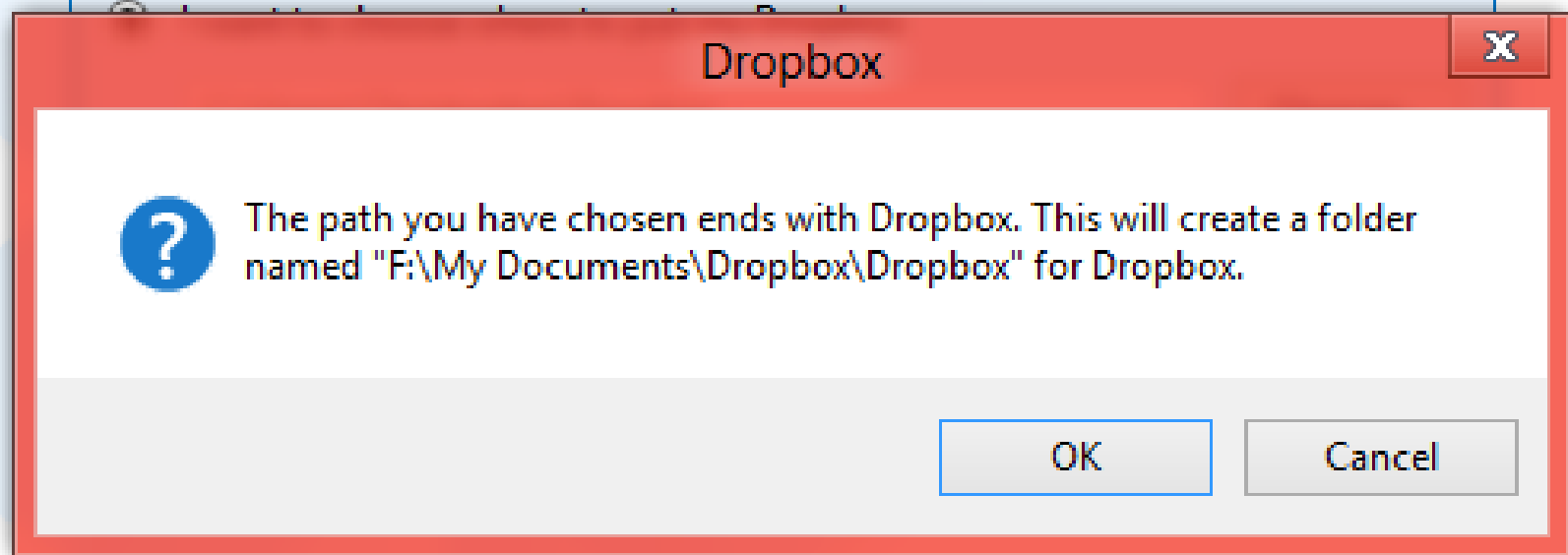




# Styles of Interaction

Human Computer Interaction  
CSCI 4620U | SOFE 4850U | CSCI 5540G  
Dr. Christopher Collins

Acknowledgement: Parts of these lectures are based on material prepared by Ron Baecker, Ravin Balakrishnan, John Chattoe, Ilona Posner, Scott Klemmer, and Jeremy Bradbury.



# Last Time

- Scenarios, Task Analysis, and Requirements

# Today

- Styles of Interaction

Don't forget to check Blackboard for required readings!

This week: Several parts of Benyon Text

HCI Theory

# **STYLES OF INTERACTION**

# Defining Interaction

*“the communication  
between user and  
system”*

- Dix, Finley, Abowd, Beale

# The Range of Interaction



## **Minimal interaction...**

User enters all input  
into the system and  
waits for output.  
(e.g., punchcards)

## **High-degree of interaction...**

User is constantly  
entering input and  
receiving output from  
the system  
(e.g., virtual reality)

# Styles of Interaction

- There are many different kinds of interaction between humans and computers – these are often referred to as **styles**
- Examples of interaction include:
  - Command-line interfaces
  - Menus
  - Natural language
  - Question/answer dialogs
  - Forms
  - WIMP interfaces
  - Point-and-click interfaces
  - 3D interfaces
  - Touch / Gesture



