

# Making the Web More Inclusive With Adaptive User Interfaces

Krzysztof Z. Gajos



**HARVARD**

**School of Engineering  
and Applied Sciences**











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v 1.0



v 2.0



v 3.0



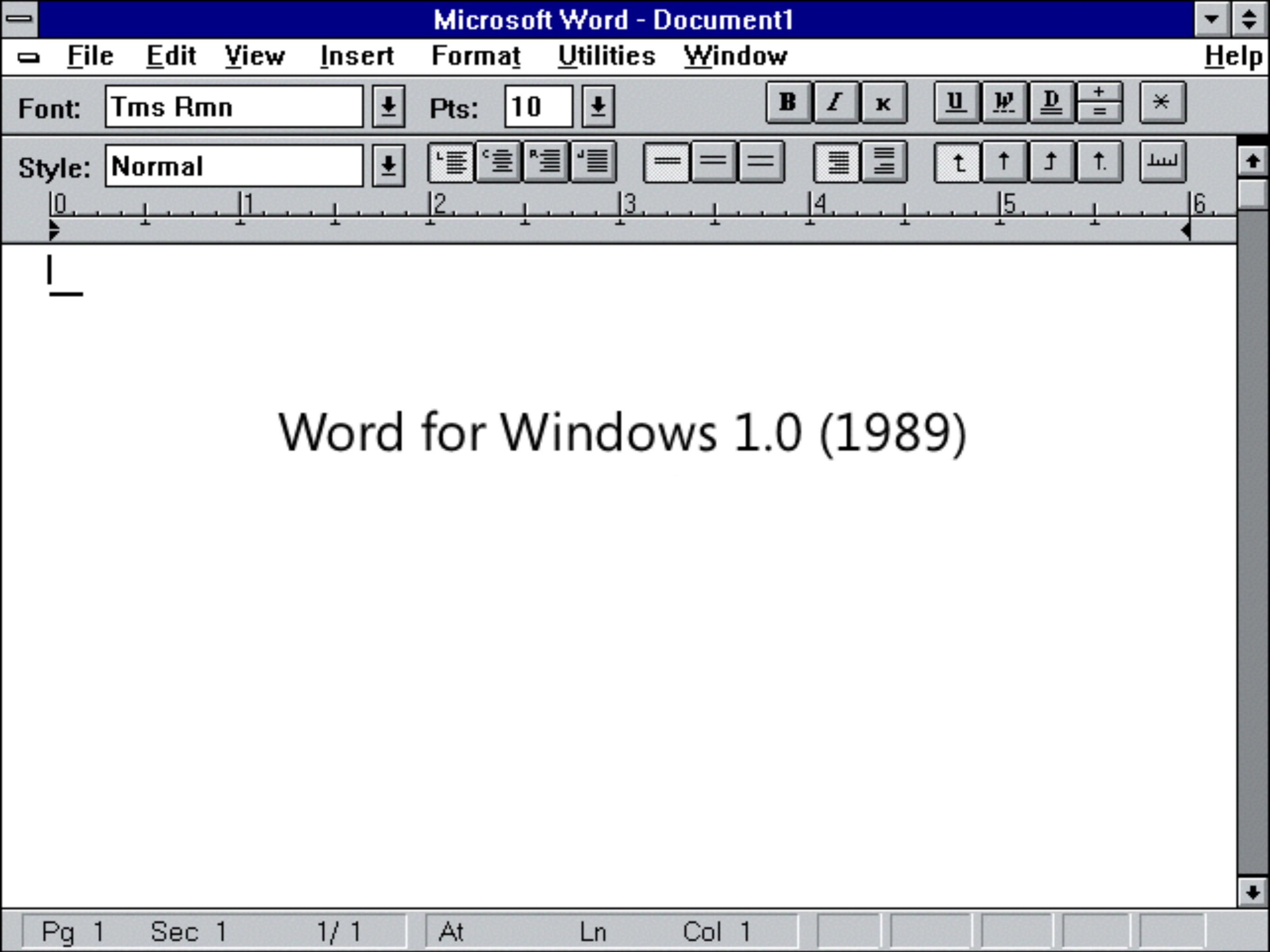
v 4.0



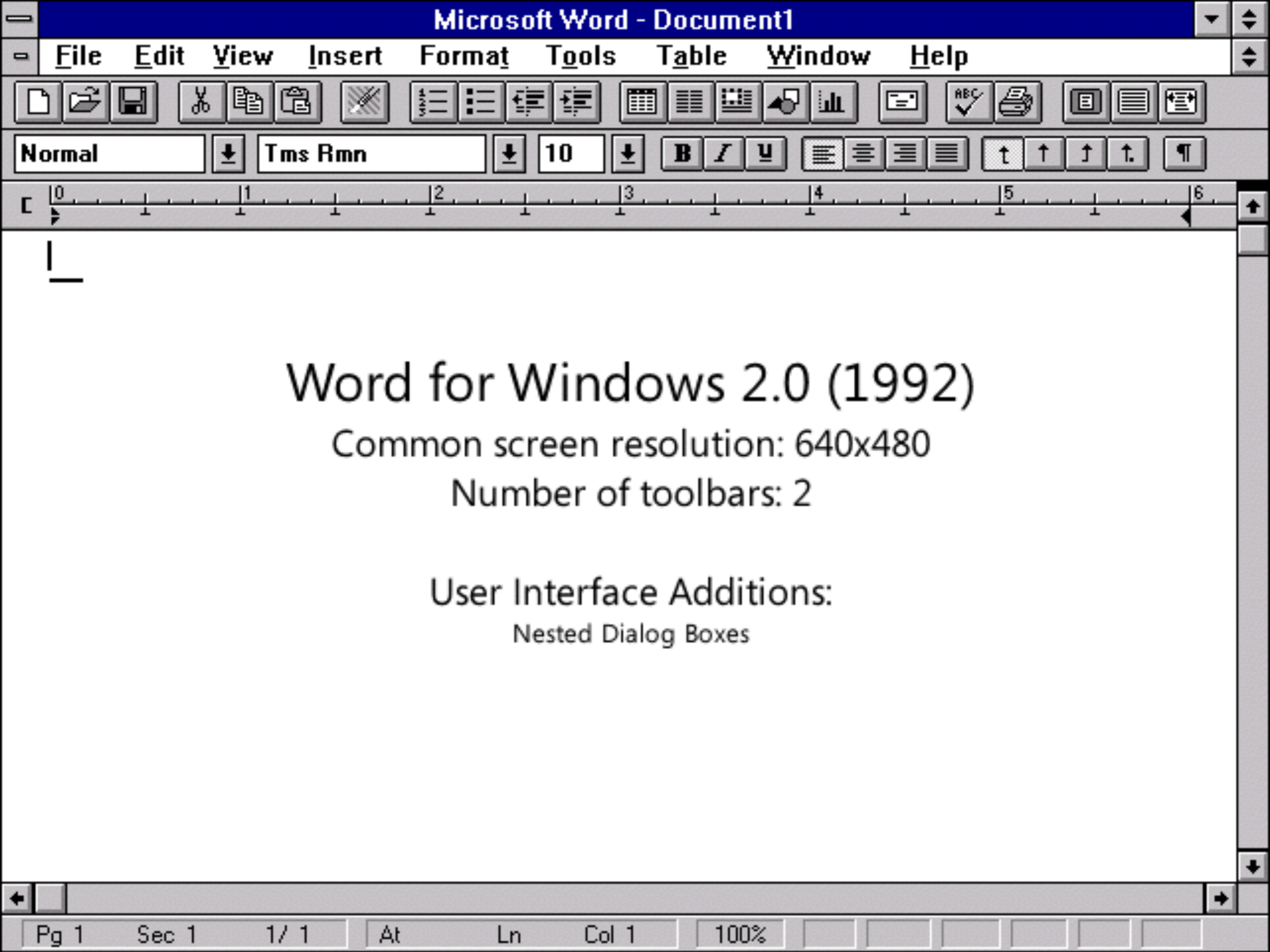




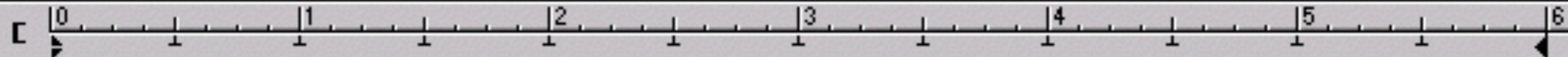




Word for Windows 1.0 (1989)



Normal Tms Rmn 10 B I U



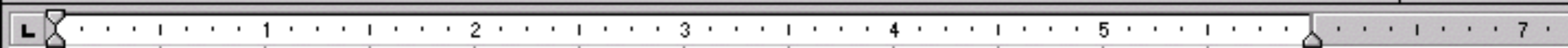
# Word for Windows 2.0 (1992)

Common screen resolution: 640x480

Number of toolbars: 2

## User Interface Additions:

Nested Dialog Boxes



# Microsoft Word 6.0 (1994)

Common screen resolution: 800x600

Number of toolbars: 8

## User Interface Additions:

- Right-click contextual menus
- Tooltips
- Tabbed dialog boxes
- Toolbars on bottom of screen
- Wizards



Microsoft Word 95 (1995)  
 Common screen resolution: 800x600  
 Number of toolbars: 9

### User Interface Additions:

- Red-squiggle spell checking
- IntelliSense ("Auto" features)



Normal Garamond

Spelling and Grammar... F7

Language Word Count... AutoSummarize... AutoCorrect... Look Up Reference...

Track Changes Merge Documents... Protect Document...

Mail Merge... Envelopes and Labels... Letter Wizard...

Macro Templates and Add-Ins... Customize... Options...

Set Language... Thesaurus... Shift+F7 Hyphenation...

100%

# RICH ANDREWS

Click **here** and type objective]

## EXPERIENCE

1990–1994 Arbor Shoe Southridge, SC

*National Sales Manager*

- Increased sales from \$50 million to \$100 million.
- Doubled sales per representative from \$5 million to \$10 million.
- Suggested new products that increased earnings by 23%.

1985–1990 Ferguson and Bardell Southridge, SC

*District Sales Manager*

- Increased regional sales from \$25 million to \$350 million.
- Managed 250 sales representatives in 10 Western states.
- Implemented training course for new recruits — speeding profitability.

1980–1984 Duffy Vineyards Southridge, SC

*Senior Sales Representative*

Tables and Borders

1/2

Table icons: grid, borders, shading, text direction, etc.



Draw AutoShapes

Click and drag to create table and to draw rows, columns and borders.

- Spelling and Grammar... F7
- Language
- Word Count...
- AutoSummarize...
- AutoCorrect...
- Look Up Reference...
- Track Changes
- Merge Documents...
- Protect Document...
- Online Collaboration
- Mail Merge...
- Envelopes and Labels...
- Letter Wizard...
- Macro
- Templates and Add-Ins...
- Customize...
- Options...

# Contents

<b>Introduction</b>	<b>i</b>	<b>How To Create a Document</b>	<b>4</b>
		<b>More Template Tips</b>	<b>4</b>
<b>CHAPTER 1</b>		<b>CHAPTER 3</b>	
<b>How To Customize This Manual</b>	<b>1</b>	<b>How To Customize This Manual</b>	<b>1</b>
<b>About the "Picture" Icons</b>	<b>1</b>	<b>About the "Picture" Icons</b>	<b>1</b>
<b>Section Breaks are Key</b>	<b>2</b>	<b>Section Breaks are Key</b>	<b>2</b>
<b>About Pictures and Captions</b>	<b>2</b>	<b>About Pictures and Captions</b>	<b>2</b>
<b>How To Generate a Table of Contents</b>	<b>3</b>	<b>How To Generate a Table of Contents</b>	<b>3</b>
<b>How To Create an Index</b>	<b>3</b>	<b>How To Create an Index</b>	<b>3</b>
<b>How To Change Headers and Footers</b>	<b>3</b>		
<b>How To Save Time in the Future</b>	<b>4</b>	<b>CHAPTER 3</b>	
<b>How To Create a Document</b>	<b>4</b>		





Document1 - Microsoft Word

File Edit View Insert Format Tools Table Window Help

Type a question for help

100% Read

Table Columns Times New Roman 10 B I U

<Click Recount to view> Recount

Value1	Value2	Value3	Value4
--------	--------	--------	--------

Search Results

30 results from Office Online

- Update an index, table of contents, table of figures, or table of authorities  
Help > Tables of Contents, Index, and Tables of Figures
- Change the appearance of a table of contents, index, table of authorities, or table of figures  
Help > Tables of Contents, Index, and Tables of Figures
- Delete an index, table of authorities, or table of figures  
Help > Tables of Contents, Index, and Tables of Figures
- Split a table  
Help > Tables
- Table of Contents II: Advanced TOCs, long documents, and other tables  
Training > Word

Search

Microsoft Office Online

tables

Can't find it?

Page 1 Sec 1 1/1 At 1.1" Ln 2 Col 1 REC TRK EXT OVR

Microsoft Office Word ...

Change the appearance of a table of contents, index, table of authorities, or table of figures

Show All

- On the **Insert** menu, point to **Reference**, click **Index and Tables**, and then click the tab you want.
- In the **Formats** box, click **From template**, and then click **Modify**.
- In the **Styles** box, click the style you want to change, and then click **Modify**.
- To add the new style definition to your template, select the **Add to template** check box.
- Under **Formatting**, select the options you want.

Notes

- To change the appearance of a table of contents in a Web frame, you must first position the insertion point inside the frame that contains the table of contents. To change the appearance of a table of contents in a Web frame that uses hyperlinks, change the properties of the hyperlink style.
- To edit the text of an individual entry, locate the source of the entry, modify it, and then update the entire table of contents, index, table of authorities, or table of figures.

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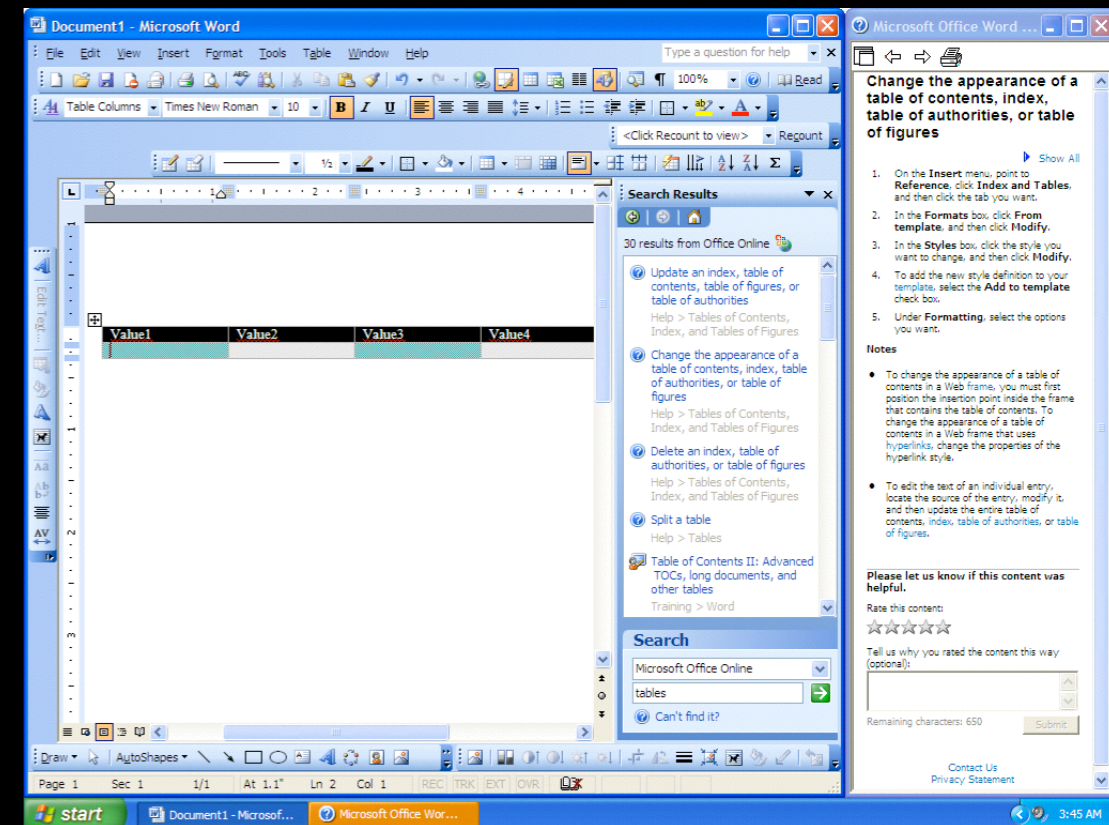
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# What Can We Do About This?

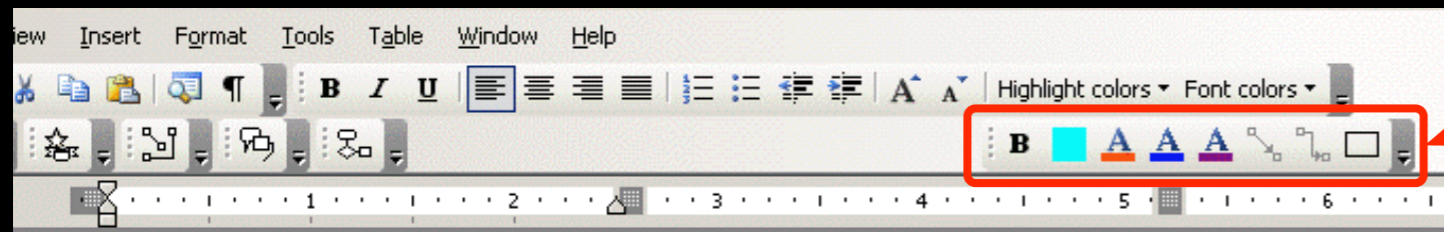
- Customization
- User interface agents
- Adaptive user interfaces



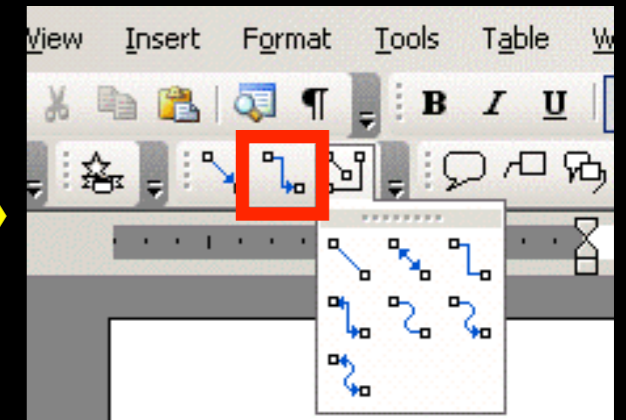
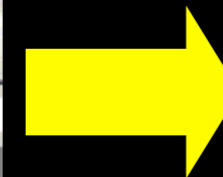
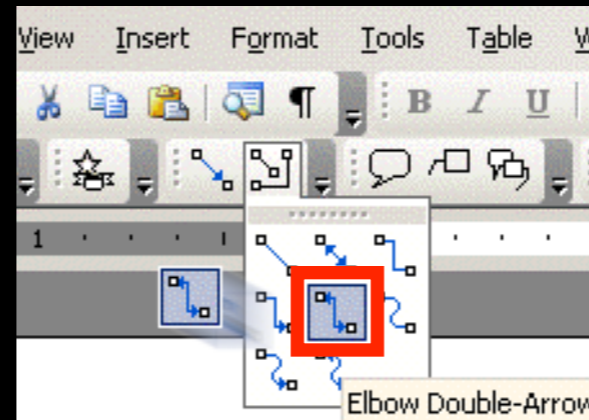
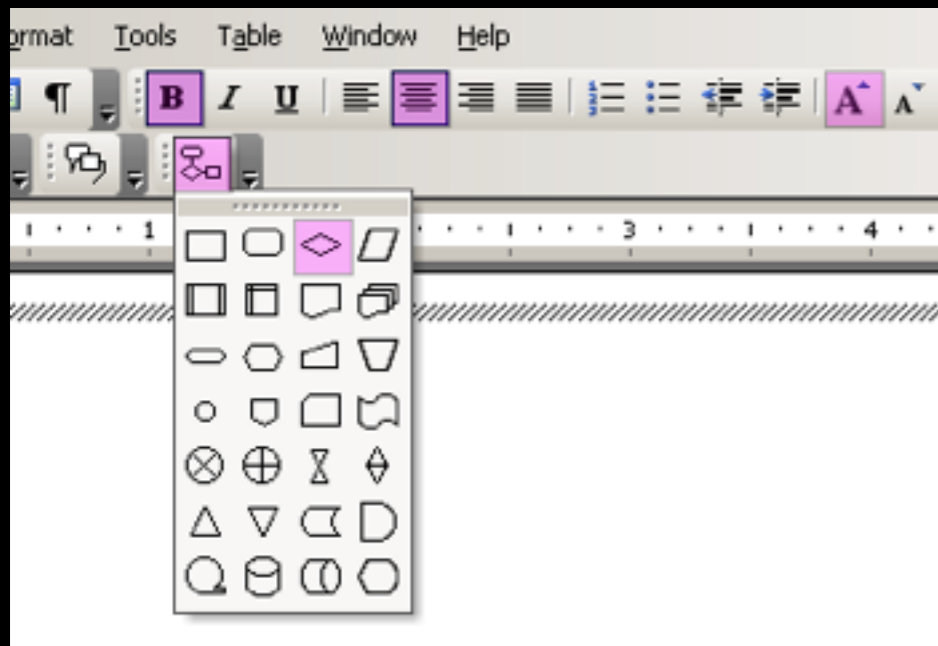
# Adaptive user interfaces

# Adaptive user interfaces

## 1. Exploring the Design Space of User Interfaces That Adapt to What Users Do

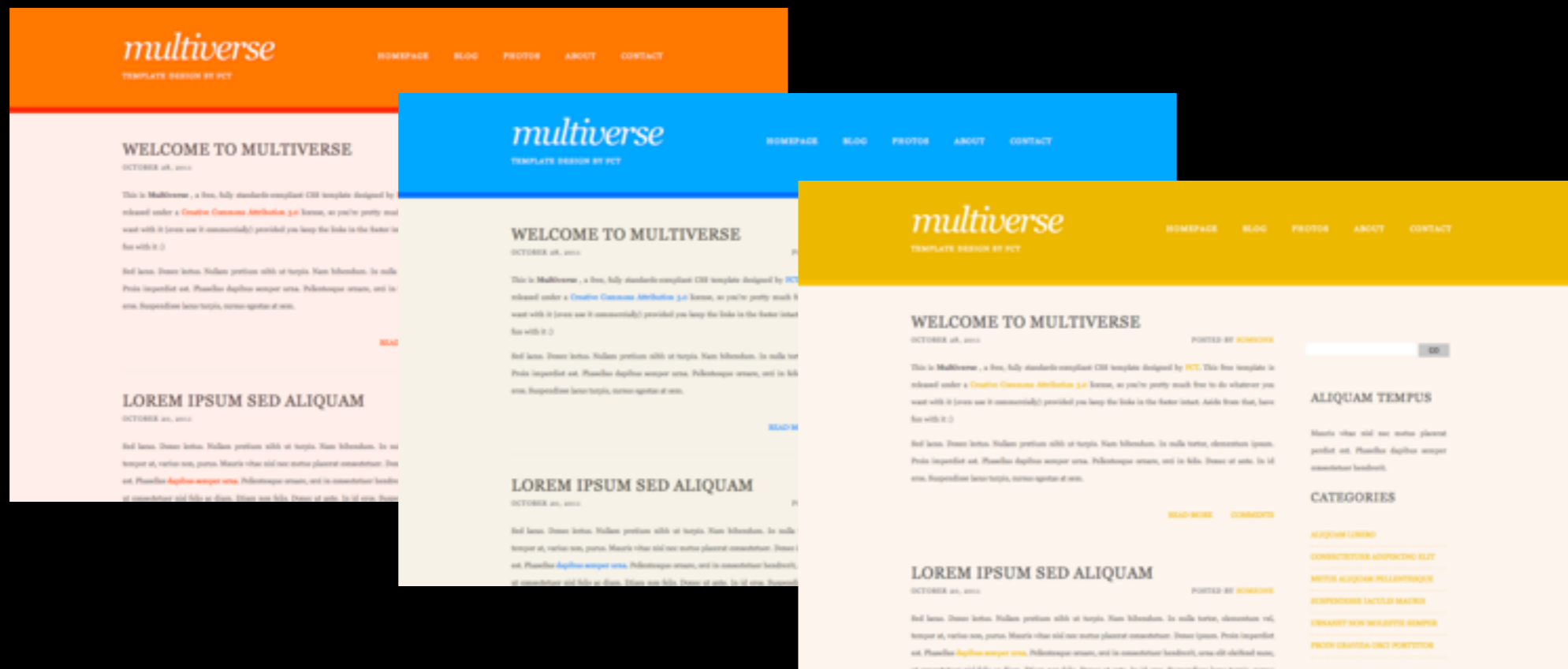


Adaptive toolbar



# Adaptive user interfaces

1. Exploring the Design Space of User Interfaces That Adapt to What Users Do
2. SPR Web: Adapting to Users' Color Vision Abilities



