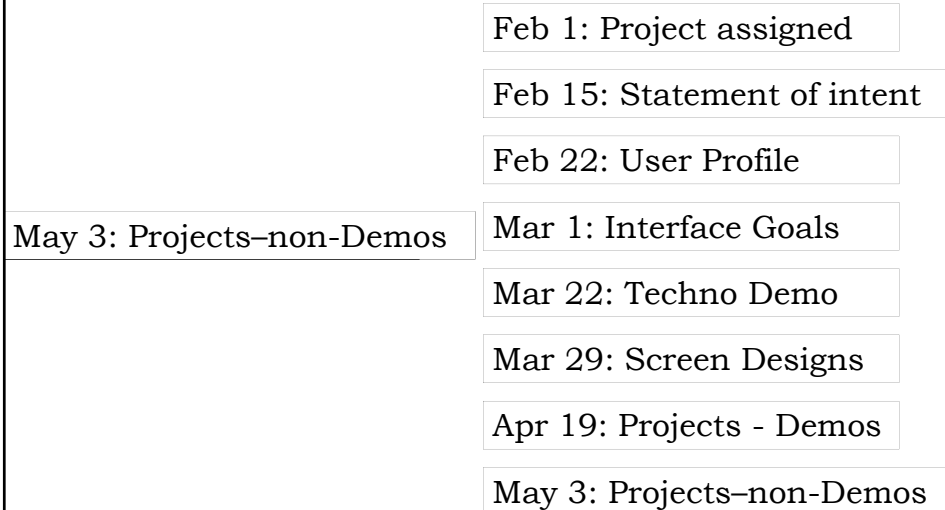
- Don't show data just because it's available
- Consider the users' goals
- Display information or data only if it supports those goals
- Incorrect or unneeded data :
 - Slows users down
 - Damages their trust
 - Increases errors on the part of users

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6. Show Things Adjacently in Space



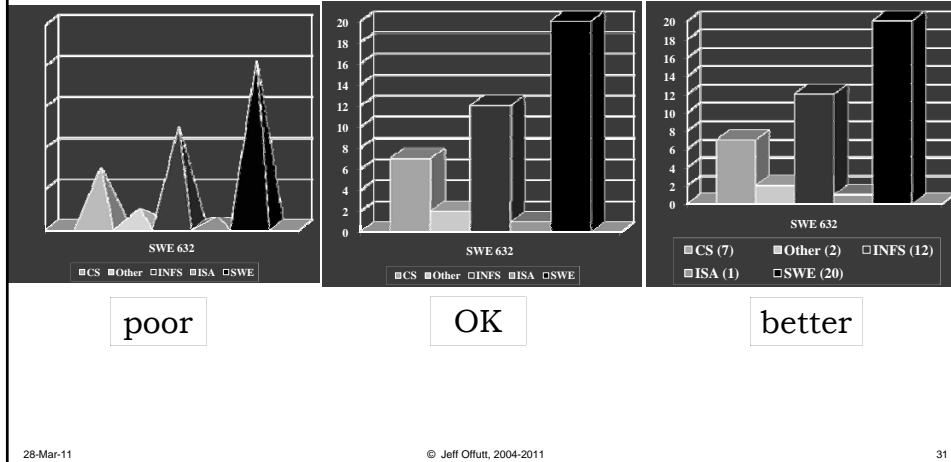
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7. Do Not De-quantify Quantifiable Data

Charts are good, but the numbers need to be available



Visual Element Summary

A visual interface must be based on visual patterns