# Command-line Interface

```
bash-2.05b$ pwd
/home/dstone
bash-2.05b$ cd /usr/portage/app-shells/bash
bash-2.05b$ ls -al
total 68
drwxr-xr-x  3 root root  4096 May 14 12:05 .
drwxr-xr-x 26 root root  4096 May 17 02:36 ..
-rw-r--r--  1 root root 13710 May  3 22:35 ChangeLog
-rw-r--r--  1 root root  2924 May 14 12:05 Manifest
-rw-r--r--  1 root root  3720 May 14 12:05 bash-2.05b-r11.ebuild
-rw-r--r--  1 root root  3516 May  2 20:05 bash-2.05b-r9.ebuild
-rw-r--r--  1 root root  5003 May  3 22:35 bash-3.0-r11.ebuild
-rw-r--r--  1 root root  4038 May 14 12:05 bash-3.0-r7.ebuild
-rw-r--r--  1 root root  3931 May 14 12:05 bash-3.0-r8.ebuild
-rw-r--r--  1 root root  4267 Mar 29 21:11 bash-3.0-r9.ebuild
drwxr-xr-x  2 root root  4096 May  3 22:35 files
-rw-r--r--  1 root root   164 Dec 29 2003 metadata.xml
bash-2.05b$ cat metadata.xml
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE pkgmetadata SYSTEM "http://www.gentoo.org/dtd/metadata.dtd">
<pkgmetadata>
<herd>base-system</herd>
</pkgmetadata>
bash-2.05b$ sudo /etc/init.d/bluetooth status
Password:
* status:  stopped
bash-2.05b$ ping -q -c1 en.wikipedia.org
PING rr.chtpa.wikimedia.org (207.142.131.247) 56(84) bytes of data.

--- rr.chtpa.wikimedia.org ping statistics ---
 1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/ndev = 112.076/112.076/112.076/0.000 ms
bash-2.05b$ grep -i /dev/sda /etc/fstab | cut --fields=3
/dev/sda1      /mnt/usbkey
/dev/sda2      /mnt/ipod
bash-2.05b$ date
Wed May 25 11:36:56 PDT 2005
bash-2.05b$ lsmod
Module                  Size  Used by
joydev                  8256  0
ipw2200                 175112  0
ieee80211               44228  1 ipw2200
ieee80211_crypt         4872  2 ipw2200,ieee80211
e1000                   84468  0
bash-2.05b$
```

(Source: Wikipedia - [http://en.wikipedia.org/wiki/Image:Bash\\_screenshot.png](http://en.wikipedia.org/wiki/Image:Bash_screenshot.png))

# Command-line Interface

- **Advantages:**

- Very expressive and flexible
- Direct access to the system
- Ideal for “experts”

- **Disadvantages:**

- Hard to learn for newbies
  - **Example:** Unix shell. Requires users to learn many different commands. In order to get help users often need to know the command they are looking for (MAN pages)

# Menus

- Items in menu-based interfaces can often be selected using the **keyboard** or **mouse**

Personal Information Updater (v1.0)

Please select an option:

1. Updated address
2. Update phone number
3. Update email
4. Change password
5. Updated security question
6. Quit

What about touch?

# Menus

- **Advantages:**
  - Menu item names and order can provide help to newbies and “non-experts” in navigating the system (**recognition** vs. recall)
- **Disadvantages:**
  - Limited **flexibility**
  - Limited **power**

# Natural Language

- Natural language interfaces are common in limited domains
- **Example:** Siri (others?)
- General natural language interfaces are difficult to implement



# Natural Language

- **Advantages:**

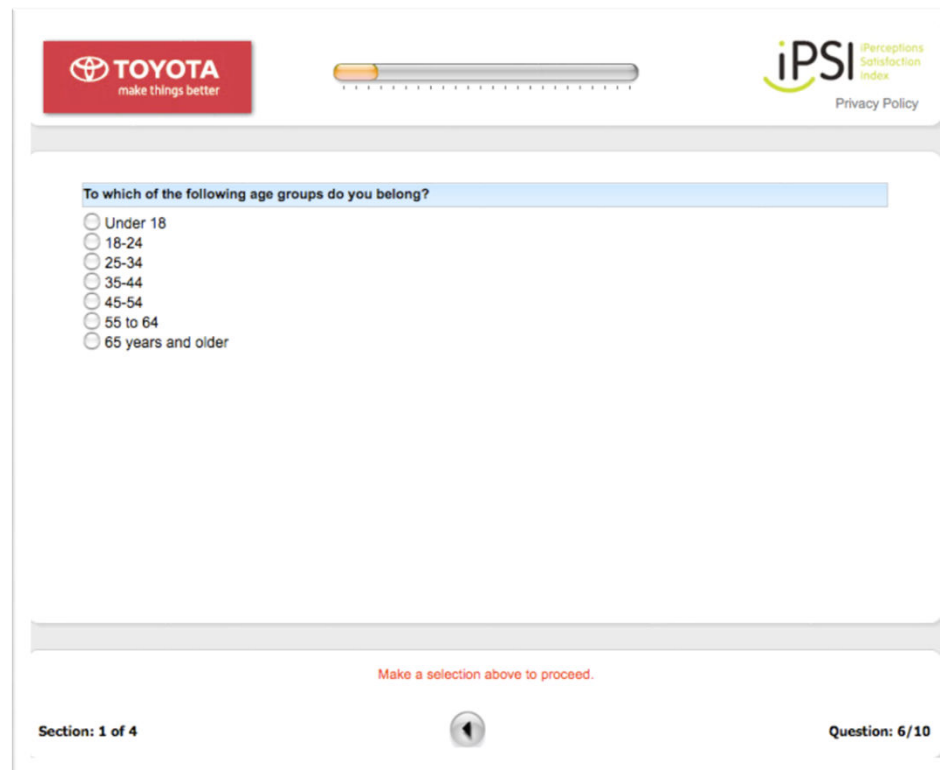
- Very flexible and expressive (if computer has an open vocabulary) – generally not the case!