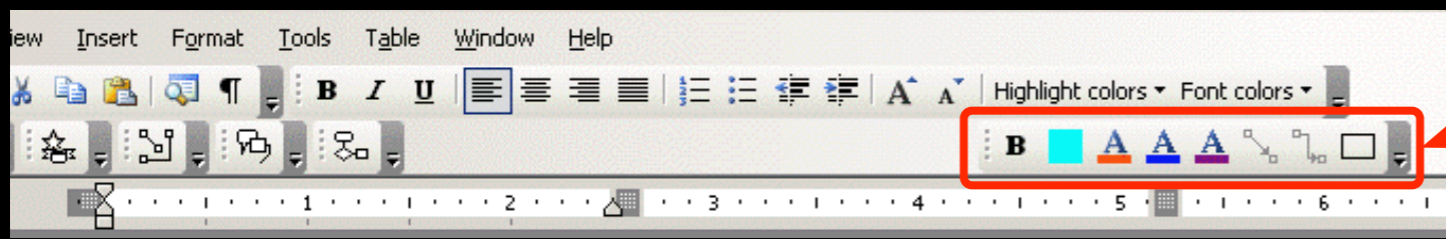
# Adaptive user interfaces

1. Exploring the Design Space of User Interfaces That Adapt to What Users Do
2. SPR Web: Adapting to Users' Color Vision Abilities
3. SUPPLE: Adapting to Users' Motor Abilities

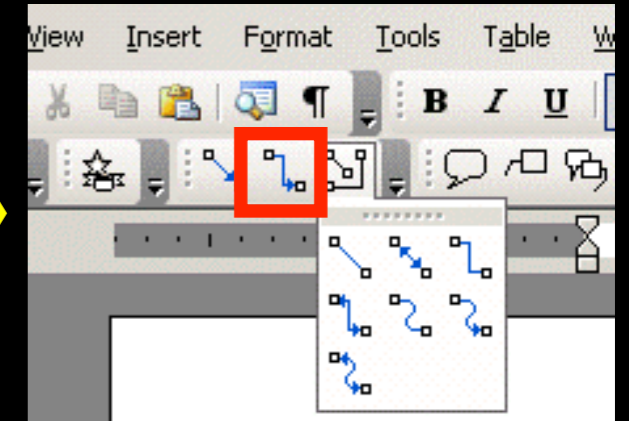
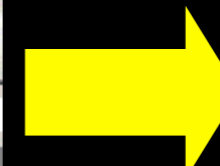
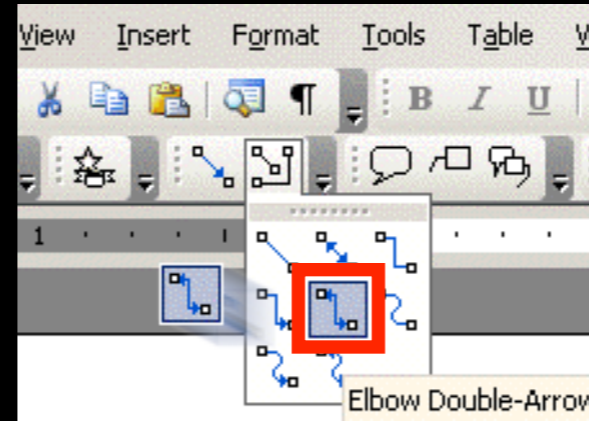
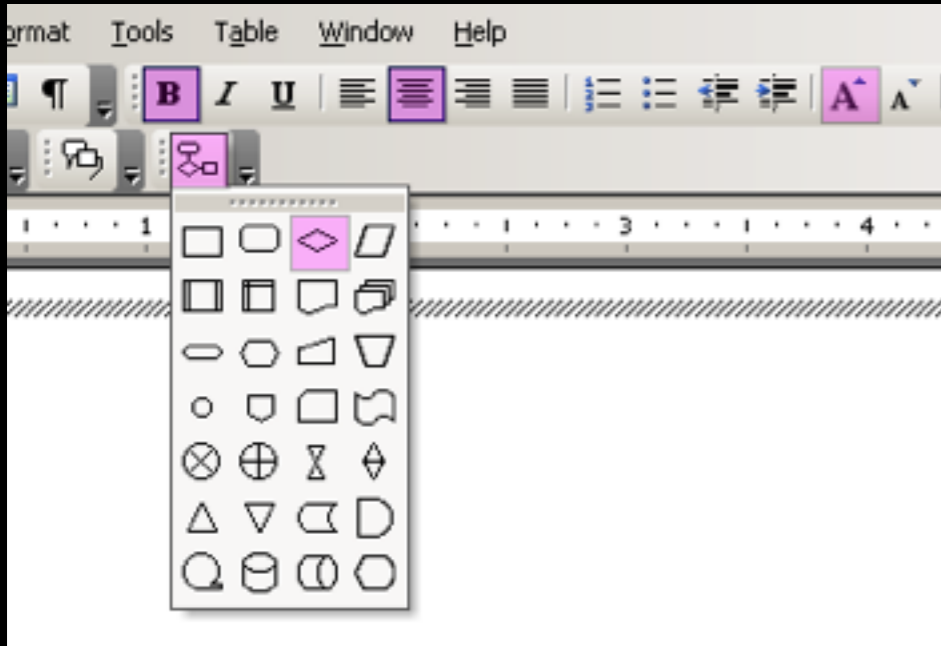


# Part II: Synthesis

- Traditional one-size-fits-all design inevitably leads to discrimination. Adaptive User Interfaces can democratize access to digital resources.
- To succeed, we need to empower designers and programmers to use more powerful abstractions in UI development



Adaptive toolbar



# Exploring the Design Space of User Interfaces That Adapt to What Users Do

with Mary Czerwinski, Desney Tan, Daniel Weld, Kate Everitt





BEN SHNEIDERMAN

# *Direct Manipulation vs Interface Agents*



PATTIE MAES

Excerpts from debates  
at IUI 97 and CHI 97

Intelligent User Interfaces can save time and effort

Intelligent User Interfaces will confuse and frustrate users



**BEN SHNEIDERMAN**



**PATTIE MAES**

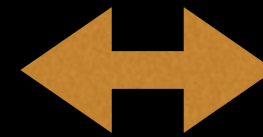
**HCI**

**AI**

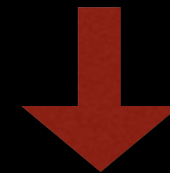
- Greenberg and Witten [1985]



- Trevellyan and Browne [1987]



- Mitchell and Shneiderman [1989]



- Sears and Shneiderman [1994]



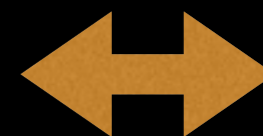
- McGrenere, Baecker and Booth [2002]



- Findlater and McGrenere [2004]



- Tsandilas and shraefel [2005]



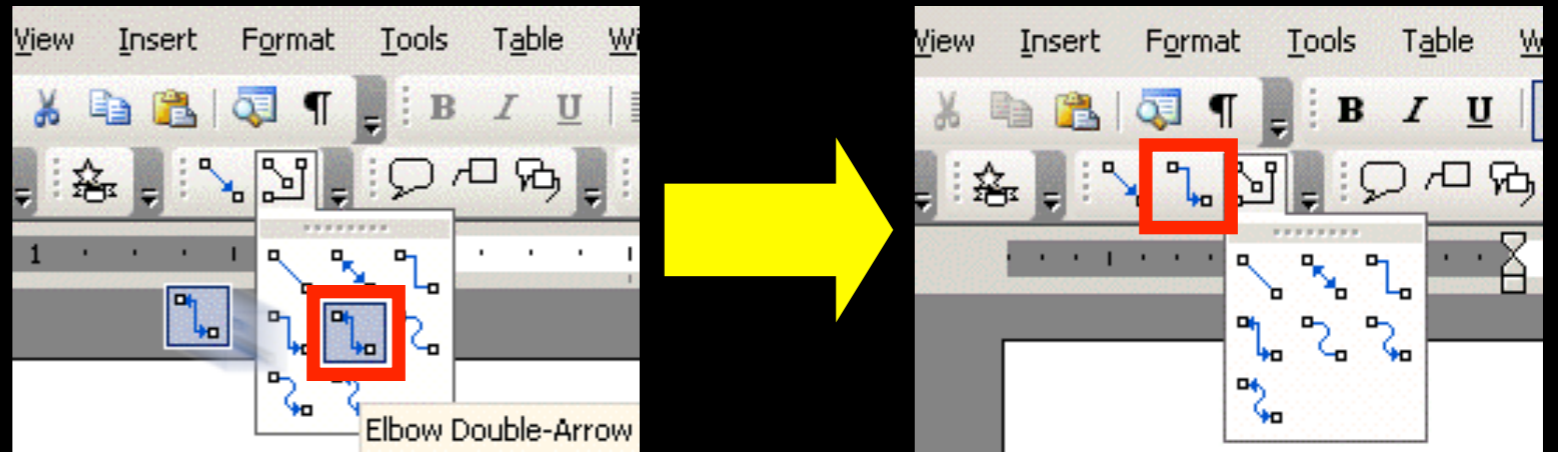
# The Split Interface



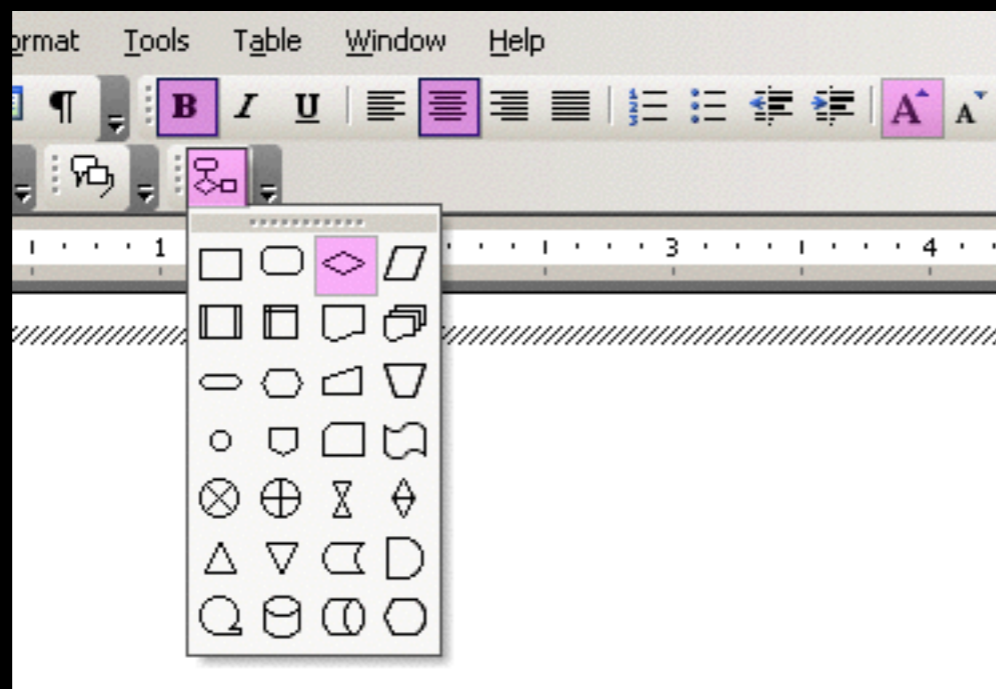
Adaptive toolbar

based on [Sears & Shneiderman, 1994]

# The Moving Interface



# The Visual Popout Interface



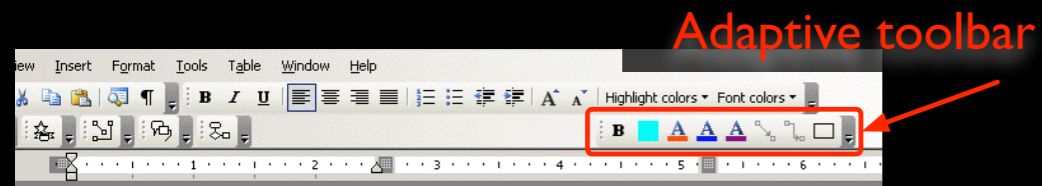
[Gajos, et al., AVI'06]

# **Mapping the Design Space for Adaptive User Interfaces: The Good, the Bad, and the Ugly**

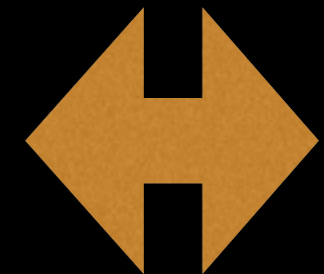
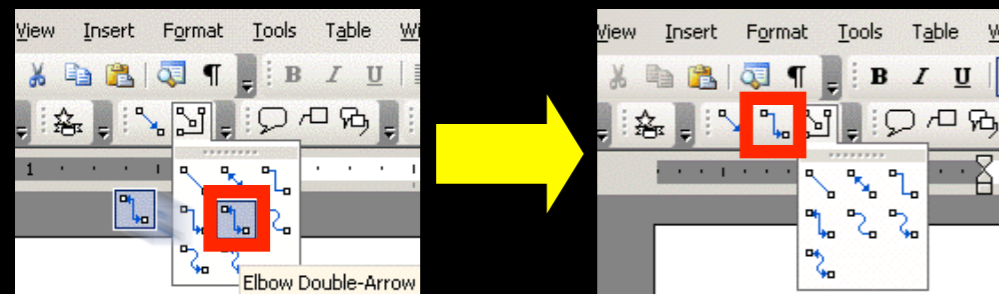
Satisfaction?

Performance?

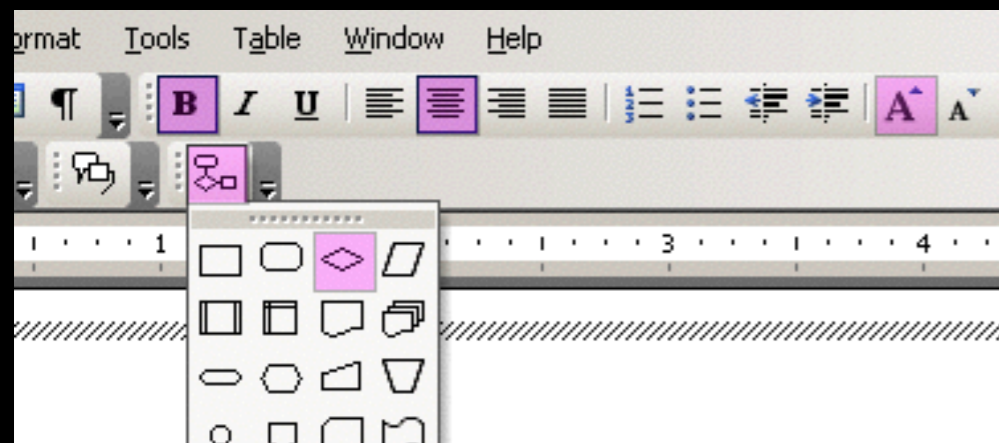
## Split Interface



## Moving Interface

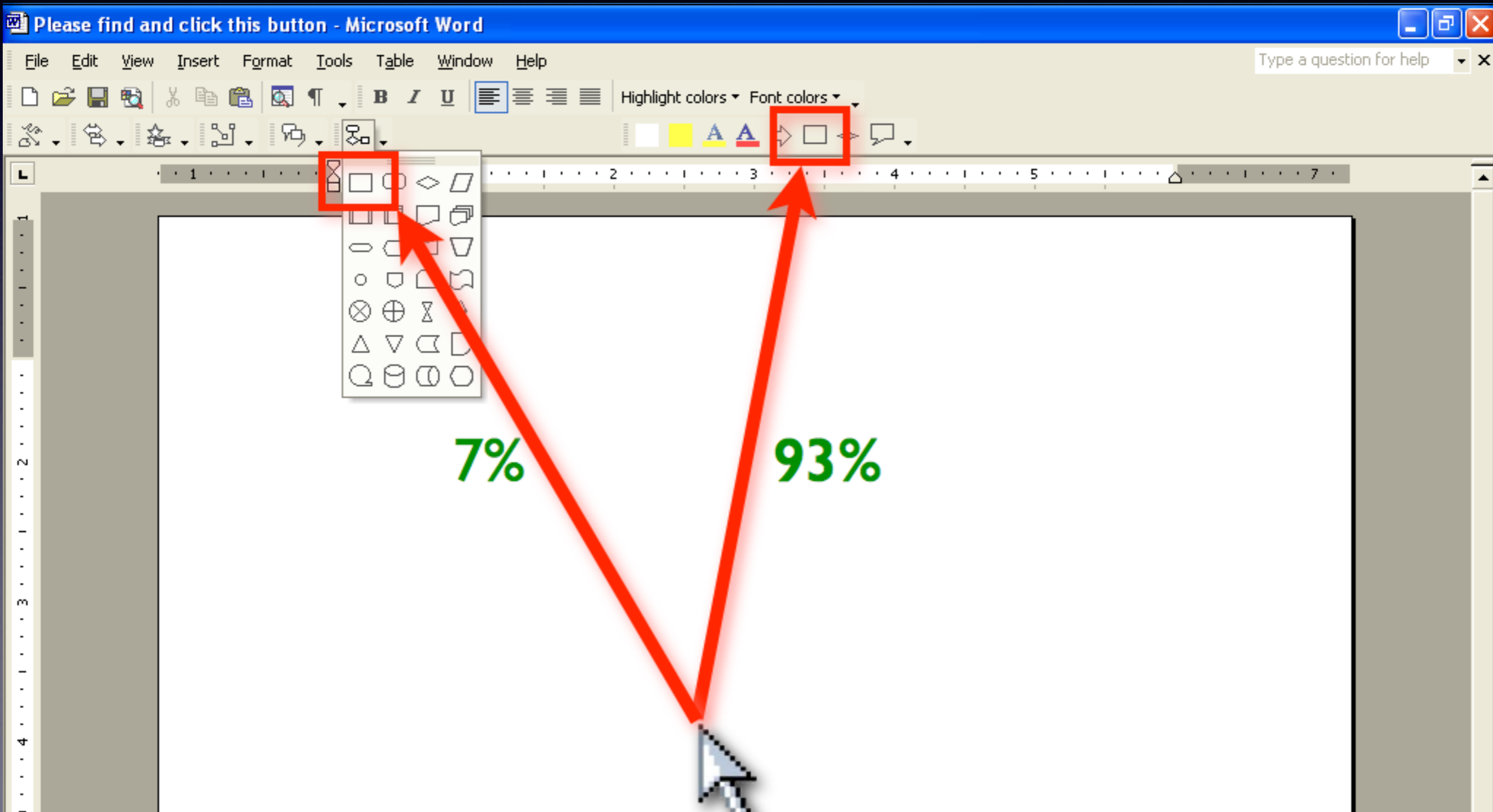


## Visual Popout Interface

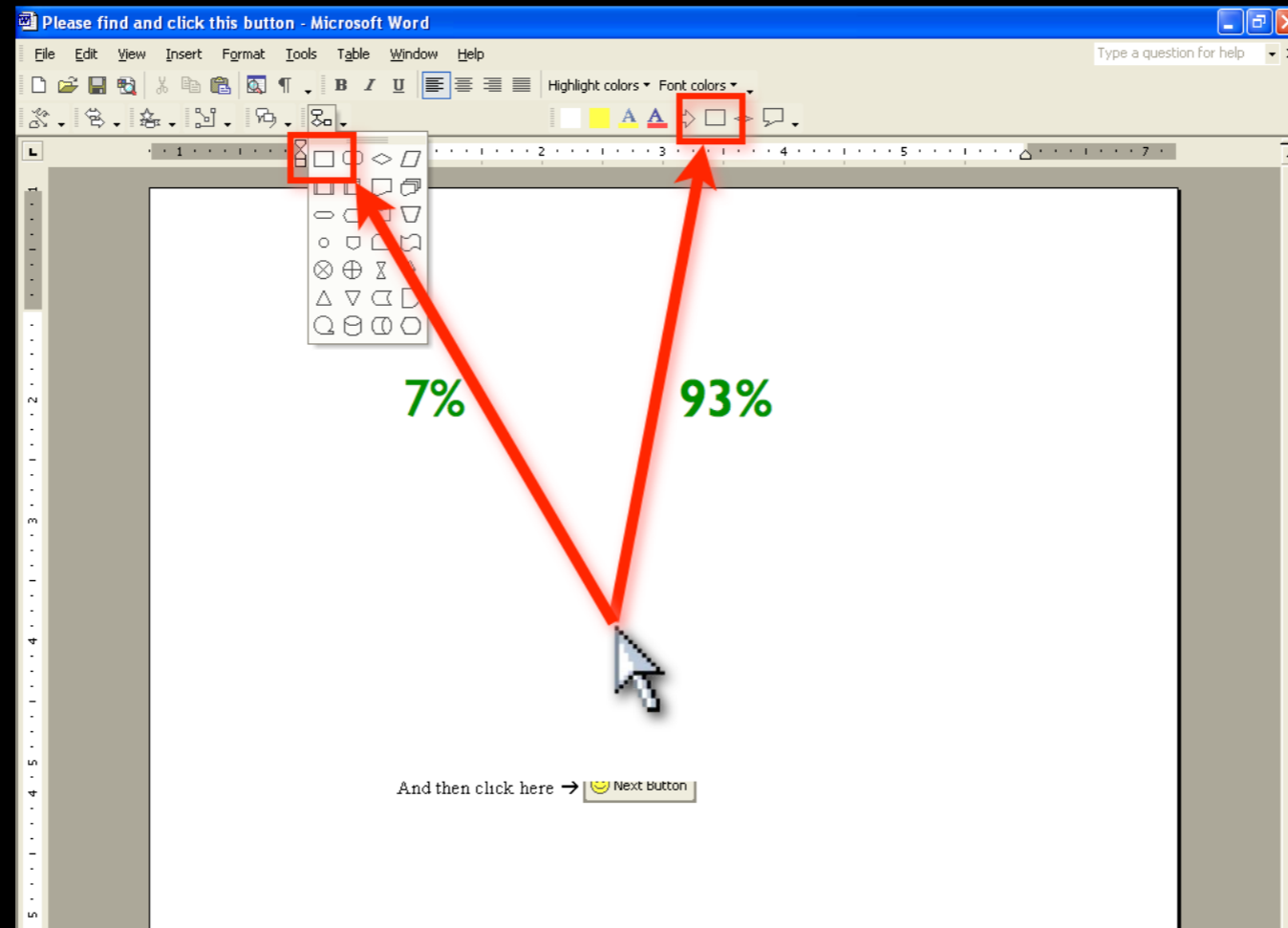


[Gajos, et al., AVI'06]

# What makes Split Interfaces work?



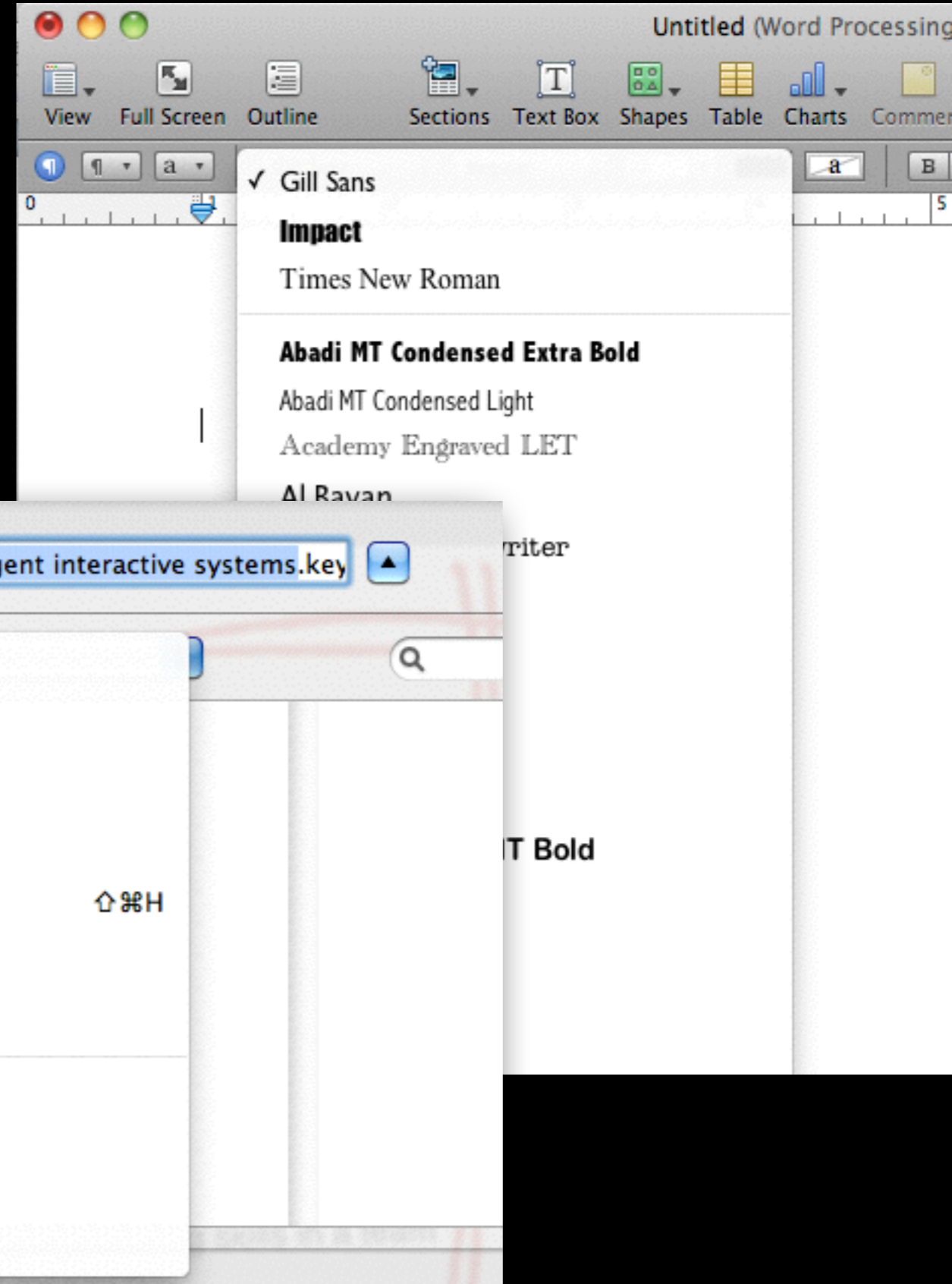
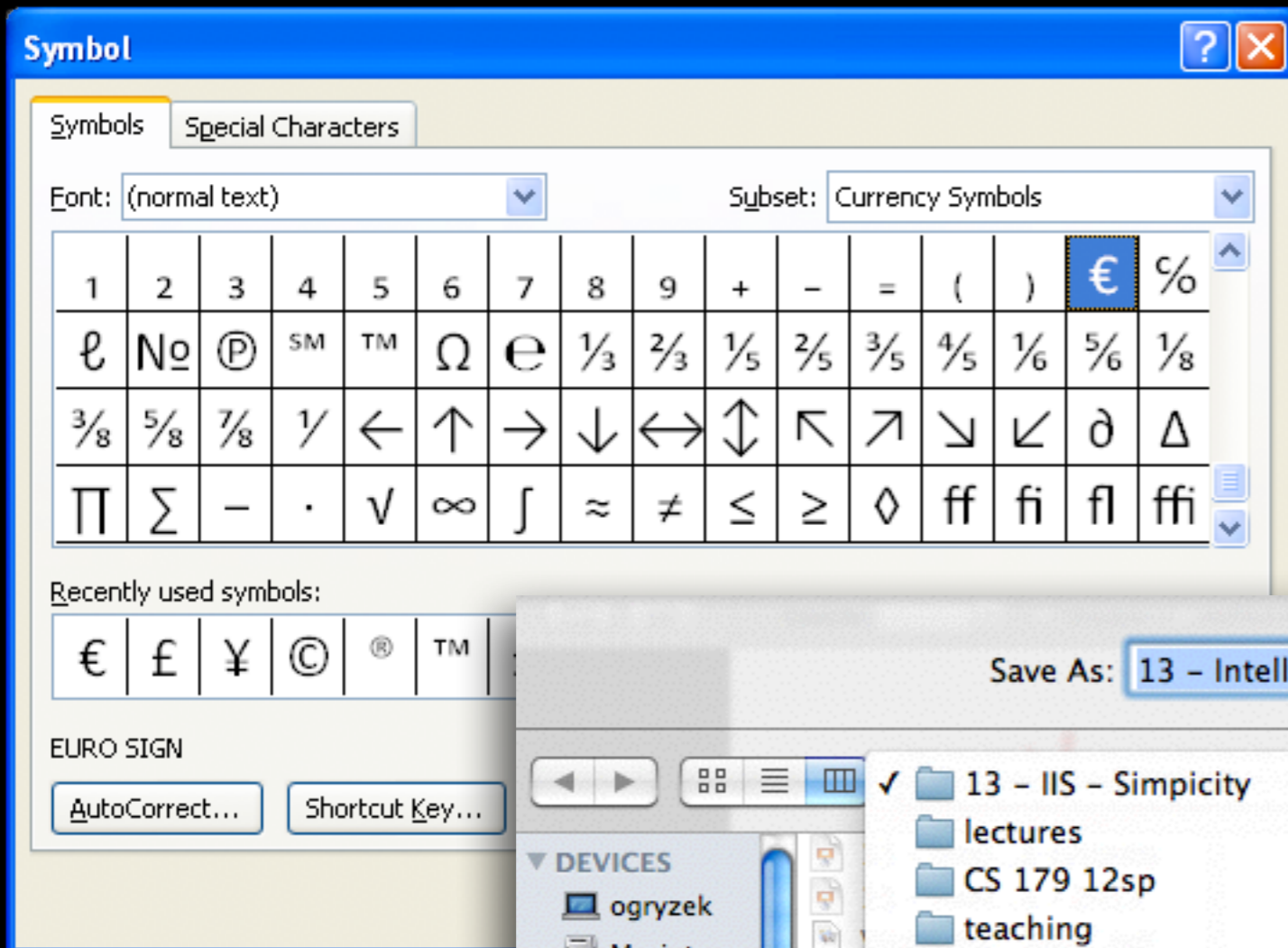
# What makes Split Interfaces work?



- Use of adaptive mechanism is optional
- Minimal cost of incorrect prediction



# Split Interfaces in Real World



# Exploring the Design Space of User Interfaces That Adapt to What Users Do

- User interfaces that adapt continuously to what users do can improve both performance and satisfaction
- Split Interfaces are a particularly effective design pattern:
  - Use of adaptive mechanism is optional
  - Minimal cost of incorrect prediction



Adaptive toolbar

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### ALIQUAM TEMPUS

Mauris vitae nisl nec metus placerat perdit est. Phasellus dapibus semper ornatur hendrerit.

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# SPR Web: Subjective Response—Preserving Recoloring Tool for Websites

David Flatla  
Katharina Reinecke  
Carl Gutwin  
Krzysztof Gajos





# redlusciouslips

everything fabulous about beauty

## 7 things ... about Olay's Advanced Daily Moisturiser with Cooling Essence

comments (2)

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7 things ... about olay's advanced daily moisturiser with cooling essence  
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art in beauty: holton rower x dior  
just a little bit more with benefit hervana  
that fine line - maybelline hypersharp liner  
look fabulous online!  
red of the day - burberry lip cover soft satin lipstick in brick red (19)  
my origins experience - made fabulous with plantscription!  
flawlessly ... with shiseido perfect refining foundation

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everything fabulous about beauty

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# redusciouslips

everything fabulous about beauty

## 7 things ... about Olay's Advanced Daily Moisturiser with Cooling Essence

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[that fine line - maybelline hypersharp liner](#)  
[look fabulous online!](#)  
[red of the day - burberry lip cover soft satin lipstick in brick red \(19\)](#)  
[my origins experience - made fabulous with plantscription!](#)  
[flawlessly ... with shiseido perfect refining foundation](#)

Ads

**It is not sufficient to make access  
possible**

**Access also has to be equitable**



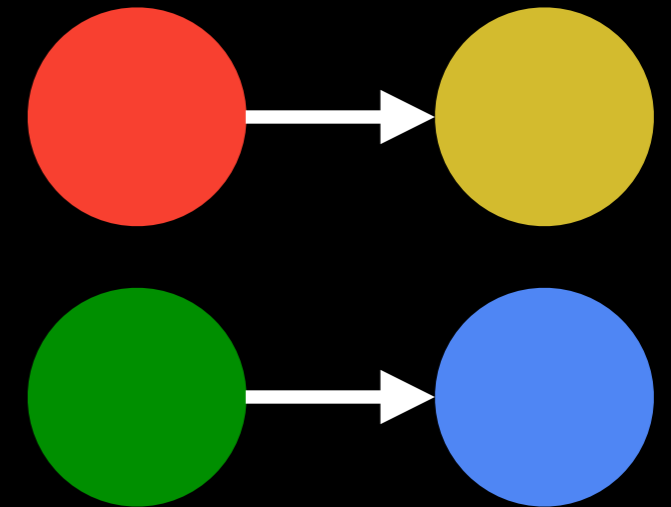
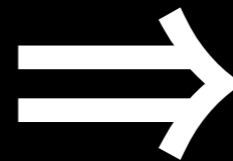
# Recoloring Problem



Original image



Individual  
color  
perception  
model

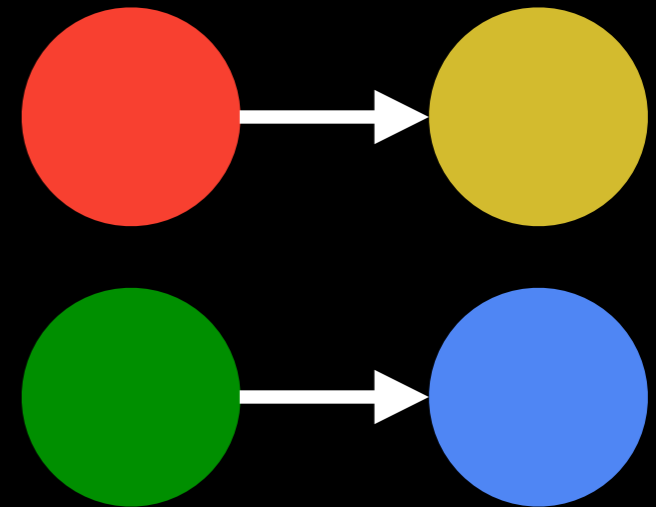
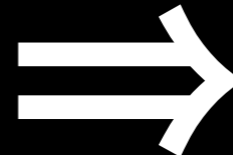


Color mapping

# Recoloring Problem



+

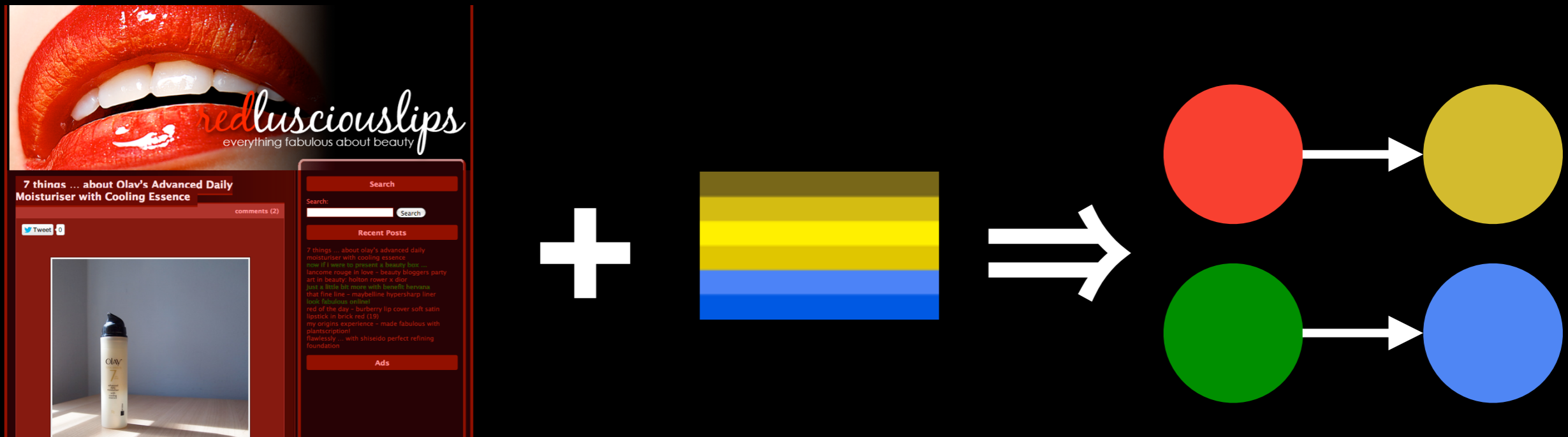


## Objective function components:

- Preserve Differentiability
- Naturalness

} Prior work

# Recoloring Problem

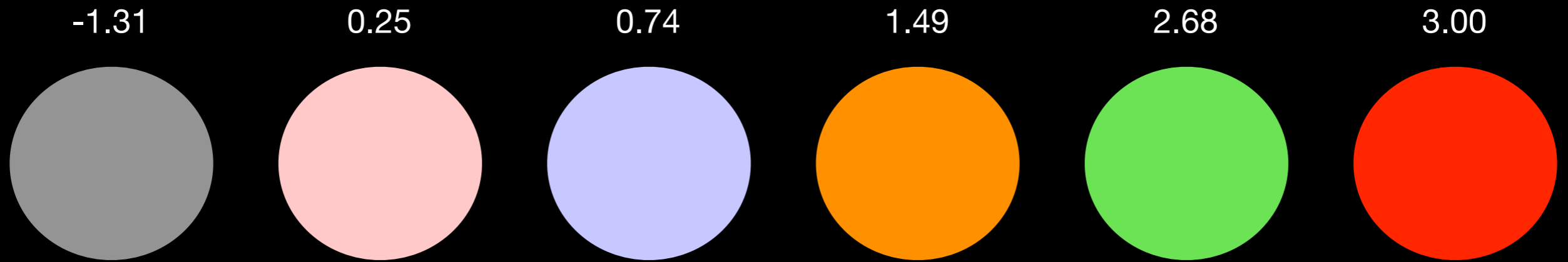


## Objective function components:

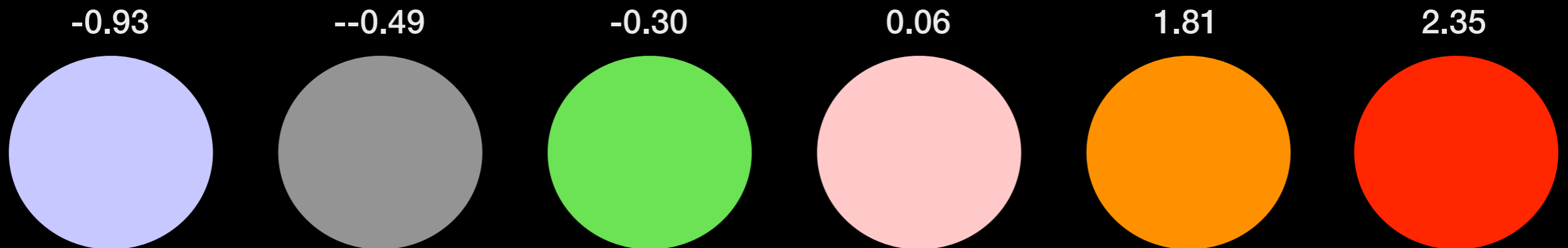
- Preserve Differentiability
- Naturalness
- Preserve Subjective Response
- Preserve Subjective Response Differentiability

SPR  
Web

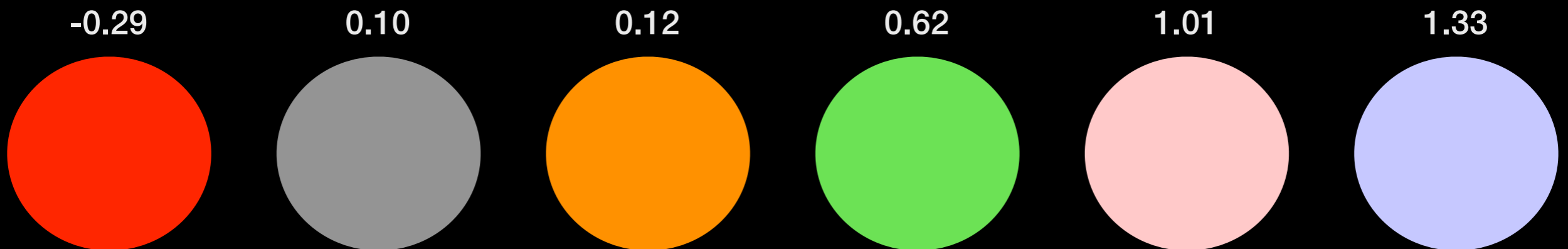
# Activity: passive (-) to active (+)



# Temperature: cool (-) to warm (+)



# Weight: heavy (-) to light (+)

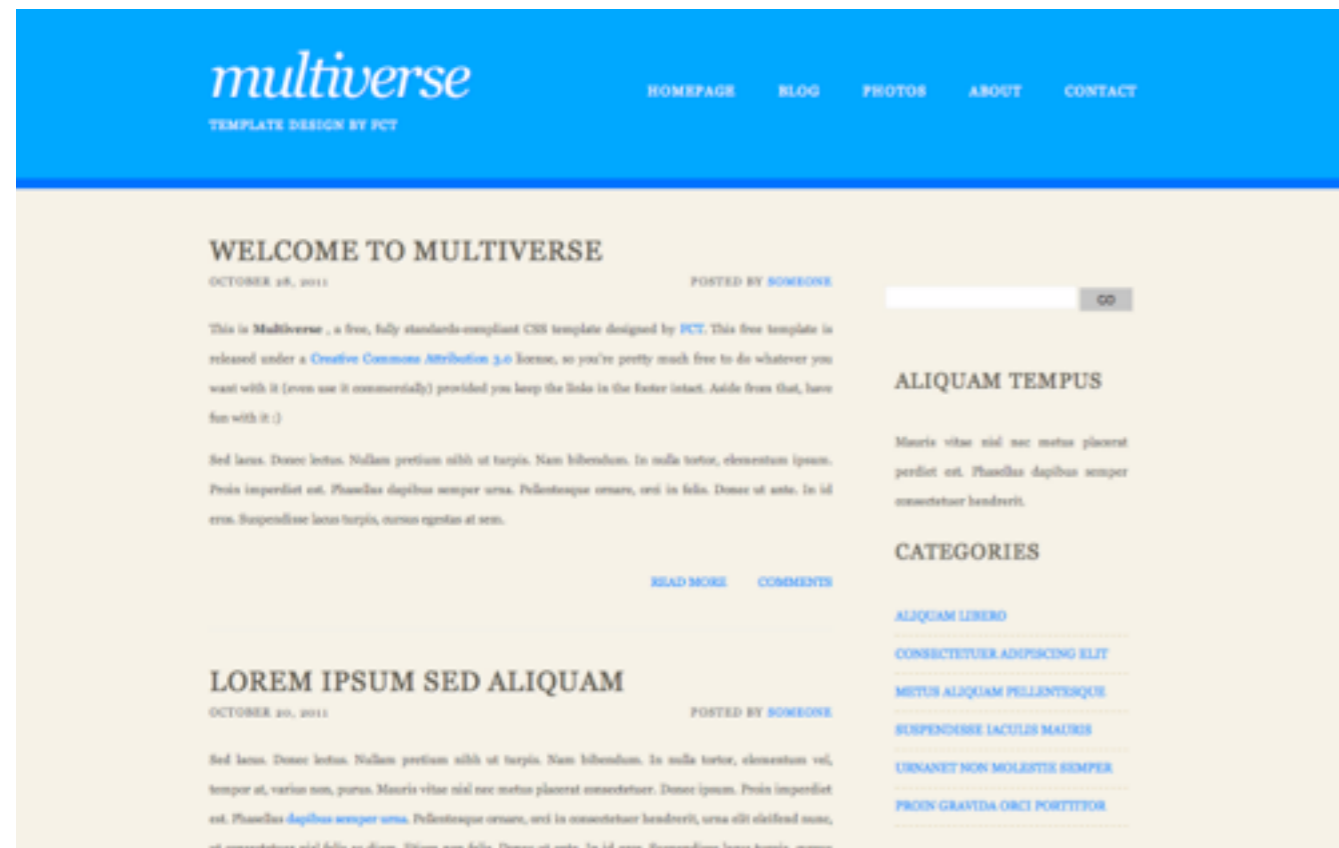
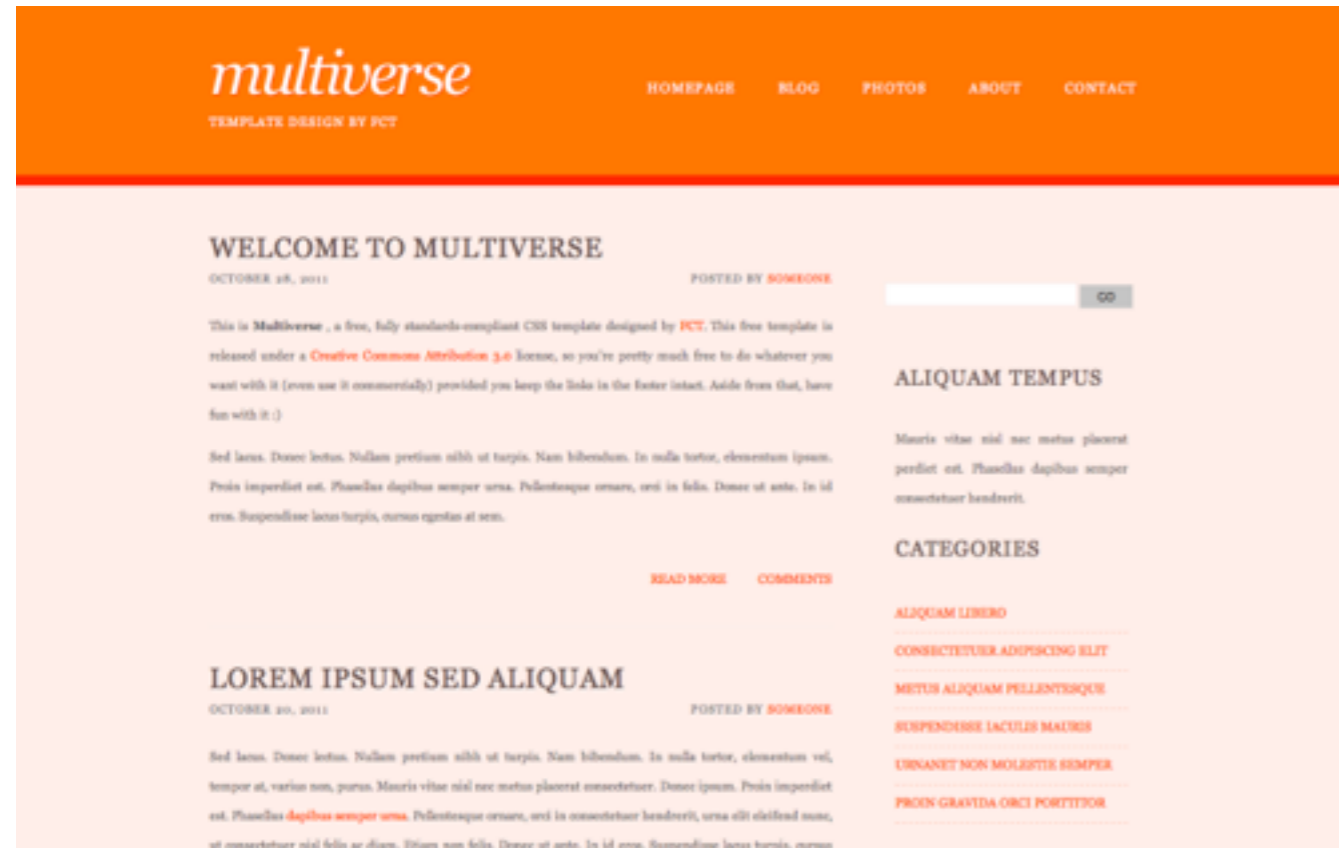


What subjective responses do people with color vision deficiencies have to color?



original

CVD simulation



existing recoloring tool

SPRWeb

# Results

- **Differentiability:** as good as prior work
- **Naturalness:** significantly better than prior work

# Results from a User Study

- Activity: as good as prior work
- Temperature: significantly better than prior work
- Weight: as good as prior work



**It is not sufficient to make access possible**

**Access also has to be equitable**

SPR Web provides people who have color vision deficiencies with

- similar **access** to color-encoded information
- similar color-mediated **experience**



# **SUPPLE: Adapting to Users' Motor Abilities**

with Daniel Weld and Jacob Wobbrock



**Ken**



**Claire**

**Print**

**Printer**

Name **Canon Photo** ▼

Status: Idle

Type: Ink jet

Where: Printer room

Print to File

Manual Duplex

**Page range**

All

Current Page

Pages

**Copies**

Number of copies **1** ▲▼

Collate

**Print Content**

Print what **Document** ▼

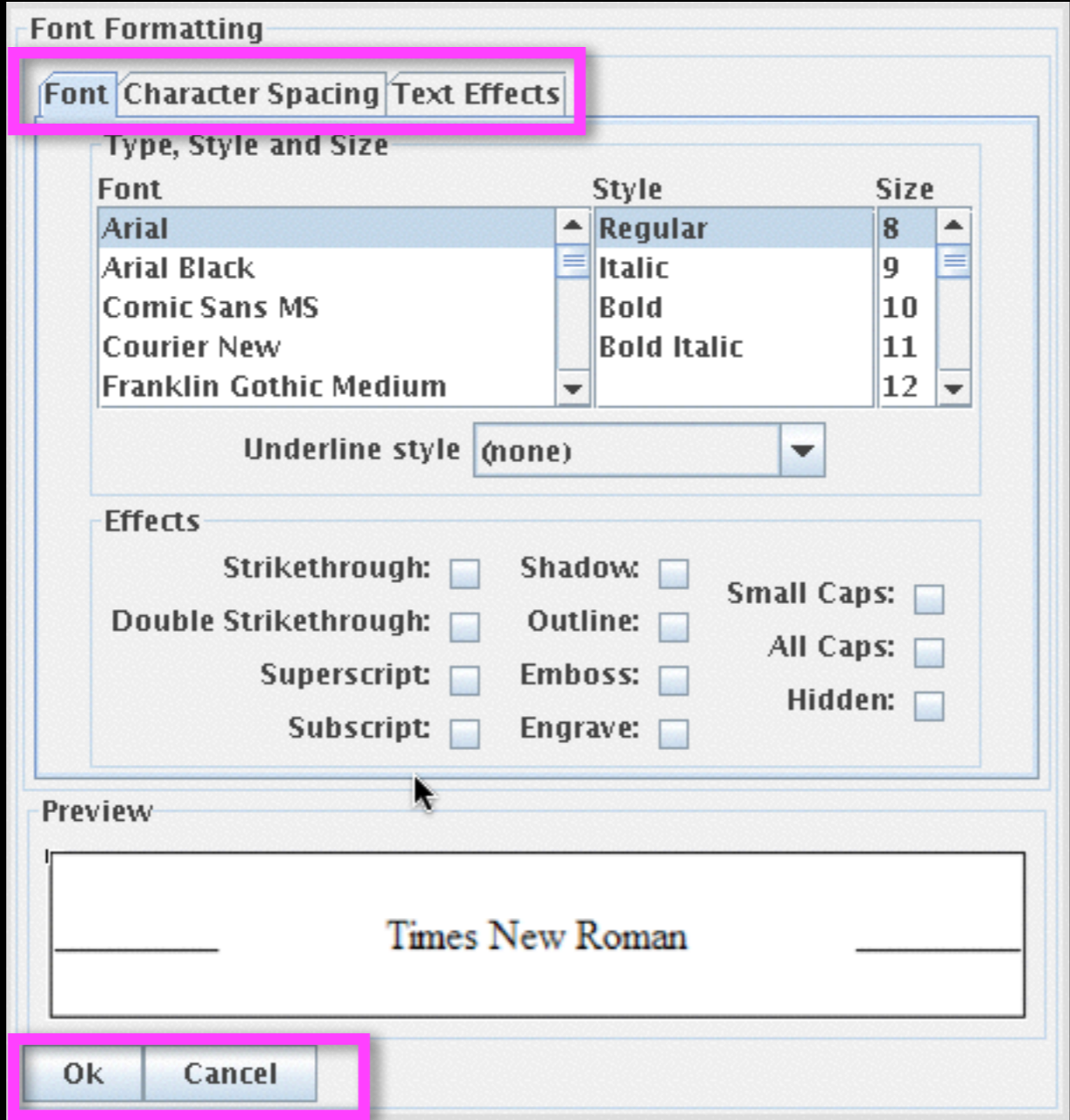
Print **All pages in range** ▼

**Zoom**

Print what **1 page** ▼

Scale to paper size **No Scaling** ▼

**OK** **Cancel**



**It is not sufficient to make access  
possible**

**Access also has to be **equitable****

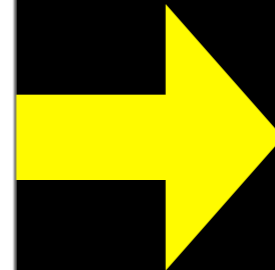
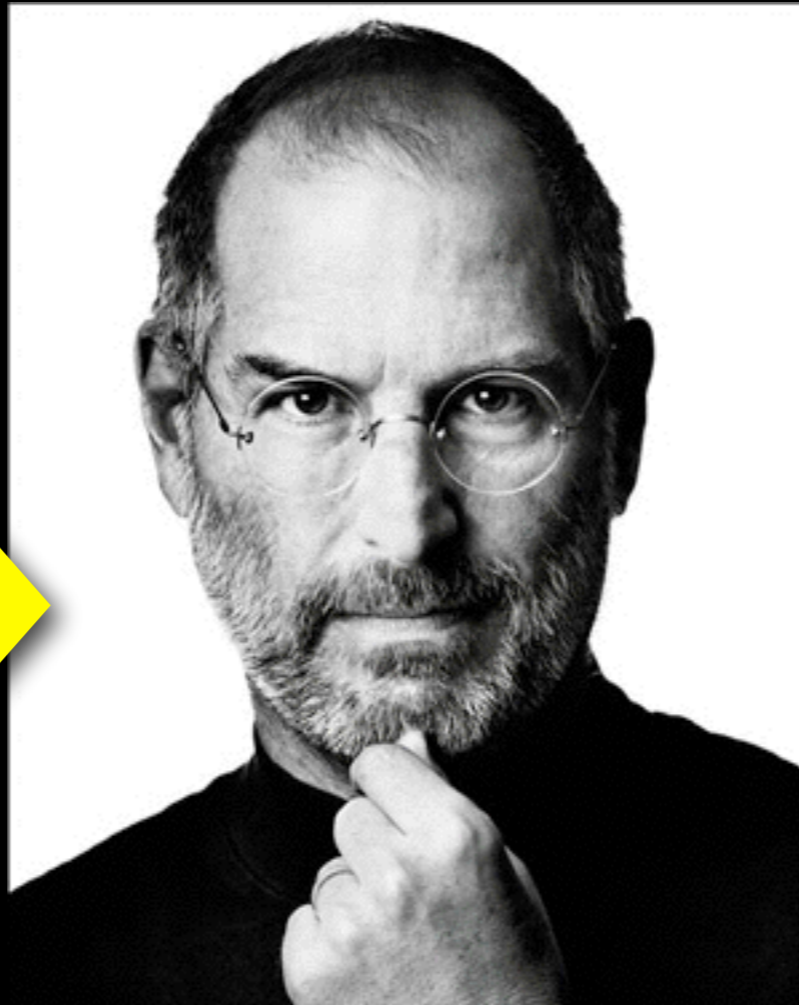
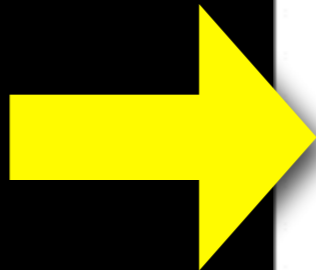
*DESIGN*

*DESIGN*

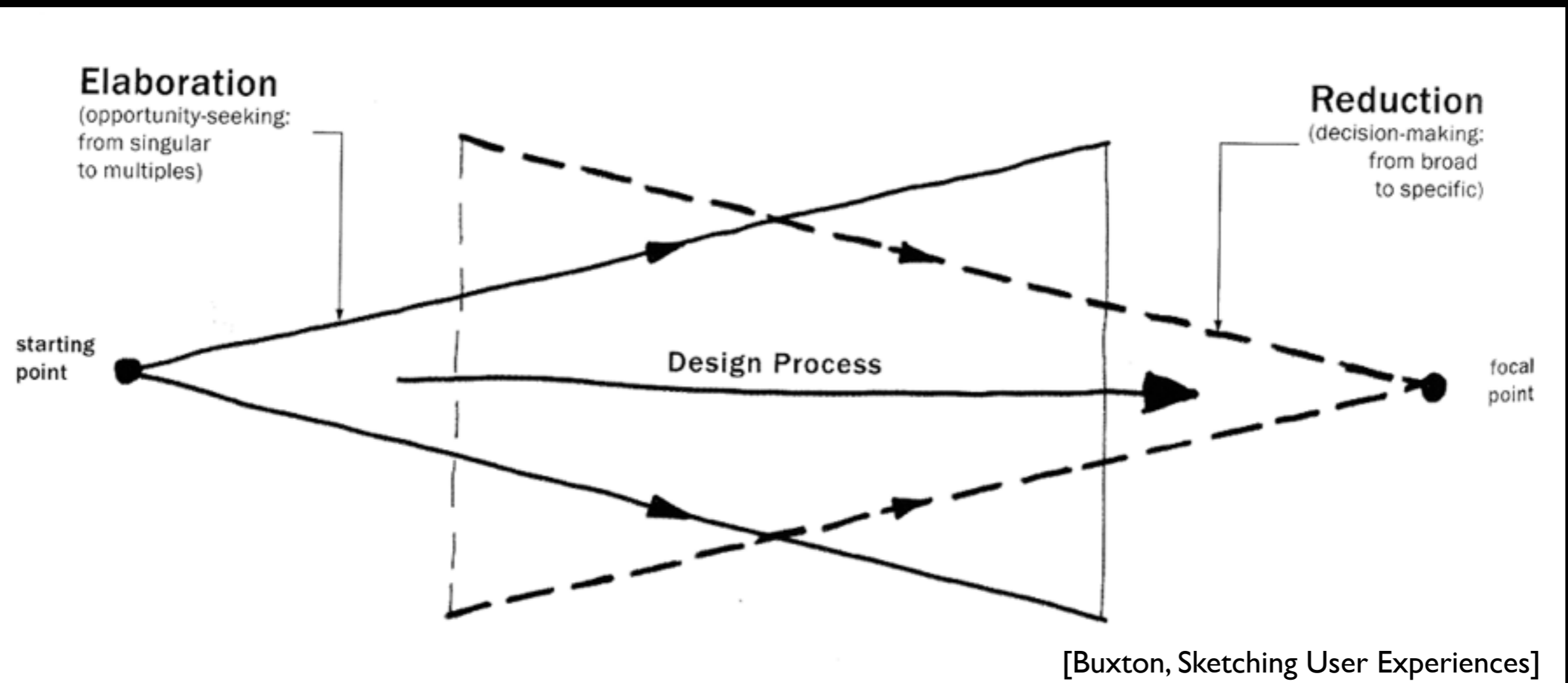


# Design by Genius

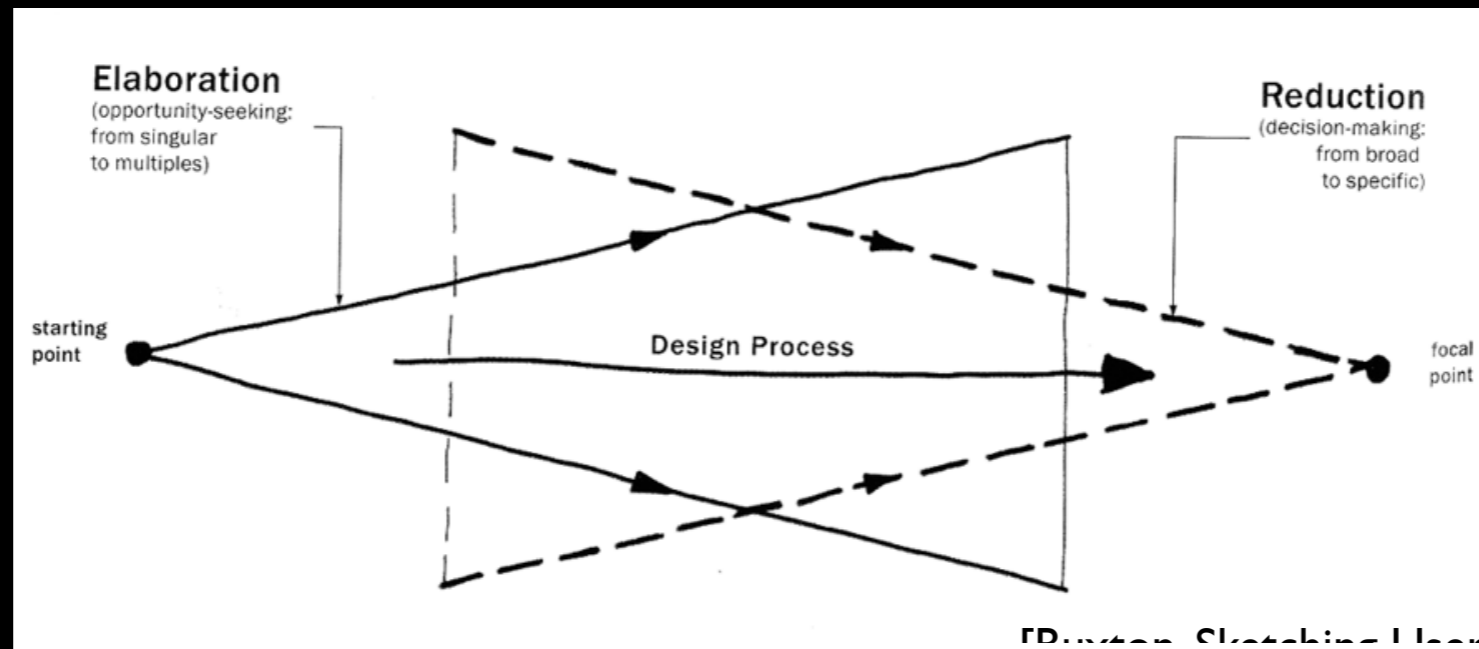
Specification



# Design by Exploration

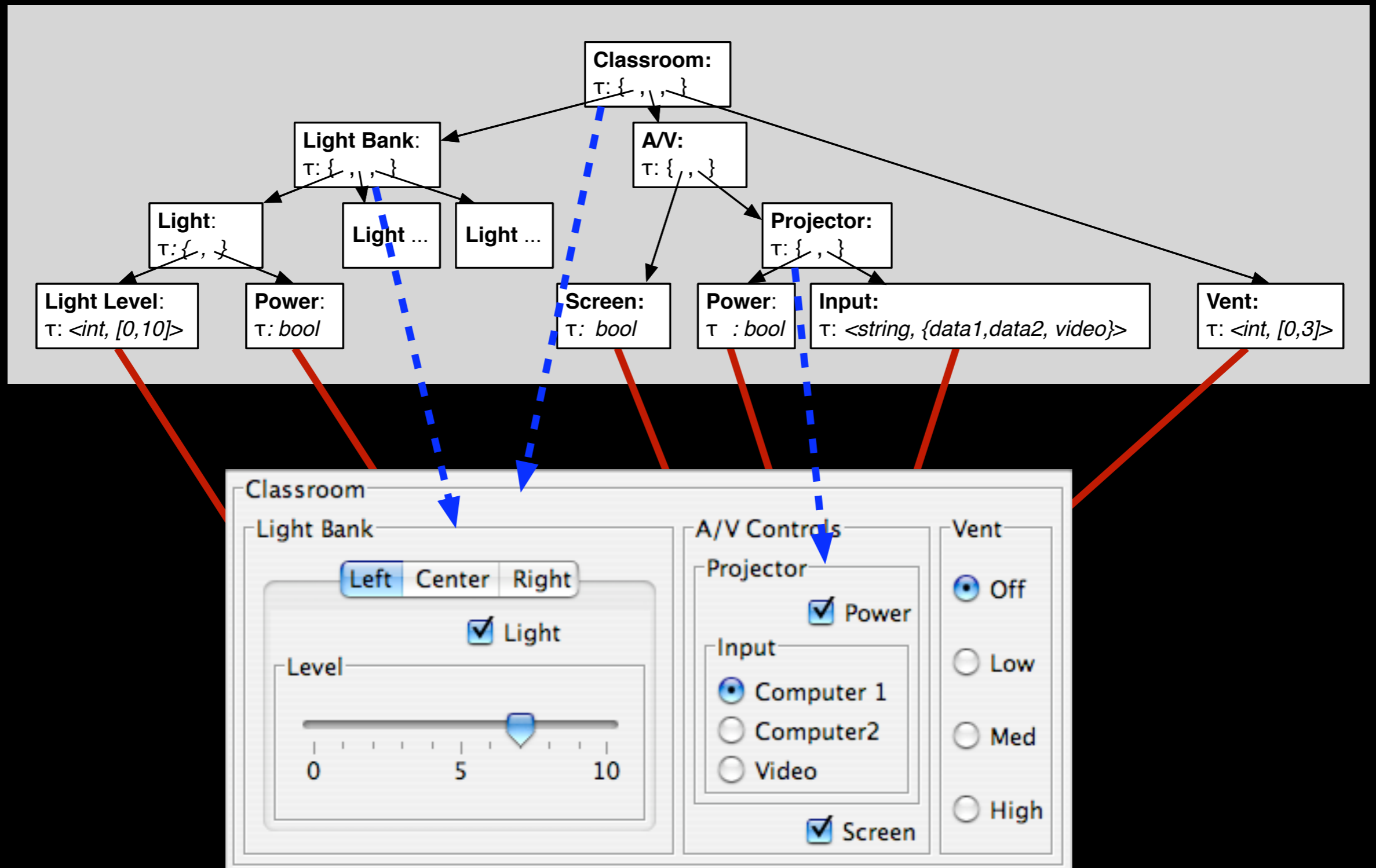


# Design as Optimization

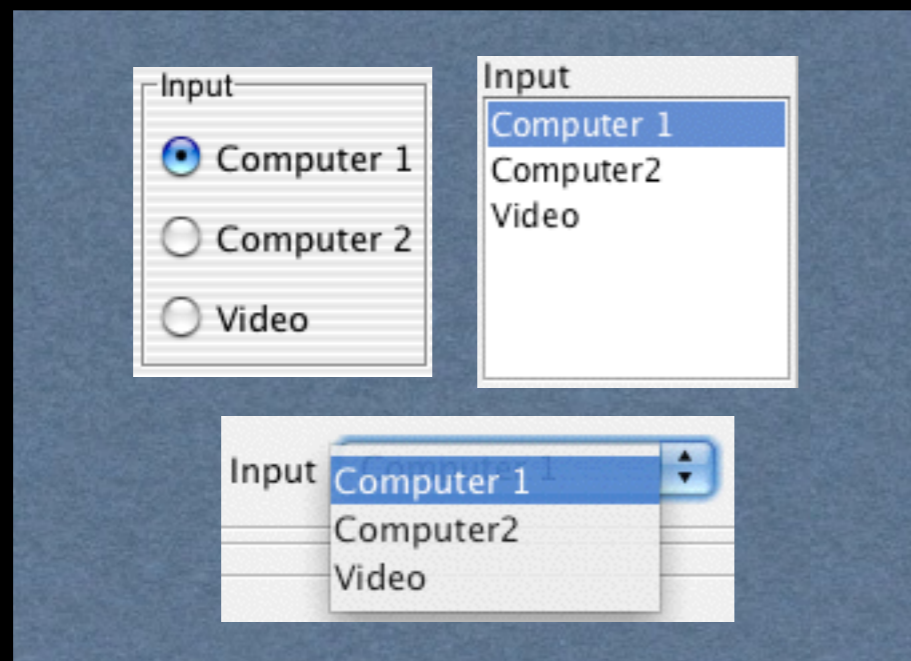


- Consider all possible designs
- Use a quantitative metric of quality to pick the best
- Do it quickly!

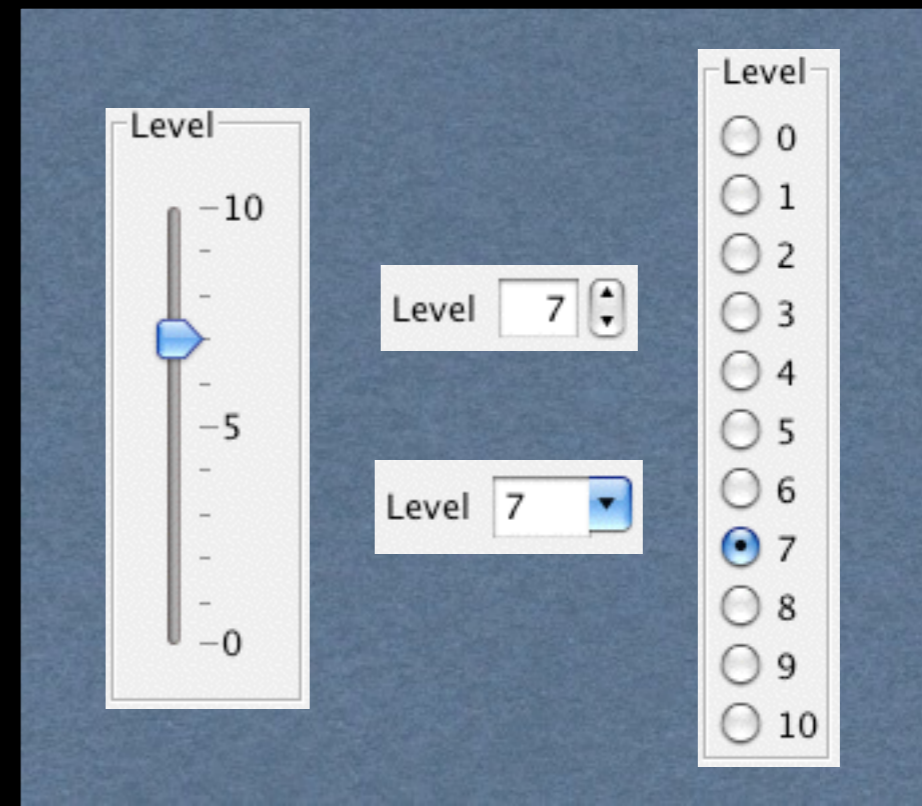
# Enumerating The Design Space



# Enumerating The Design Space

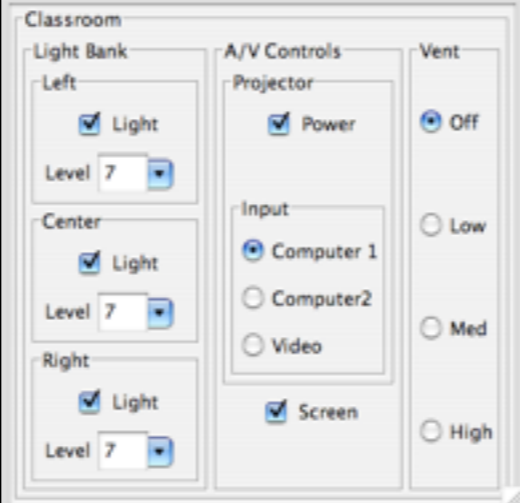


Discrete choice  
from a fixed  
set of options



Integer selection  
from a bounded  
range

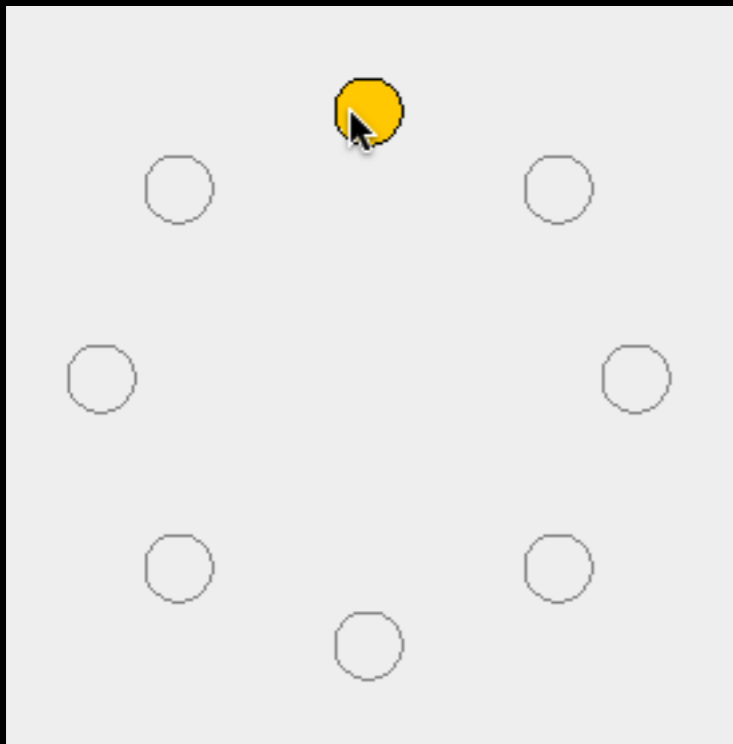
# Use a quantitative metric of quality to pick the best

cost(  ) = time

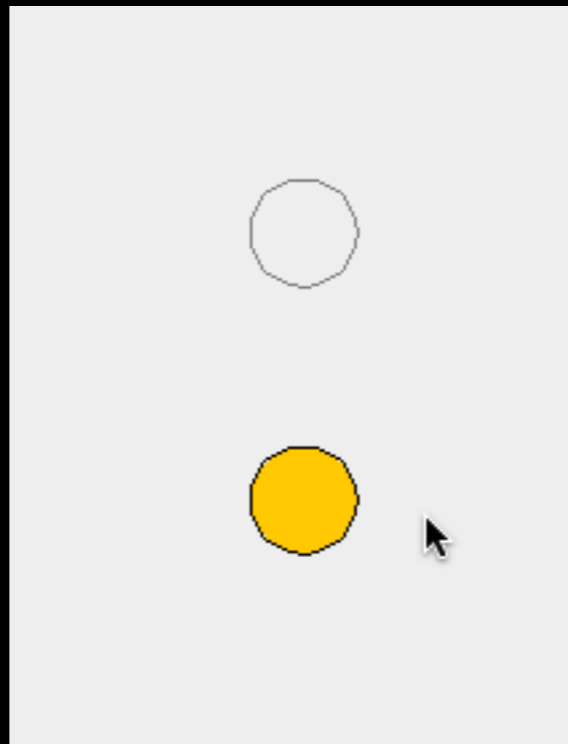


# Learn What A Person Can Do

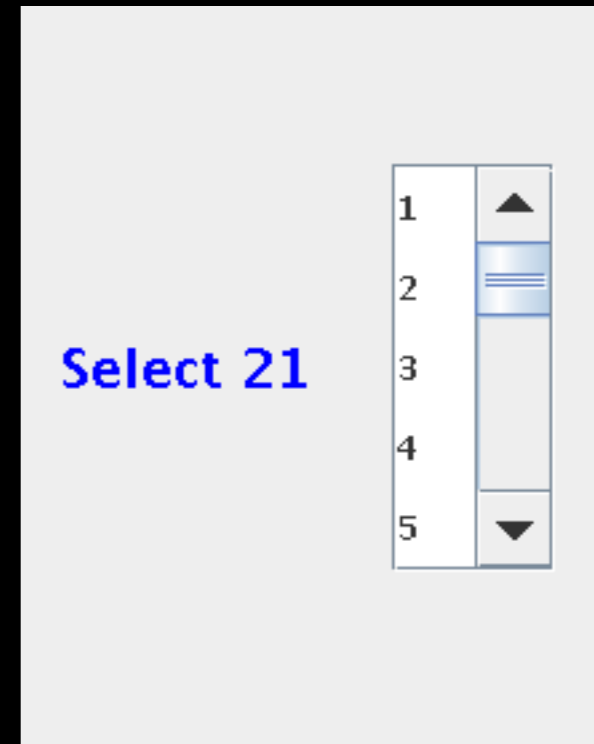
## Pointing



## Dragging



## List Selection



**Find a solution quickly!**

$10^{17}$



1017





Supple: Stereo Example

### Properties

#### Stereo

Power:

Volume



X-Bass:

#### Tape

Mode:  Tape 1

Tape 2

Reverse:

Dolby Noise Reduction:

< Play

Play >

Stop

Pause

Rewnd

FFwd

#### CD

Disc: 1

Track: 1

Play

Stop

Pause

Repeat:

Random:

#### Tuner

<< Seek

Frequency: 89

Seek >>

Band:  FM

AM

# Adaptation to Devices

The image illustrates the adaptation of a classroom control interface to different devices. The main background shows a desktop version of the interface with sections for Light Bank (Left, Center, Right), A/V Controls (Projector, Input, Power), and Vent. Overlaid on this are three smaller screenshots:

- Mobile Phone View:** Shows a simplified menu with sections for Classroom, Light Bank, A/V Controls, and Projector. The Projector section shows Power: <On>.
- Tablet View:** Shows a list of options (6, 7, 8, 9) under a SELECT header, with Light: <Off> below.
- Desktop View:** Shows a detailed control panel with sections for Center, Right, A/V Controls, and Vent. The A/V Controls section includes a checked Light checkbox and a slider. The Projector section includes a checked Power checkbox and an Input dropdown menu set to Computer 1. The Vent section includes a checked Screen checkbox and radio buttons for Off, Low, Med, and High.

Folders

New Rename Delete Expunge

Junk-E-Mail  
 Unerwünscht  
 Unbekannt2  
 Deleted Messages  
 Events

Messages

New Reply Forward Delete Move

05.02 12:53 PM Lucy Dunne <lucy.dunne@gmail.com> [Announcements] ISWC 2008: Ca  
 01.02 08:30 AM uwgradevents@u.washington.edu [UWgradevents] Career Events for Gra  
 31.01 05:20 PM Varshavsky Alex <walex@cs.toronto.edu> Pervasive 2008 Late Breakin  
 31.01 05:02 PM Varshavsky Alex <walex@cs.toronto.edu> Pervasive 2008 Late Breakin  
 26.10.07:50 AM avi2008@cib.na.cnr.it AVI2008: CALL FOR PAPERS  
 AS merged to form new full c  
 International Conference on Inte  
 [nts] CFP: Special Issue on Per  
 Diagrams: CFP: Smart Graphi  
 /ASIVE 2005: Extended Work

Configuration

Rendering

Configuration

Accounts

Web.de IMAP  
 UW IMAP  
 Web.de POP3  
 .Mac (kgajos)  
 Fastmail

Details

Account Details

Account Name: Web.de IMAP  
 Reply Address: supple@web.de  
 From Address: supple@web.de

Add Account Remove Acco

Details

Rendering

Details

Senders: khai@cc.gatech.edu  
 Date: Mon Feb 21 12:07:11 PST 2005  
 Recipients: announcements@ubicomp.org  
 Subject: [Announcements] PERVASIVE 2005: Extended Workshop Deadlines, Ad...

Content

<TEXT/PLAIN; charset=us-ascii>

\*\*\*\*\*ADVANCE PROGRAM / REGISTRATION\*\*\*\*\*

The advance program of PERVASIVE 2005 is now online  
<http://www.pervasive.ifi.lmu.de/program.html>

The early registration deadline is March, 14th 2005  
<http://www.pervasive.ifi.lmu.de/registration.html>  
 Registration for a workshop only is available.

\*\*\*\*\*WORKSHOP DEADLINES EXTENDED\*\*\*\*\*

Some Pervasive 2005 workshops have extended their  
 deadlines for another week. Please take advantage of the  
 opportunity to present your research results in one of  
 the following workshops:

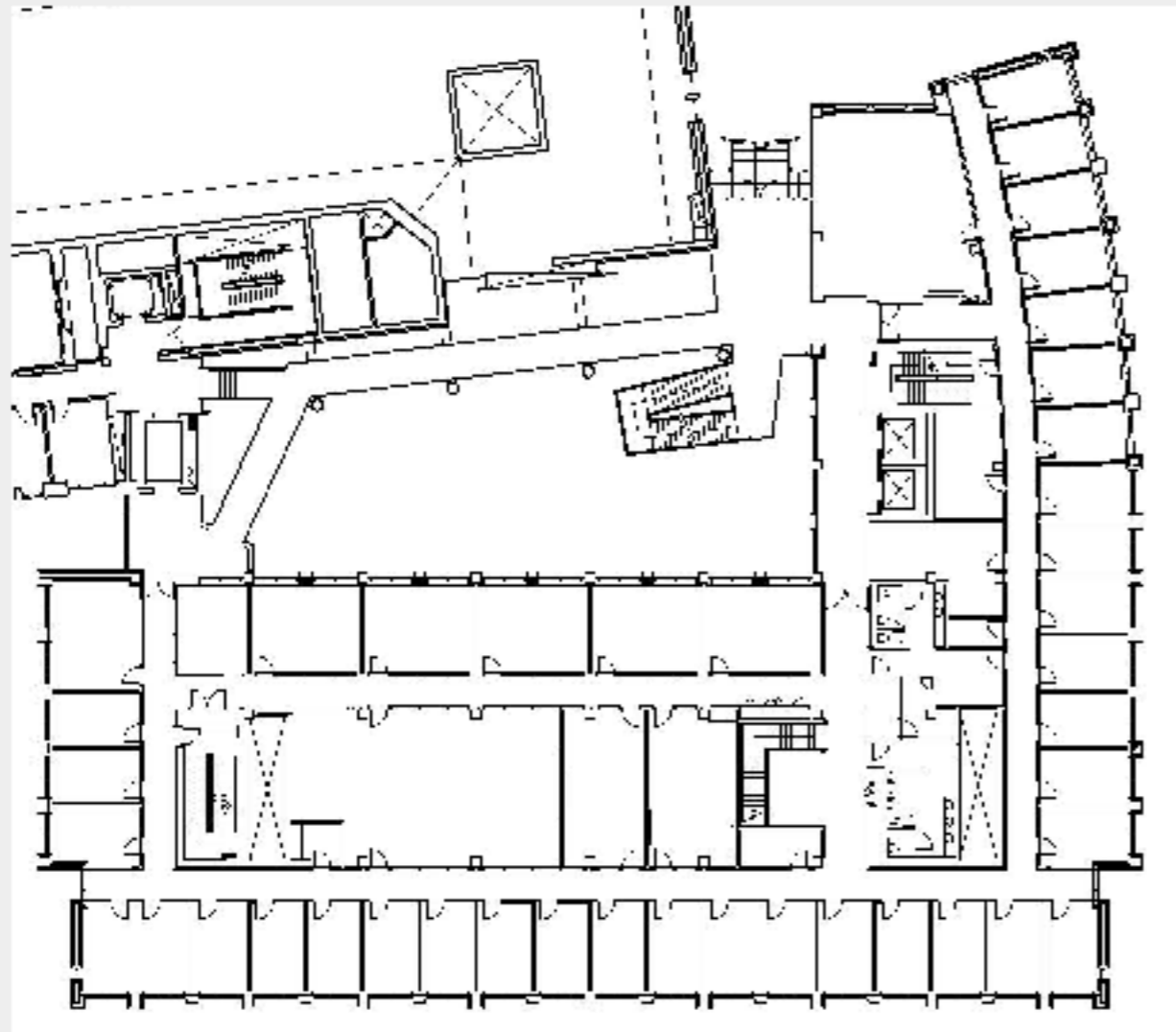
W2:International Workshop on Software Techniques for Embedded  
 and Pervasive Systems (STEPS), 2005  
 (deadline extended to March 1st)  
<http://www.pervasive.ifi.lmu.de/workshop.html#W2>

W3:PerGames 2005: Second International Workshop on Pervasive  
 Gaming Applications

## Map Demo

Pick a location

The Map



Location: (824.0,240.0)

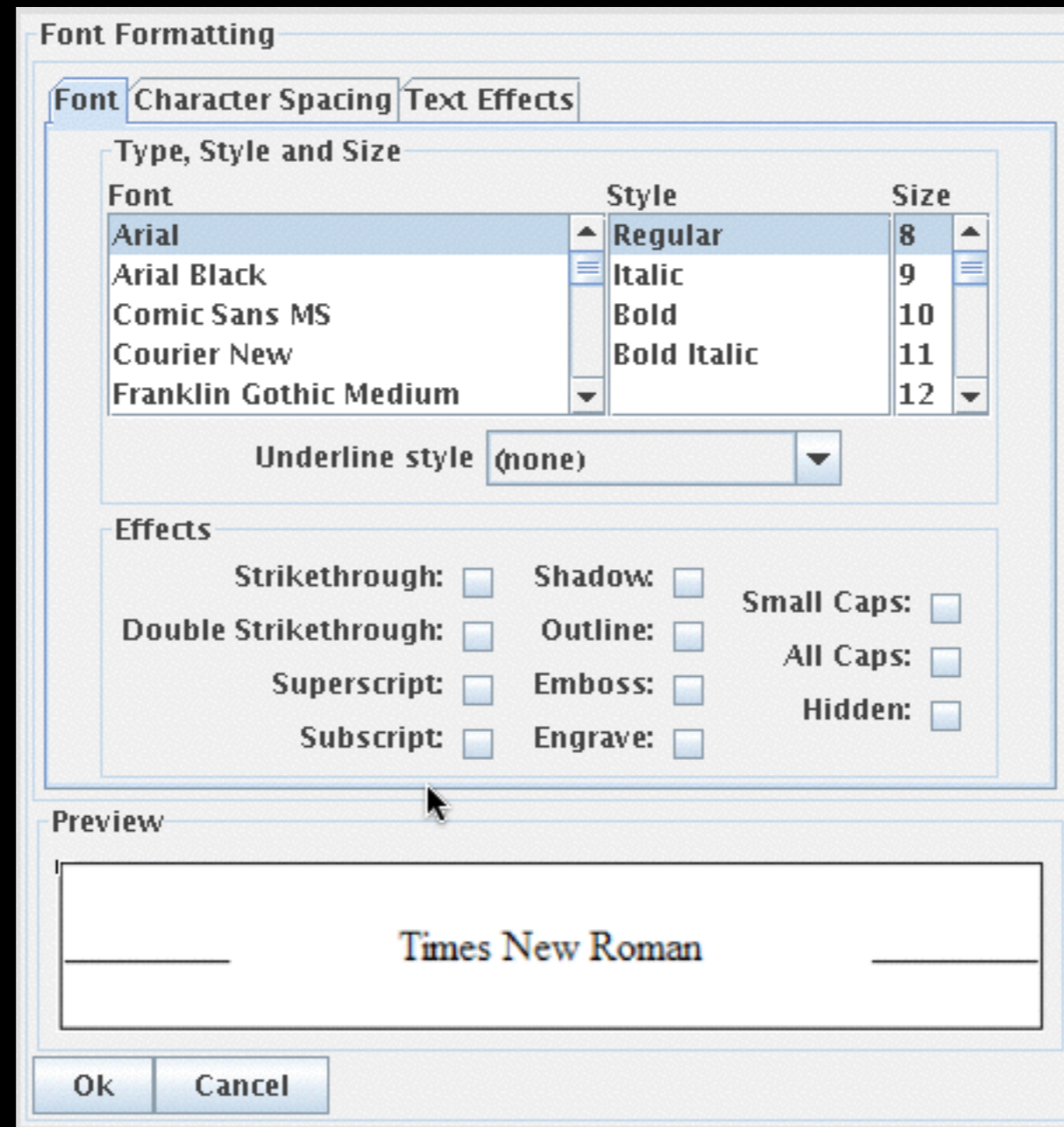
Info

Photo



Name: Dan  
Office: 588

# Results



# Font Formatting

Font Character Spacing Text Effects

## Type, Style and Size

Font	Style	Size	Underline style
Arial	Regular	8	<input checked="" type="radio"/> (none)
Arial Black	Italic	9	<input type="radio"/> Single solid
Comic Sans MS	Bold	10	<input type="radio"/> Double solid
Courier New	Bold Italic	11	<input type="radio"/> Dotted
Franklin Gothic Medium		12	<input type="radio"/> Dashed
Italic		13	<input type="radio"/> Wavy
Gautami		14	
Georgia		15	
Helvetica		16	
Latha		17	
Lucida Console		18	
Lucida Sans Unicode		19	
Microsoft Sans Serif		20	
Modern MS Sans Serif		21	
MS Serif		22	
Mv Boli		23	
Palatino Linotype		24	
Roman		25	
Script		26	
Small Fonts		27	

- ### Effects
- Strikethrough
  - Double Strikethrough
  - Superscript
  - Subscript
  - Shadow
  - Outline
  - Emboss
  - Engrave
  - Small Caps
  - All Caps
  - Hidden

Ok  
Cancel

## Preview

Times New Roman

# Font Formatting

## Font

### Type, Style and Size

Font	Style	Size
Arial	Regular	8
Arial Black	Italic	9
Comic Sans MS	Bold	10
Courier New	Bold Italic	11
Franklin Gothic Medium		12
Italic		13
Gautami		14
Georgia		15
Helvetica		16
Latha		17
Lucida Console		18
Lucida Sans Unicode		19
Microsoft Sans Serif		20
Modern MS Sans Serif		21
MS Serif		22
Mv Boli		23
Palatino Linotype		24
Roman		25
Script		26
Small Fonts		27
Symbol		28
Tahoma		29

### Underline style

- (none)
- Single solid
- Double solid
- Dotted
- Dashed
- Wavy

### Effects

- Strikethrough
- Double Strikethrough
- Superscript
- Subscript
- Shadow
- Outline
- Emboss
- Engrave
- Small Caps
- All Caps
- Hidden

## Character Spacing

- ### Scale
- 200%
  - 150%
  - 100%
  - 90%
  - 80%

- ### Spacing
- |           | By |
|-----------|----|
| Normal    | 0  |
| Expanded  | 1  |
| Condensed | 2  |
|           | 3  |
|           | 4  |
|           | 5  |
|           | 6  |
|           | 7  |
|           | 8  |
|           | 9  |

- ### Position
- |         | By |
|---------|----|
| Normal  | 0  |
| Raised  | 1  |
| Lowered | 2  |
|         | 3  |
|         | 4  |

Kerning for fonts

- ### Points and above
- 8
  - 9
  - 10
  - 11
  - 12
  - 13
  - 14
  - 15
  - 16
  - 17

## Text Effects

- ### Animations
- (none)
  - Blinking Background
  - Las Vegas Lights
  - Marching Black Ants
  - Marching Red Ants
  - Shimmer
  - Sparkle Text

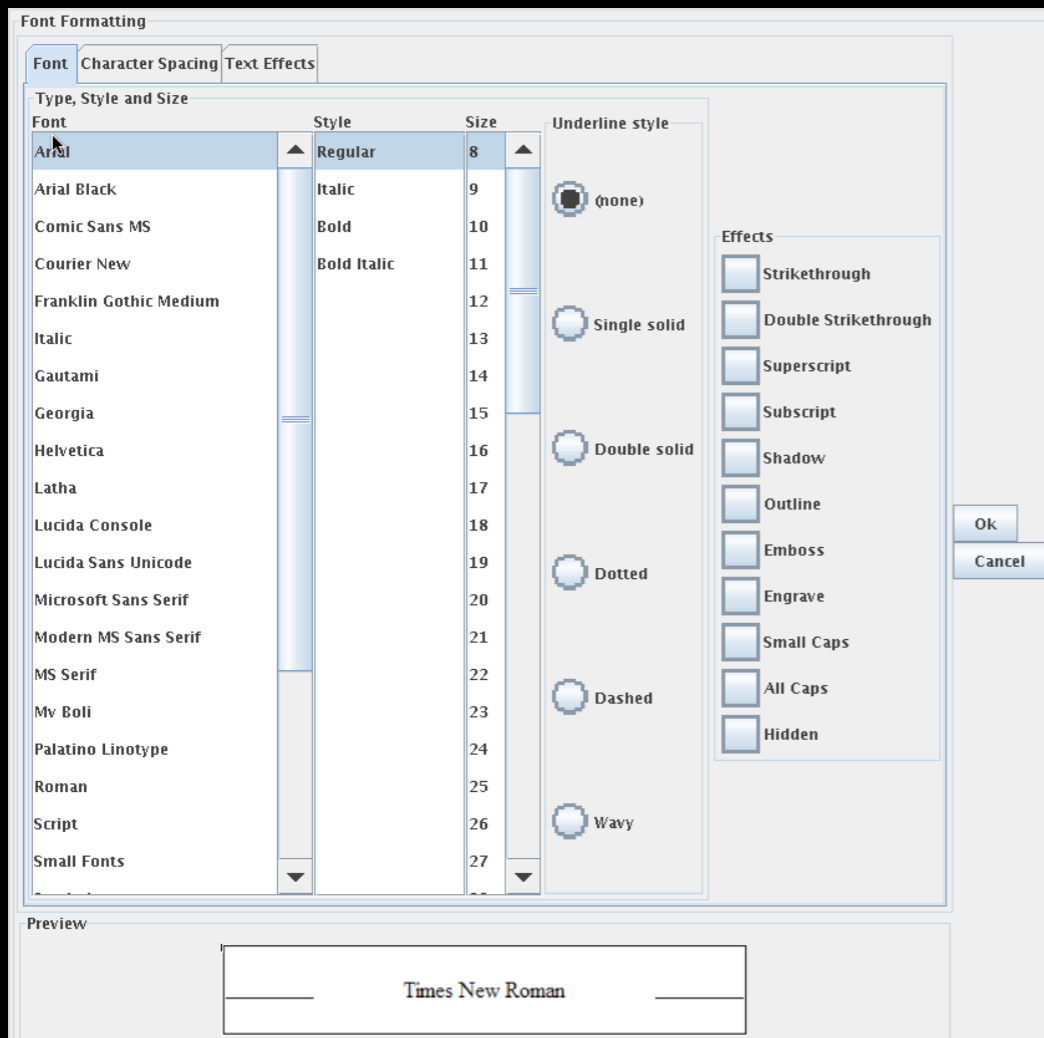
Ok

Cancel

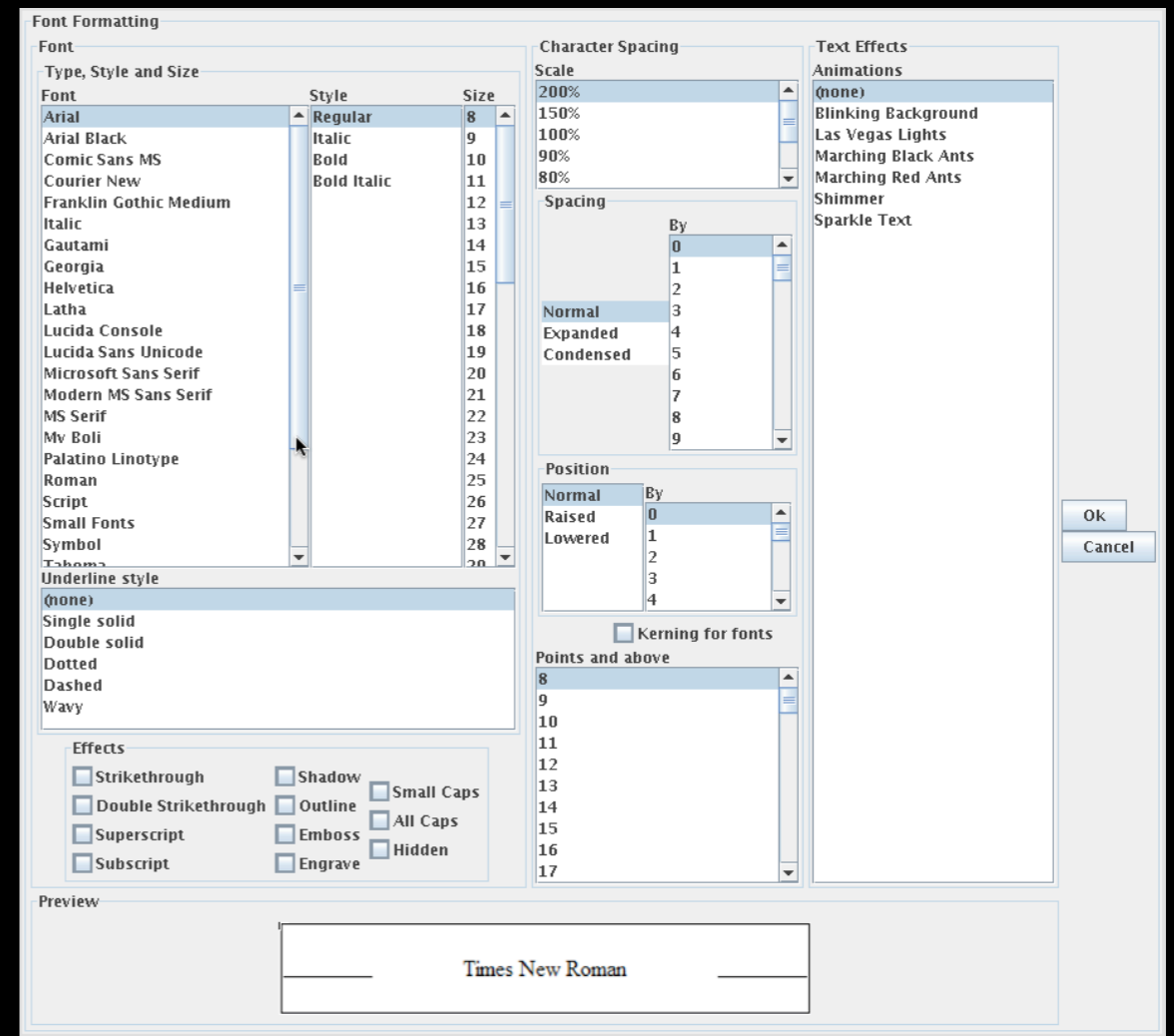
## Preview

Times New Roman





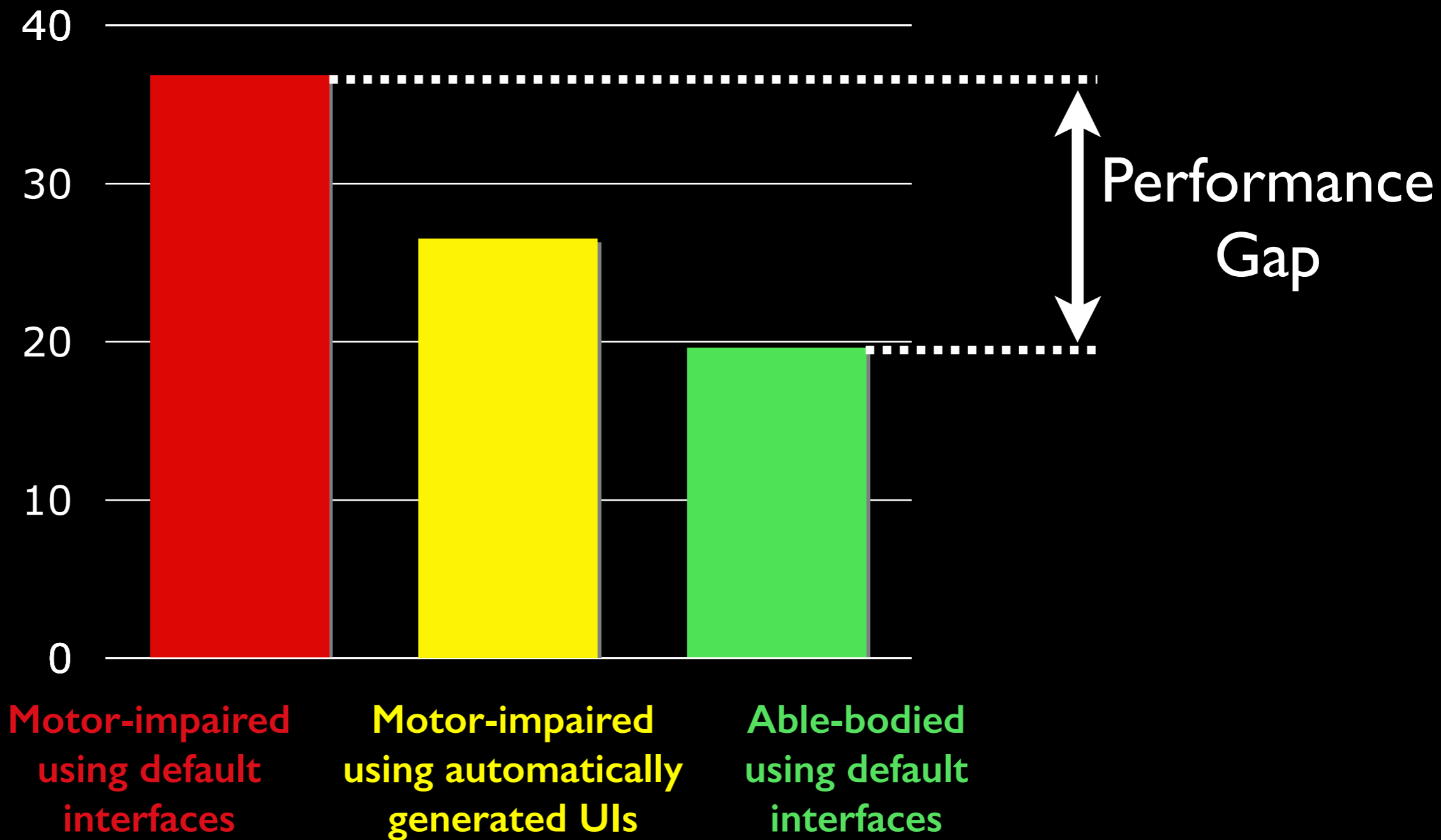
Impaired dexterity



Low strength



Average Time to Complete  
a set of tasks



# SUPPLE:

## Adapting to Users' Motor Abilities

- User interface design as optimization
- Automatically generated user interfaces optimized for a person's motor performance can improve performance and satisfaction of users with motor impairments
- **Universal design is an elusive dream:** designs that help some users will cause harm others

Message #1:

Adaptive User Interfaces  
can democratize access  
to digital resources





One-size-fits-all



Adaptive





# redusciouslips

everything fabulous about beauty

## 7 things ... about Olay's Advanced Daily Moisturiser with Cooling Essence

comments (2)

Tweet 0



Search

Search:

Search

Recent Posts

7 things ... about olay's advanced daily moisturiser with cooling essence  
now if i were to present a beauty box ...  
lancome rouge in love - beauty bloggers party  
art in beauty: holton rower x dior  
just a little bit more with benefit hervana  
that fine line - maybelline hypersharp liner  
look fabulous online!  
red of the day - burberry lip cover soft satin lipstick in brick red (19)  
my origins experience - made fabulous with plantscription!  
flawlessly ... with shiseido perfect refining foundation

Ads



# One-size-fits-all



## 7 things ... about Olay's Advanced Daily Moisturiser with Cooling Essence

comments (2)

Tweet 0



Search

Search:

Search

Recent Posts

7 things ... about olay's advanced daily moisturiser with cooling essence  
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lancome rouge in love - beauty bloggers party  
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just a little bit more with benefit hervana  
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Ads

# Adaptive



## 7 things ... about Olay's Advanced Daily Moisturiser with Cooling Essence

comments (2)

 Tweet 0



### Search

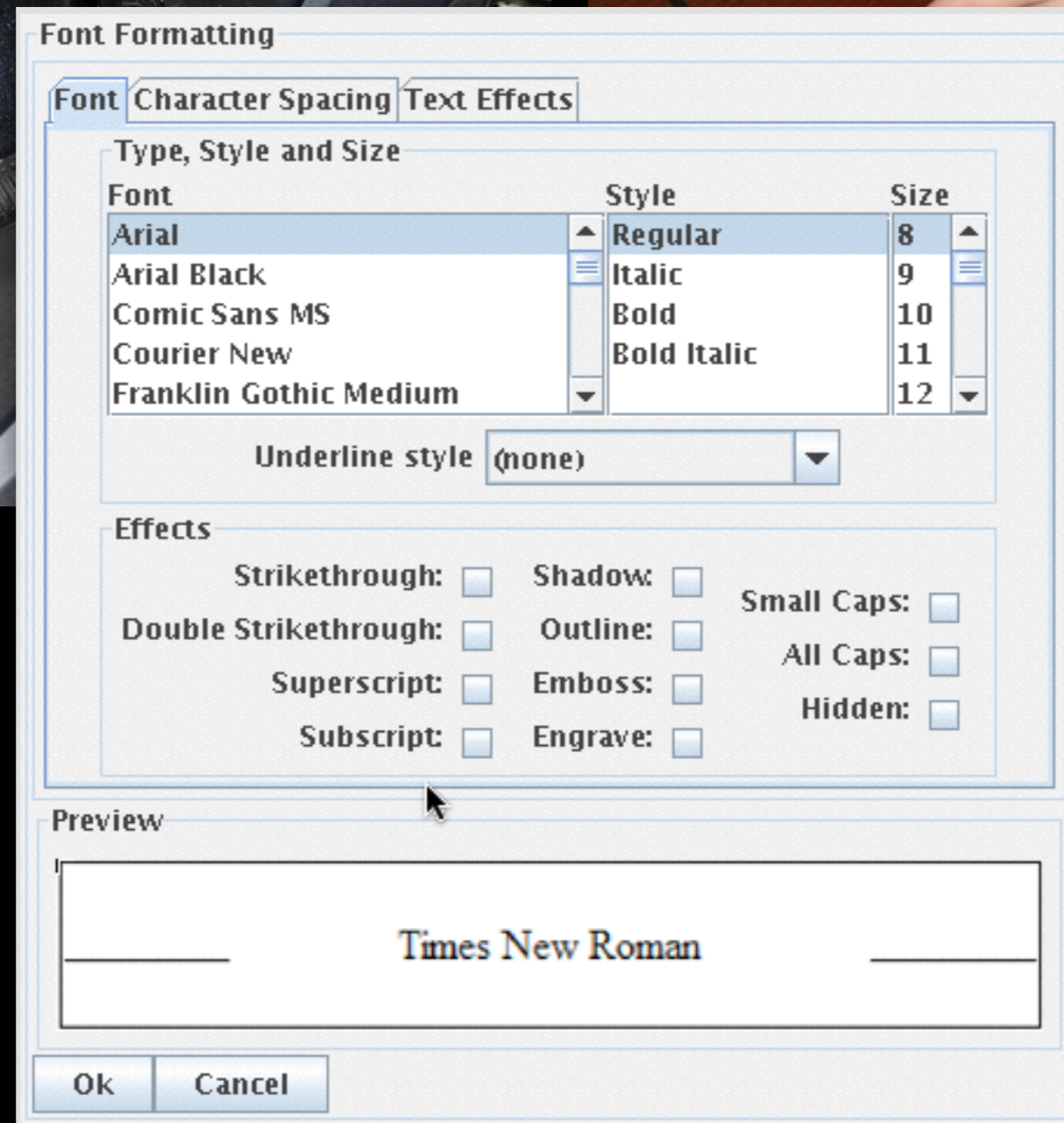
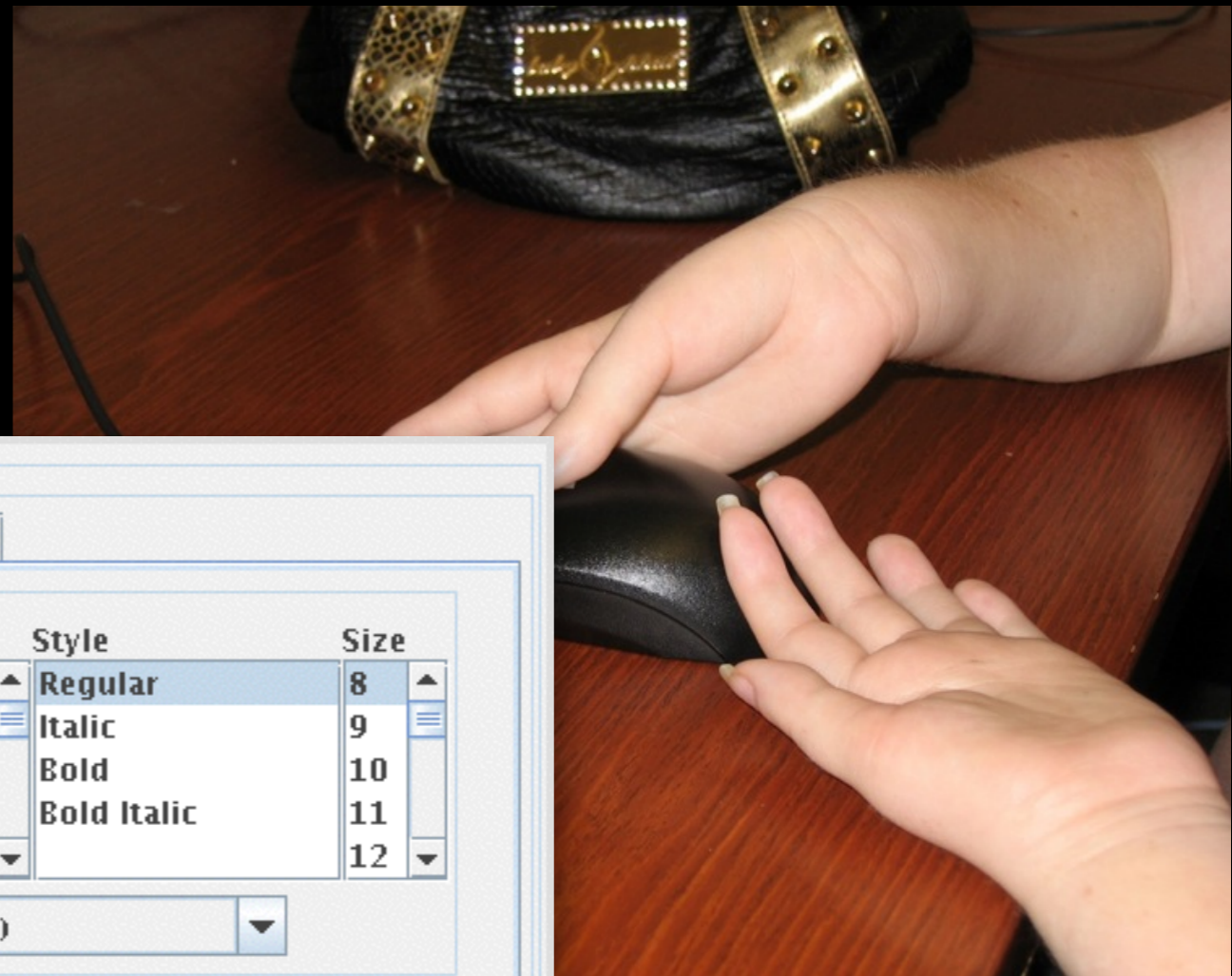
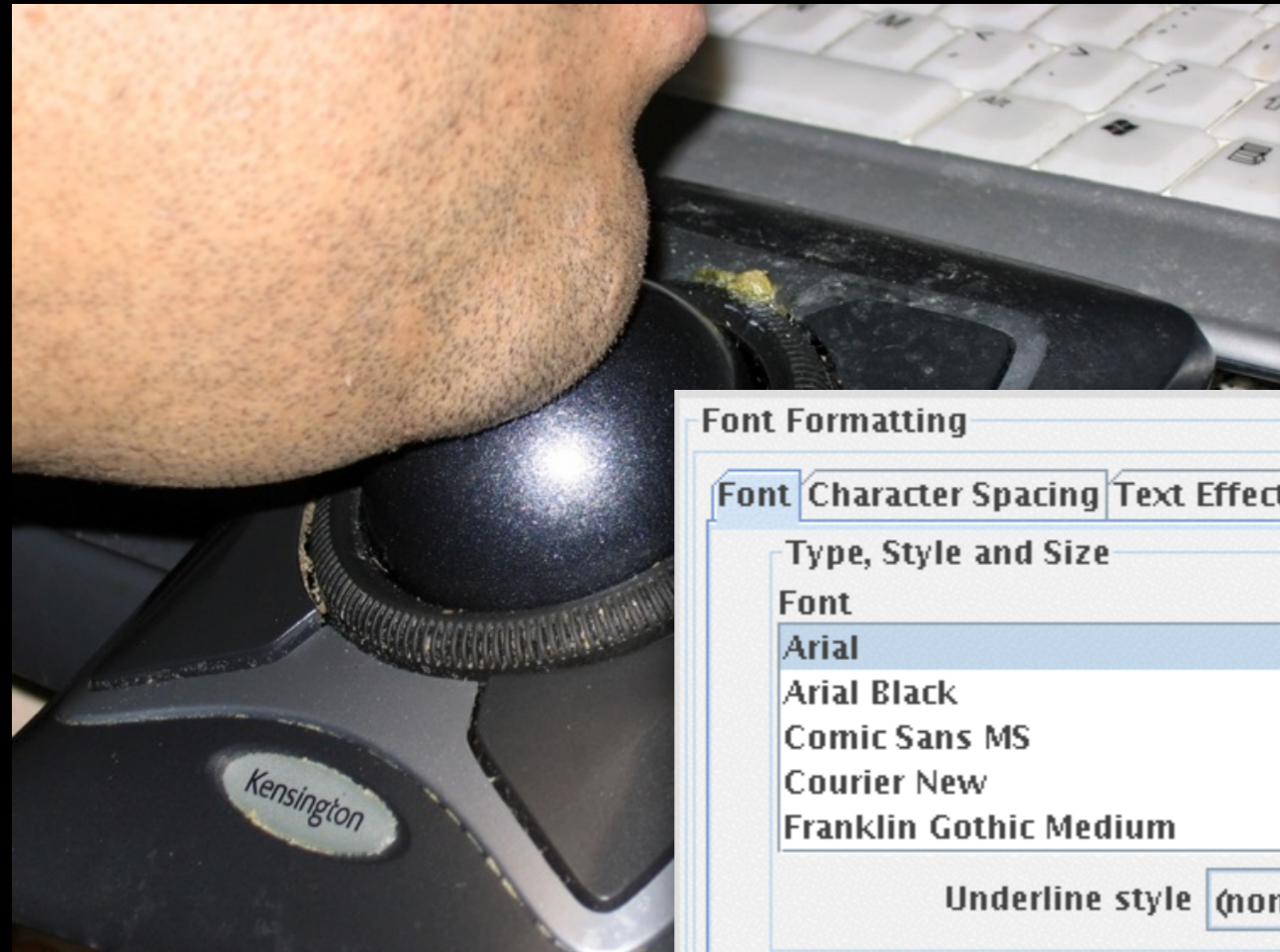
Search:

### Recent Posts

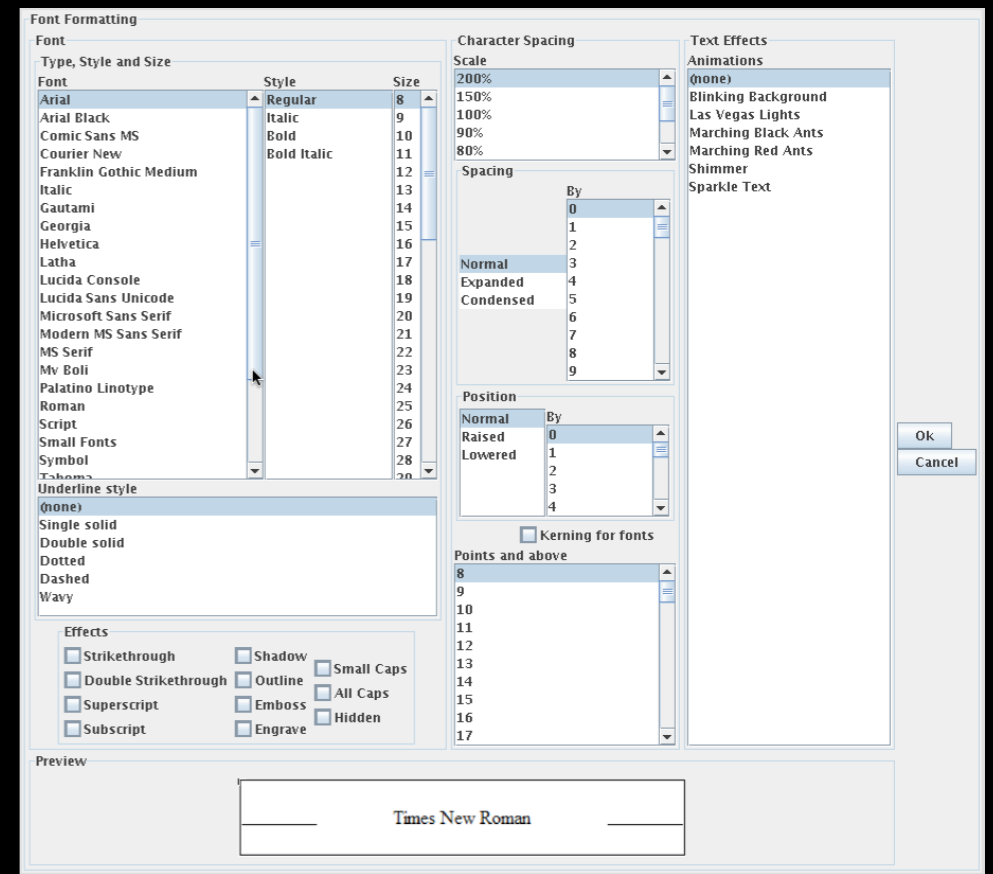
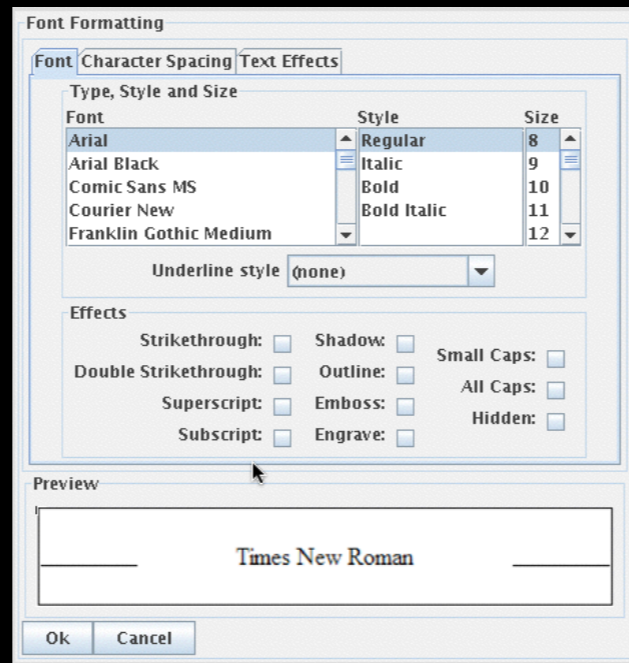
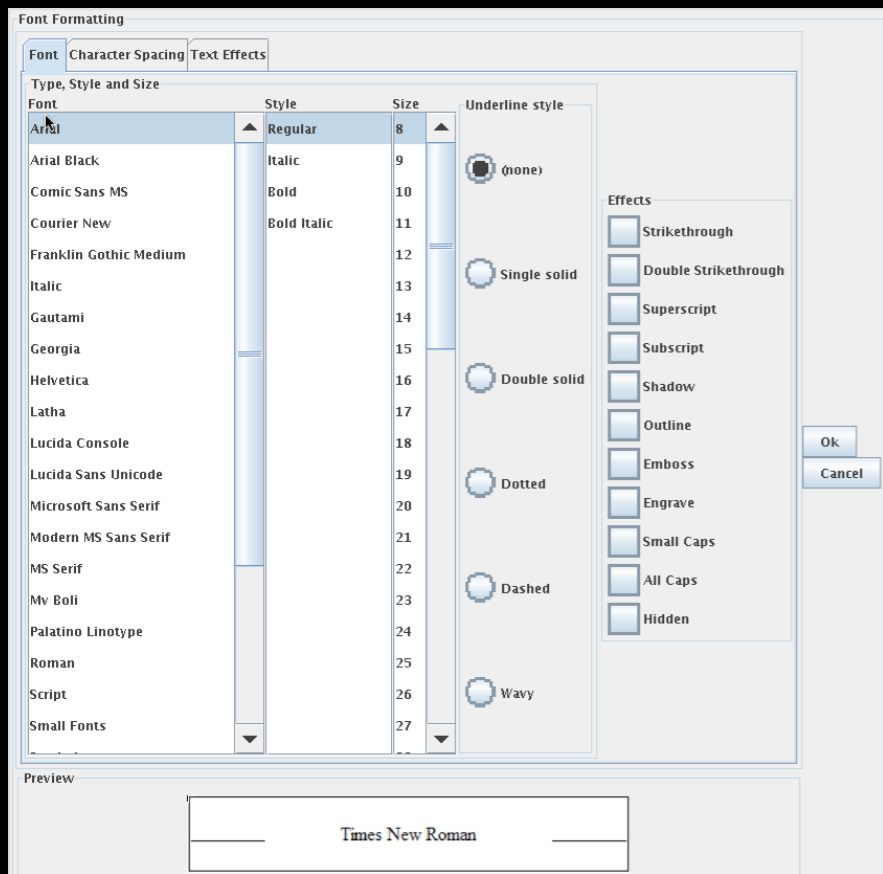
7 things ... about olay's advanced daily moisturiser with cooling essence  
[now if i were to present a beauty box ...](#)  
[lancome rouge in love - beauty bloggers party](#)  
[art in beauty: holton rower x dior](#)  
[just a little bit more with benefit hervana](#)  
[that fine line - maybelline hypersharp liner](#)  
[look fabulous online!](#)  
[red of the day - burberry lip cover soft satin lipstick in brick red \(19\)](#)  
[my origins experience - made fabulous with plantscription!](#)  
[flawlessly ... with shiseido perfect refining foundation](#)

### Ads

# One-size-fits-all



# Adaptive



# Adaptive Visual Design?



Katharina Reinecke  
and Krzysztof Gajos



**IDLEBRAIN**  
telugu cinema etc

మనీ మనీ మనీ మనీ

Site Search

Email login:

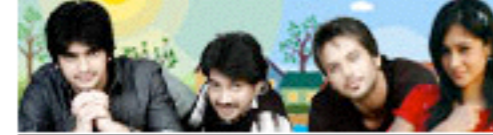
Password:

Login

New Users Sign-up!

News | Discussions | Reviews | Trailers | Functions | Photos | Downloads | Interviews

**NTR OOSARAVELLI** Overseas by Hari Venkateswara Pictures  
Venkat Garikapati - 732-986-6511 - Rayani Chandu - 612-986-4632



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• Nanna  
• Virodhi  
• 180  
• Badrinath  
• Vaishali  
• 100% Love  
• Mr. Perfect  
• My name is Khan  
[more...](#)

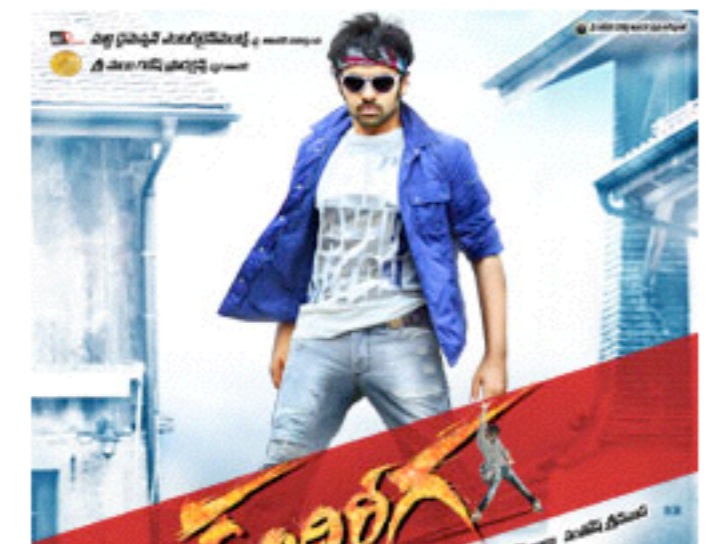
**Sri Rama Rajyam memory card launch**

The memory card containing music and trailers of NBK - Babu's film Sriramarajyam was launched at Novotel on 23 Aug



**Rajanna inspired by a true story**

Nagarjuna's forthcoming film Rajanna is inspired by the real character of Suddala Hanumanthu who fought against Rajakars



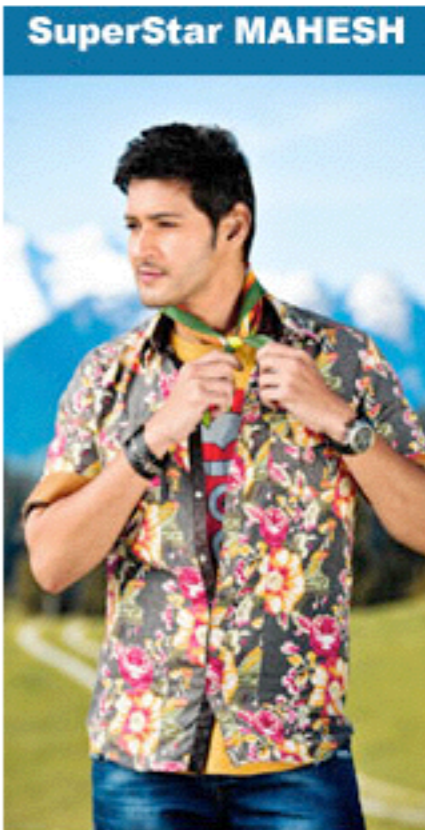
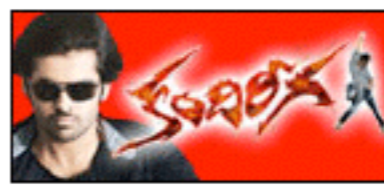
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Latest Updates

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- Madhu Shalini in Department
- 1947 ALS music launch
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- Photos: Amy Jackson
- Photos: Hari Priya
- I Hate U wallpapers
- Kandireega US Schedules
- Photos: Thasha
- Pinks Bollywood Bash party
- Photos: Ishq
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- TANTEX Sathavadhanam
- Photos: Sheena
- Nandeewarudu movie launch
- I Hate U movie launch
- Money III US premieres info
- Photos: Power
- Sri Ramarajyam memory card music launch
- Chiru launches Designer..
- Gautam Patnaik interview



QA TRAINING IN VIRGINIA

NRIVA global Conv  
Sep 3 - 5  
Washington DC



Overseas by  
**14 REELS**  
through  
**FICUS**  
Harish Sajja  
404 397 9990



Worldw  
Aug  
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before

USA  
G  
So  
916-49  
Su  
908 -78

మల్లీ డైమండ్స్  
శ్రీ నారాయణ

# First Impression of Aesthetic Appeal Impacts

- Perception of trustworthiness
- Willingness to engage
- Usability!

# Study: Individual Differences in Perception of Visual Appeal

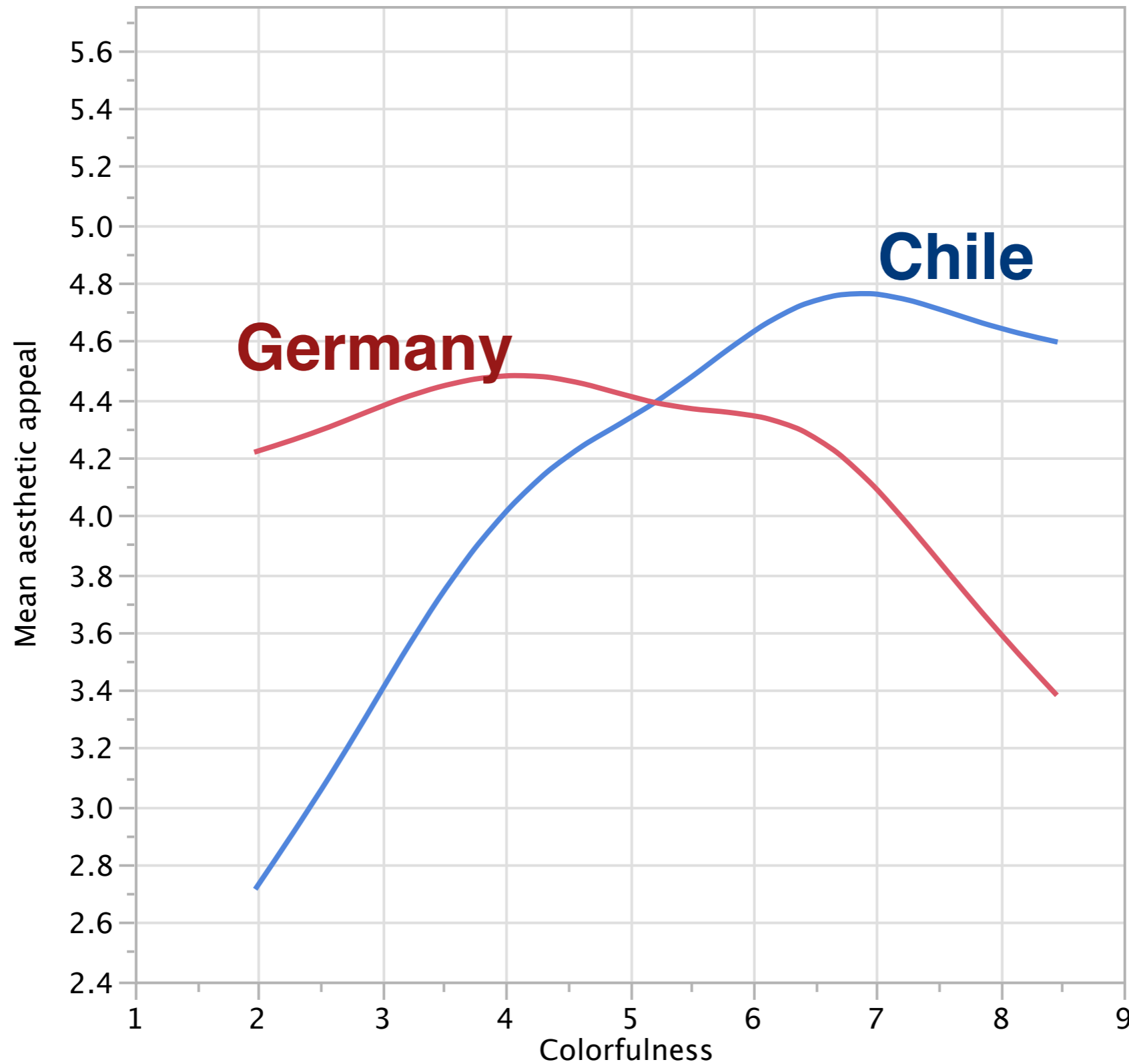
- 400+ web sites
- 40,000 participants
- 43 countries



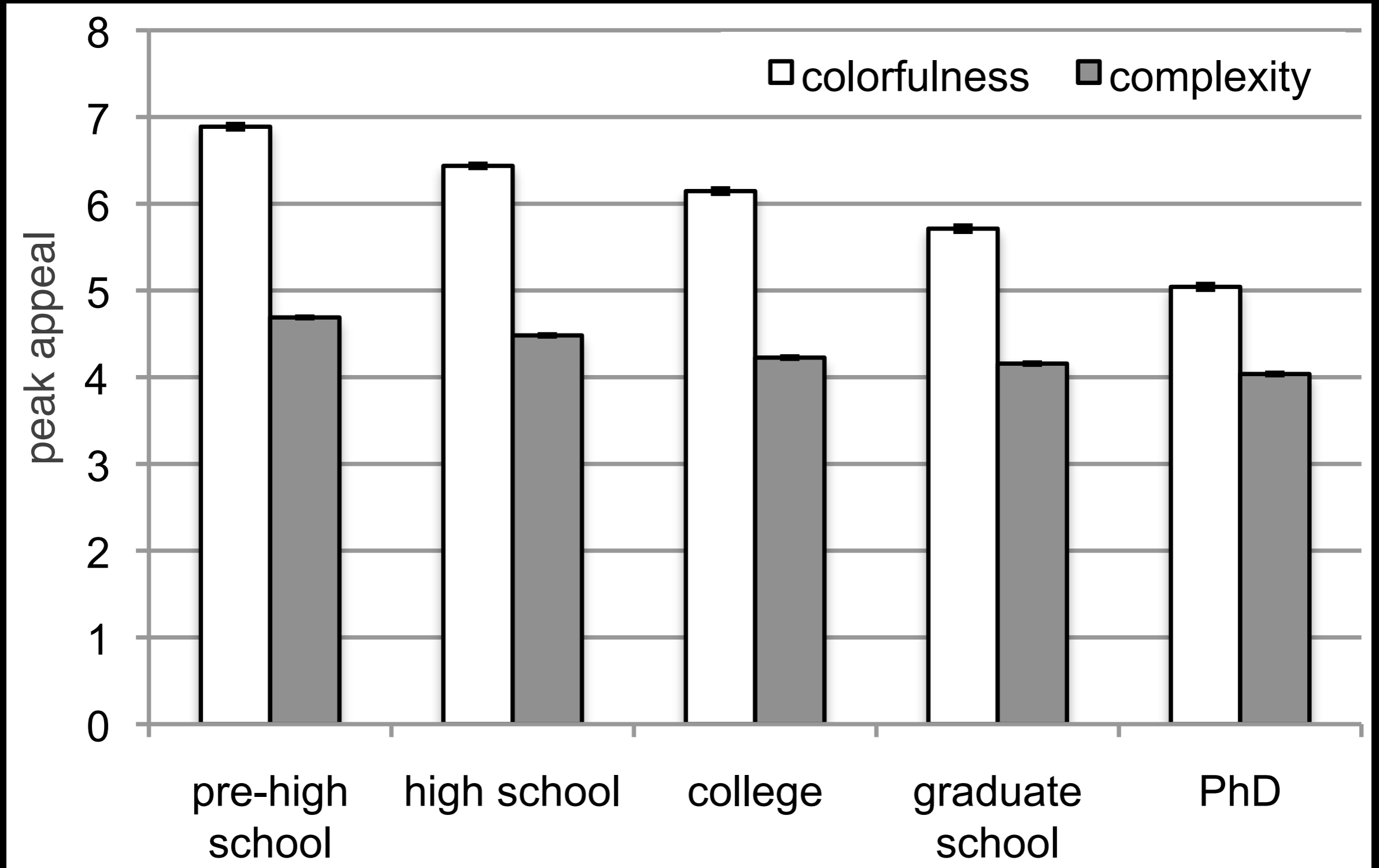
LABINTHEWILD.org



# National Culture



# Education





## Introduction to Computer Science

An introduction to the intellectual enterprises of computer science and the art of programming.

### About this Course

CS50x is Harvard College's introduction to the intellectual enterprises of computer science and the art of programming for majors and non-majors alike, with or without prior programming experience. An entry-level course taught by David J. Malan, CS50x teaches students how to think algorithmically and solve problems efficiently. Topics include abstraction, algorithms, data structures, encapsulation, resource management, security, software engineering, and web development. Languages include C, PHP, and JavaScript plus SQL, CSS, and HTML. Problem sets inspired by real-world domains of biology, cryptography, finance, forensics, and gaming. As of Fall 2013, the on-campus version of CS50x was Harvard's second-largest course.

Students who earn a satisfactory score on 9 problem sets (i.e., programming assignments) and a final project will receive a certificate from HarvardX. This is a self-paced course - you may take CS50x on your schedule.

School: [HarvardX](#)

Course Code: CS50x

Classes Start: anytime, self-paced

Estimated effort: 9 problem sets (10 to 20 hours each), 1 final project

### Prerequisites:

None.

[Register for CS50x](#)  
and choose your student track



9.7K

Student Reviews

★★★★★  
16 Reviews

[Write a review](#)



by ezix

★★★★★



Yes, please!



No, gracias

# One-size-fits-all

The screenshot shows the edX website interface for the 'Introduction to Computer Science' course. At the top, the edX logo is on the left, and navigation links for 'HOW IT WORKS', 'COURSES', 'SCHOOLS & PARTNERS', and 'REGISTER NOW' are in the center. A 'log in' button is on the right. Below the navigation is a header image with 'CS50.NET' and 'PR' visible. The main content area is titled 'Introduction to Computer Science' and includes a description: 'An introduction to the intellectual enterprises of computer science and the art of programming.' Below this is an 'About this Course' section with detailed text about the course content and its self-paced nature. On the right side, there is a sidebar with course details: 'School: HarvardX', 'Course Code: CS50x', 'Classes Start: anytime, self-paced', and 'Estimated effort: 9 problem sets (10 to 20 hours each), 1 final project'. There is also a 'Prerequisites' section stating 'None.' and a prominent blue button that says 'Register for CS50x and choose your student track'. Below the button are social media icons for Twitter, Facebook, LinkedIn, and Google+, along with a '9.7K' rating. At the bottom of the sidebar, there is a 'Student Reviews' section showing a 5-star rating and '16 Reviews', with a 'Write a review' link and a user profile for 'ezix' with a 5-star rating.

Yes, please!



edX HOW IT WORKS COURSES SCHOOLS & PARTNERS REGISTER NOW log in



### Introduction to Computer Science

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**About this Course**

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 Course Code: CS50x  
 Classes Start: anytime, self-paced  
 Estimated effort: 9 problem sets (10 to 20 hours each), 1 final project

**Prerequisites:**  
None.

[Register for CS50x](#)  
and choose your student track

9.7K

Student Reviews **★★★★★**  
16 Reviews

[Write a review](#)

by edX **★★★★★**

Si, por favor!



# Adaptive

home browse help features learning contribute about

# TREE OF LIFE web project

Explore the Tree of Life

**Browse the Site**

- Root of the Tree
- Popular Pages
- Sample Pages
- Recent Additions
- Random Page
- Treehouses
- Images, Movies,...

**News**

Darwin 200: the celebration continues...

[read more](#)

**Learn about ...**

**Agaricales**  
(a group of fungi)

[image info](#)

The Agaricales, or *ovogamias* clade, is a monophyletic group of approximately 8500 mushroom species...

[read more](#)

[more featured pages](#)

The Tree of Life Web Project (ToL) is a collaborative effort of biologists and nature enthusiasts from around the world. On more than 10,000 World Wide Web pages, the project provides information about biodiversity, the characteristics of different groups of organisms, and their evolutionary history (i.e. *phylogeny*).

Each page contains information about a particular group, e.g., salamanders, segmented worms, phlox flowers, tyrannosaurs, euglenids, Heliconian butterflies, rib fungi, or the vampire squid. ToL pages are linked one to another hierarchically, in the form of the evolutionary tree of life. Starting with the root of all life on Earth and moving out along diverging branches to individual species, the structure of the ToL project thus illustrates the genetic connections between all living things.

[read more about the Tree of Life Web Project...](#)

treehouse  Home Library Plans & Sign Up Help Sign In

# What do you want to learn today?

Treehouse is the best way to learn how to design and develop for the web and iOS.

**Web Design**

CSS, CSS3, Analytics, HTML and Responsive Web Design.

**Web Development**

HTML5, Javascript and Introduction to Programming.

**iOS Development**

Build iPhone and iPad apps with Objective-C, Xcode and more.

Share Report Abuse Nest Blogs  Create Blog Sign In

## THIS ARTIST'S LIFE

DAY TO DAY IN THE CLAY STUDIO

TUESDAY, AUGUST 23, 2011

### I made \$\$\$\$s making pottery, you can too!

If you've read this blog for a while, you all know I've mastered the art of the scolding email. The problem with the perfect scolding email is that the person you are targeting is usually something of an innocent bystander, unaware that they have just set off one of your touchy little buttons, and sending them the scolding you just composed will probably just confuse them and wonder why you are such an angry person.

That's why I have you guys. You understand my touchy little buttons. And you know why I am angry, and you think it's funny when I get mad, unlike some people, who just think I'm bitter and maybe even psychotic.

Dear Whitney,

I'm the owner of a new website called [www.makesitesthatmakeyoumoneyfrompottery.com](#). I'm developing a series of products and services to help pottery hobbyists turn their passion for pottery into a money-making business. I was wondering if you would be kind enough to do an interview for me, answering questions about how you started and grew your business to what it is today. The benefits of working with us are that we will be producing a product you can use in your own business, and within the interview we will promote you and your accomplishments. Thank you!

**VISIT MY WEBSITE**

[whitney smith pottery](#)

**UPCOMING EVENTS**

studio sale  
October 15, 2011  
10 am-4 pm  
529 whod ave  
oakland, ca 94606

**JOIN MY EMAIL LIST**

You will receive a monthly newsletter with special sales, show information, and news. [Sign up here!](#)

Email

W3C  W3C By Region

STANDARDS PARTICIPATE MEMBERSHIP ABOUT W3C

View: desktop mobile print

### W3C identifies how the Web will Transform the Digital Signage Industry

18 July 2012 | [Archive](#)

W3C announced today new momentum for making the Web the future interoperable platform for Digital Signage. W3C issued a [summary of key topics and use cases for bringing Digital Signage to the Web](#), as well as a first gap analysis of enhancements to the Web to enable the transformation of the Digital Signage ecosystem. Digital signage covers a spectrum of display sizes and locations, from sports arenas and urban video terminals of every shape, to monitors in elevators, storefront windows, train stations, and public kiosks featuring rich interactivity. In June, an initial opportunity to discuss next-generation Web-based Digital Signage services drew industry stakeholders to a W3C Workshop "All Signs Point to the Web," hosted by NTT. [Read the full press release about the Workshop report and join the Web-based Signage Business Group to develop use cases and requirements for standardization.](#)

### Registration Open for Mobile Web Training Courses (in English y en Español)

18 July 2012 | [Archive](#)

### Four Device API Specifications Published; HTML Media Capture Last Call

17 July 2012 | [Archive](#)

The World Wide Web Consortium (W3C) is an international community that develops open standards to ensure the long-term growth of the Web. [Read about the W3C mission.](#)

**JOB**

[Technical Editor for HTML Working Group](#)

[Web Accessibility Specialist](#)

[Web Accessibility Engineer](#)

**W3C BLOG**

[Report from Bellevue: meaningful advances on Do Not Track](#)  
26 June 2012 by [Nick Doty](#)

[Implementing ADMS and the Core Vocabularies](#)  
25 June 2012 by [Phil Archer](#)

**STANDARDS**

- Web Design and Applications
- Web Architecture
- Semantic Web
- XML Technology
- Web of Services
- Web of Devices
- Browsers and Authoring Tools
- ... or view all

**WEB FOR ALL**

- W3C A to Z
- Accessibility
- Internationalization
- Mobile Web

Computer Science is nerdy

Computer Science is cool

The image shows a screenshot of the Treehouse website. At the top, the Treehouse logo is on the left, followed by a search bar and navigation links for Home, Library, and Plans & Sign Up. The main heading reads "What do you want to learn today?" with a subtext: "Treehouse is the best way to learn how to design and develop for the web and iOS." Below this are three tabs: "Web Design", "Web Development", and "iOS Development".

Overlaid on the right side of the page is a screenshot of the W3C website. The W3C logo is in the top left of the overlay. Navigation links include "STANDARDS", "PARTICIPATE", "MEMBERSHIP", and "ABOUT W3C". A search bar with the Google logo is on the right. The main content area features a featured article titled "W3C Identifies how the Web will Transform the Digital Signage Industry" dated 18 July 2012. The article text states: "W3C announced today new momentum for making the Web the future interoperable platform for Digital Signage. W3C issued a summary of key topics and use cases for bringing Digital Signage to the Web, as well as a first gap analysis of enhancements to the Web to enable the transformation of the Digital Signage ecosystem. Digital signage covers a spectrum of display sizes and locations, from sports arenas and urban video terminals of every shape, to monitors in elevators, storefront windows, train stations, and public kiosks featuring rich interactivity. In June, an initial opportunity to discuss next-generation Web-based Digital Signage services drew industry stakeholders to a W3C Workshop 'All Signs Point to the Web,' hosted by NTT. Read the full press release about the Workshop report and join the Web-based Signage Business Group to develop use cases and requirements for standardization." Below this are two more article teasers: "Registration Open for Mobile Web Training Courses (in English y en Español)" and "Four Device API Specifications Published; HTML Media Capture Last Call".

On the left side of the W3C overlay, there is a sidebar with a "STANDARDS" section containing links for "Web Design and Applications", "Web Architecture", "Semantic Web", "XML Technology", "Web of Services", "Web of Devices", and "Browsers and Authoring Tools". Below that is a "WEB FOR ALL" section with links for "W3C A to Z", "Accessibility", "Internationalization", and "Mobile Web".

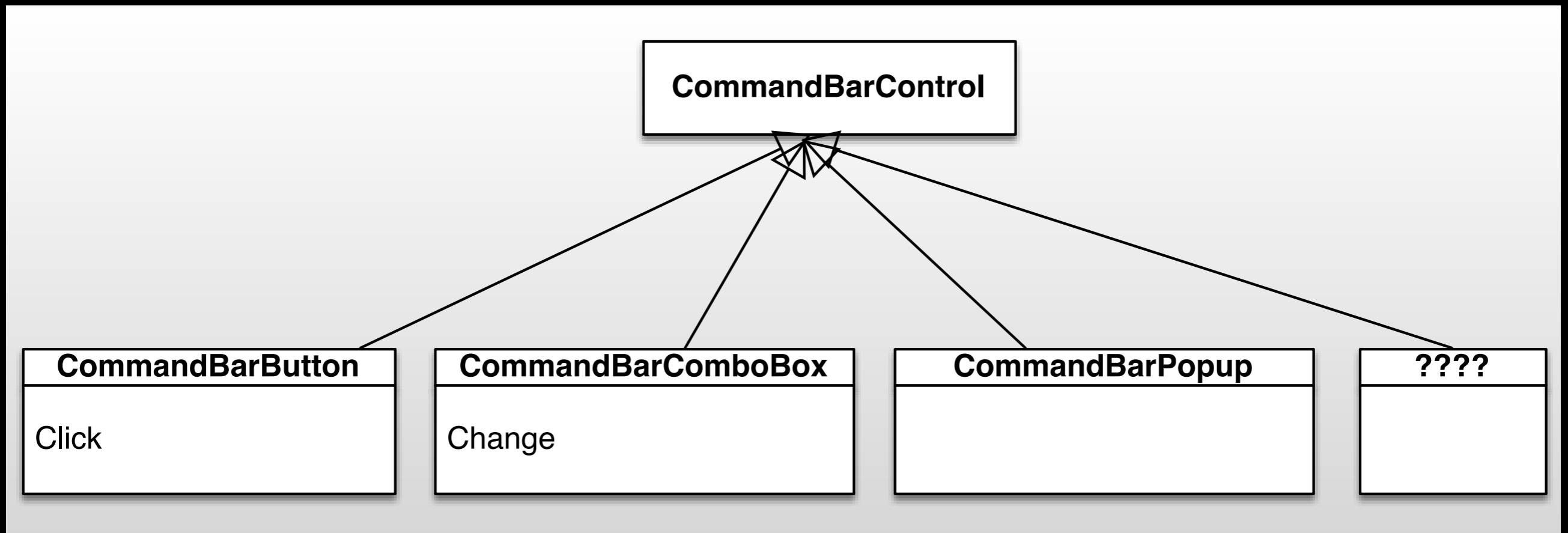
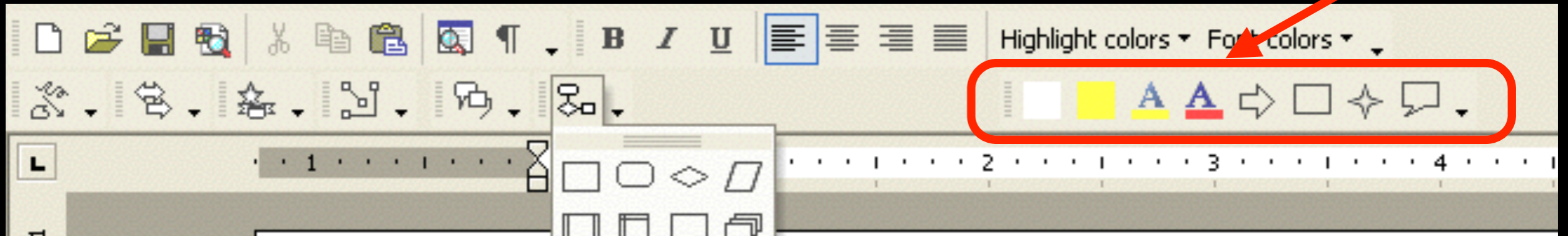
Message #2:

To succeed, we need to empower  
designers and programmers to  
use more powerful abstractions in  
UI development

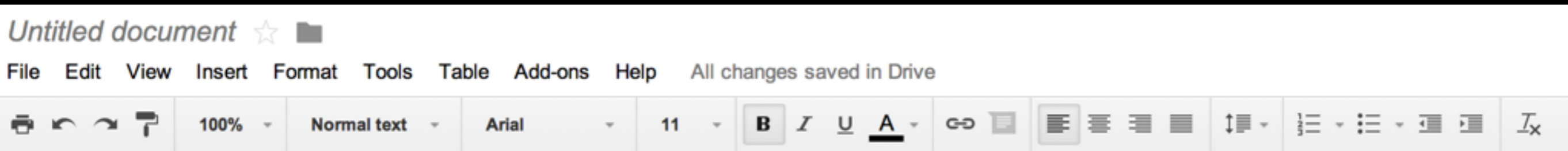


# Abstractions for Adaptive Interfaces

Adaptive toolbar



# Abstractions for Adaptive Interfaces



```
<div id="boldButton"
class="goog-toolbar-toggle-button goog-toolbar-button goog-inline-block"
role="button" aria-disabled="false" aria-pressed="false"
style="-webkit-user-select: none;" aria-hidden="false"
data-tooltip="Bold (%B)" aria-label="Bold (%B)">
  <div class="g
    style="-w
  <div clas
    style
  <div
    style="-webkit-user-select: none;">
    <div class="docs-icon-img-container docs-icon-img docs-icon-bold"
      aria-hidden="true" style="-webkit-user-select: none;">&nbsp;
    </div>
  </div>
</div>
</div>
</div>
</div>
```

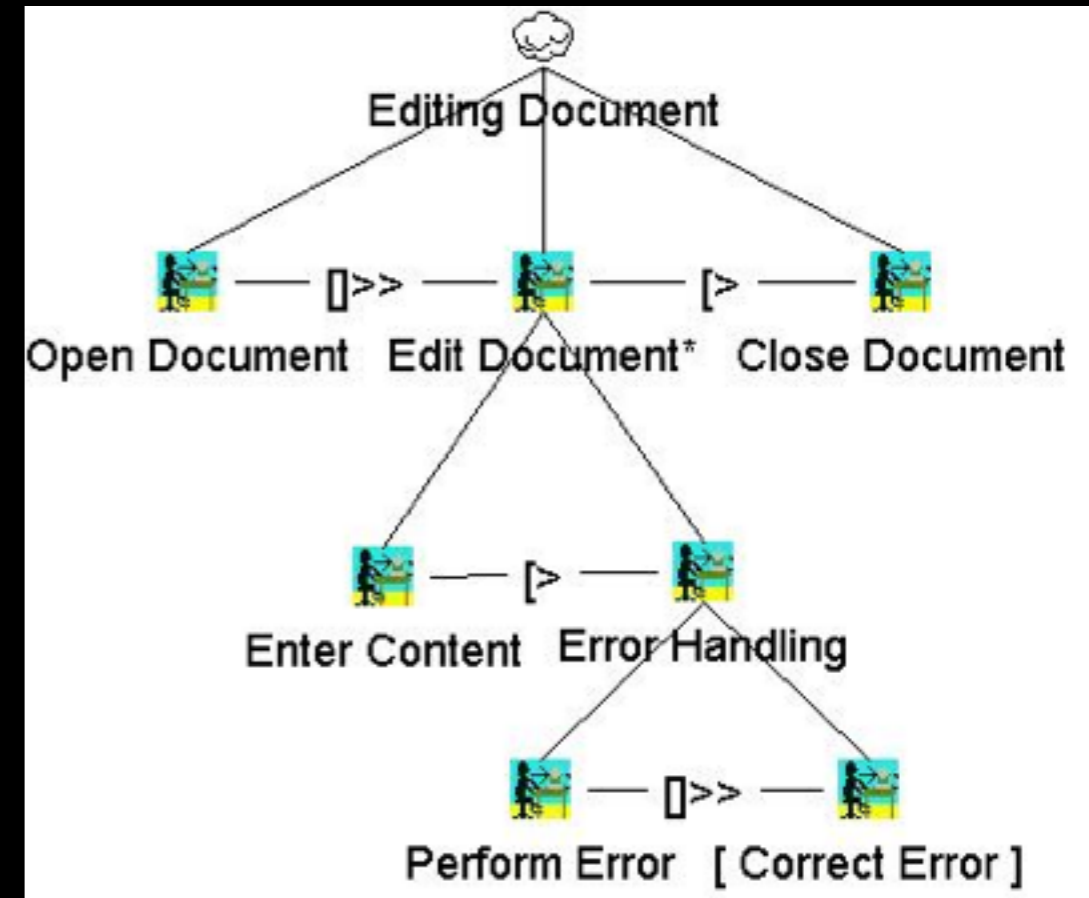
role="button"

# Model-Based Design?

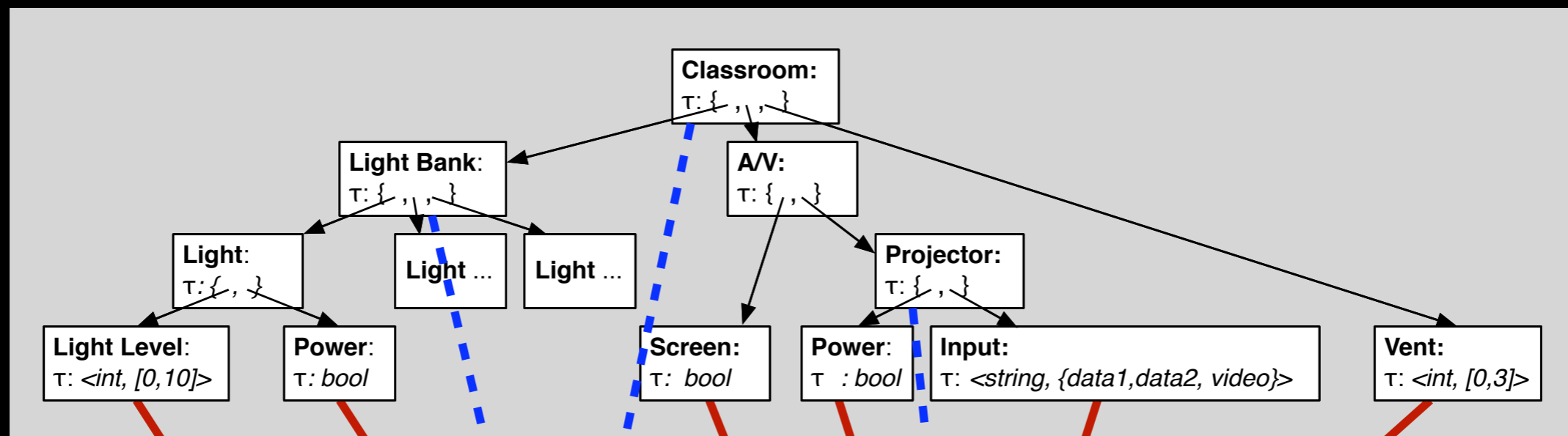
Abstract User Interface

Concrete User Interface

Final User Interface



[Paterno, Mancini, Meniconi '97]

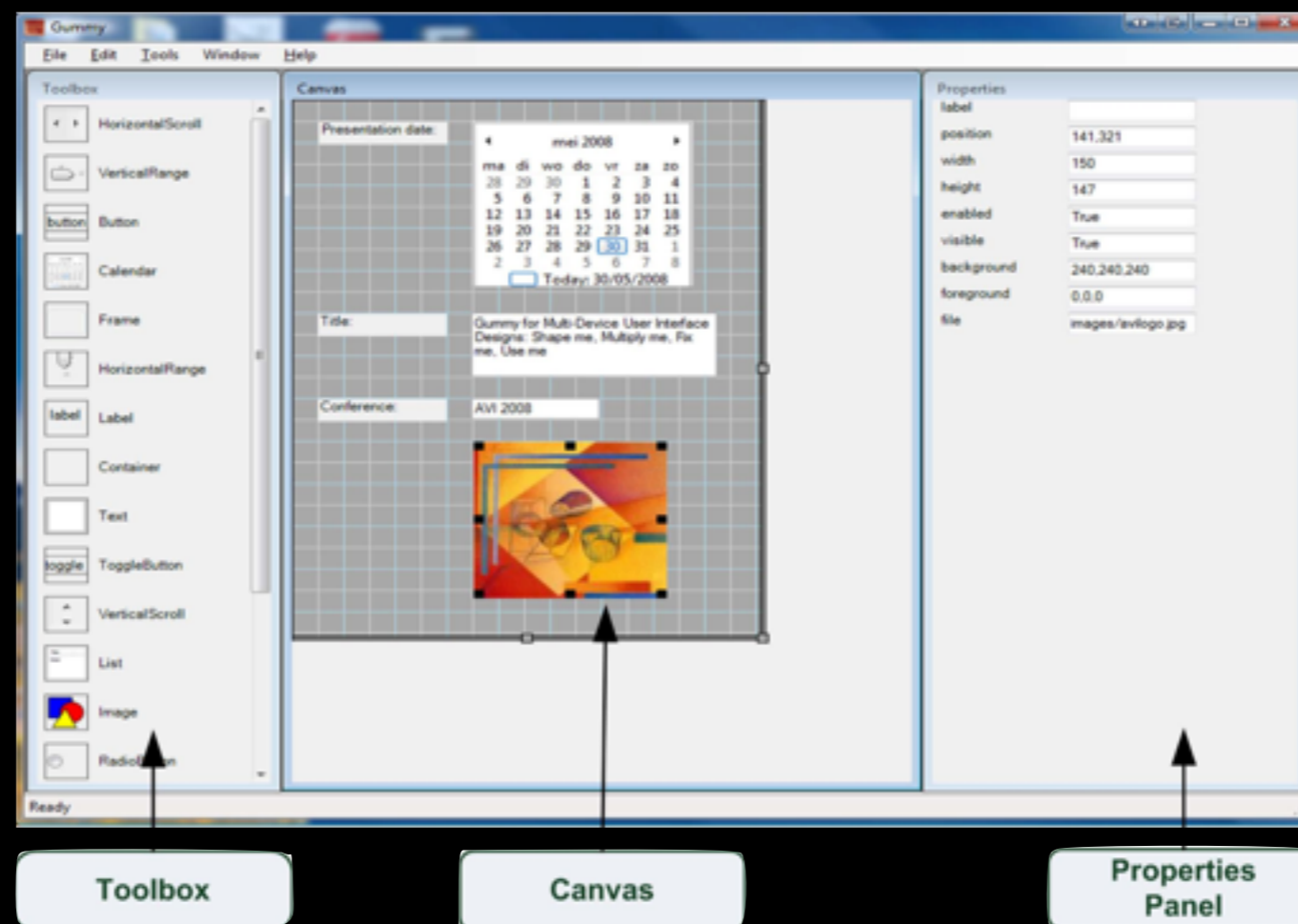


# Neither Designers Nor Programmers Use High-Level Models!

- Chickenfoot - programming by UI vocabulary  
[Bolin, et al., 2005]
- Sikuli - programming by UI appearance  
[Yeh, Chang, Miller, 2009]
- Prefab - reverse engineering UI semantics  
[Dixon and Fogarty, 2010]

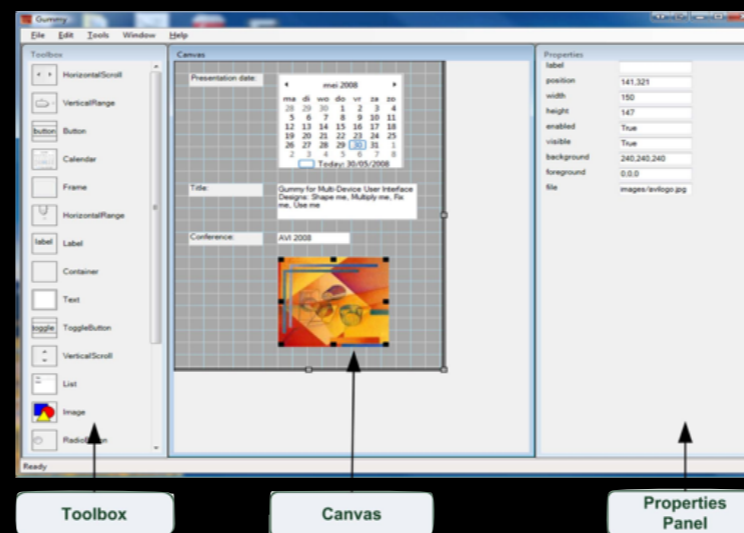
# Wanted: Tools that Empower Designers and Programmers

- Empowering designers: e.g., Gummy [Meskens, Vermeulen, Luyten, Coninx, 2008]



# Wanted: Tools that Empower Designers and Programmers

- Empowering designers: e.g., Gummy [Meskens, Vermeulen, Luyten, Coninx, 2008]



- Empowering programmers?

# Synthesis

1. Strategy for designing usable Adaptive User Interfaces:
  - Use of adaptive mechanism is optional
  - Minimal cost of incorrect adaptation



Adaptive toolbar

# Synthesis

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  - Use of adaptive mechanism is optional
  - Minimal cost of incorrect adaptation
2. It is not sufficient to make access possible.  
Access also has to be **equitable**



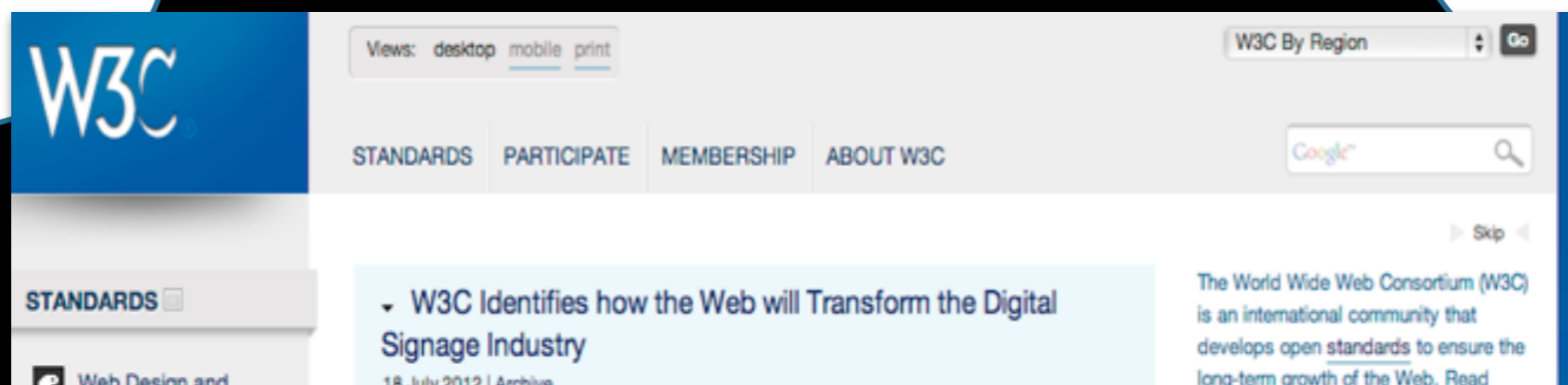


# Synthesis

1. Strategy for designing usable Adaptive User Interfaces:
  - Use of adaptive mechanism is optional
  - Minimal cost of incorrect adaptation
2. It is not sufficient to make access possible. Access also has to be **equitable**
3. One-size-fits-all approach to design inevitably leads to discrimination. **Adaptive User Interfaces Can Enable More Democratic Access to Digital Resources.**



Computer Science is nerdy



Computer Science is cool



# Synthesis

1. Strategy for designing usable Adaptive User Interfaces:
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3. One-size-fits-all approach to design inevitably leads to discrimination. **Adaptive User Interfaces Can Enable More Democratic Access to Digital Resources.**
4. We need to empower designers and programmers to use more powerful abstractions in UI development

# Key Collaborators



Katharina  
Reinecke



David  
Flatla



Daniel  
Weld



Jacob  
Wobbrock



Mary  
Czerwinski



Desney  
Tan

# Adaptive User Interfaces Can Enable More Democratic Access to Digital Resources



**Krzysztof Gajos**



**HARVARD**

**School of Engineering  
and Applied Sciences**



**LABINTHEWILD.org**

# Key Papers Related to This Talk

- Krzysztof Z. Gajos, Mary Czerwinski, Desney S. Tan, and Daniel S. Weld. **Exploring the design space for adaptive graphical user interfaces.** In *AVI '06: Proceedings of the working conference on Advanced visual interfaces*, pages 201-208, New York, NY, USA, 2006. ACM Press.
- David R. Flatla, Katharina Reinecke, Carl Gutwin, and Krzysztof Z. Gajos. **SPRWeb: preserving subjective responses to website colour schemes through automatic recolouring.** In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI '13*, pages 2069-2078, New York, NY, USA, 2013. ACM.
- Krzysztof Z. Gajos, Daniel S. Weld, and Jacob O. Wobbrock. **Automatically generating personalized user interfaces with Supple.** *Artificial Intelligence*, 174:910-950, 2010.
- Katharina Reinecke and Krzysztof Z. Gajos. **Quantifying Visual Preferences Around the World.** In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI '14*, New York, NY, USA, 2014. ACM.