- **Disadvantages:**

- Natural languages are ambiguous – difficult for system to know what you are saying
- Implementation of natural languages usually requires a limited vocabulary and requires users to know what words/phrases the system will understand
- Language systems often do not give information regarding what is required next
- Understanding (logical meaning) is harder than recognition
- Error handling is difficult

# Question/Answer Dialogs

- One common example is web questionnaires



The screenshot shows a web questionnaire interface. At the top left is the Toyota logo with the tagline "make things better". In the center is a progress bar with a yellow segment on the left. At the top right is the iPSI logo with the text "iPSI Perceptions Satisfaction Index" and a link to "Privacy Policy". The main question is "To which of the following age groups do you belong?". Below the question are seven radio button options: "Under 18", "18-24", "25-34", "35-44", "45-54", "55 to 64", and "65 years and older". At the bottom of the form, there is a red instruction "Make a selection above to proceed." and a navigation bar with "Section: 1 of 4", a circular arrow icon, and "Question: 6/10".

(Source: Toyota Canada website - <http://www.toyota.ca/>)

# Question/Answer Dialogs

- **Advantages:**
  - Good for obtaining **specific input**
  - **Easy to use** – works well for first time users
- **Disadvantages:**
  - Limited **power**
  - Limited **flexibility**



# Forms

- Form-based interfaces are common on the web, in retail systems, in options dialogs, etc.

(Source: UOIT Faculty of Science website - <http://www.science.uoit.ca>)

**Graduate Studies Information Request**

On submission of this form, you will be sent application material and further information about the program.

\* - Denotes a mandatory field.

First Name \*

Please enter your first name.

Choose a Program \*

☐ Modelling & Computational Science

☐ Applied Bioscience

☐ UOIT-Trent Materials Science

Please select the program that you are interested in.

Address 2

Please enter your address.

Last Name \*

Please enter your last name.

Address 1 \*

Please enter your address.

City \*

Please enter your city.

Visa Status \*

Select ▼

Please select your visa status.

Province/State \*

Please enter your province/state.

Postal/Zip Code \*

Please enter your postal/zip code.

# Forms

- **Advantages:**

- Can provide **flexible data entry**

- You can fill in fields in different orders
    - You can choose not to fill in some fields

- **Disadvantages:**

- **Limited applications.** Not a general model of an interface

# WIMP Interfaces

WIMP = Windows, Icons,  
Menus, Pointers

- Any Window-based operating system interface is an example of a WIMP interface
- **Examples:** Windows Aero, Mac OSX, KDE,...

# Windows

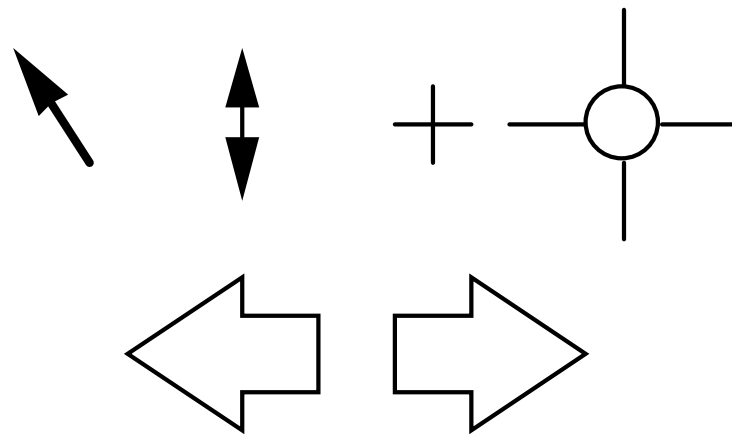
- Areas of the screen that behave as if they were independent
  - can contain text or graphics
  - can be moved or resized
  - can overlap and obscure each other, or can be laid out next to one another (tiled)
- scrollbars
  - allow the user to move the contents of the window up and down or from side to side
- title bars
  - describe the name of the window

# Icons

- small picture or image
- represents some object in the interface
  - often a window or action
- windows can be closed down (iconised)
  - small representation of many accessible windows
- icons can be many and various
  - highly stylized
  - realistic representations.

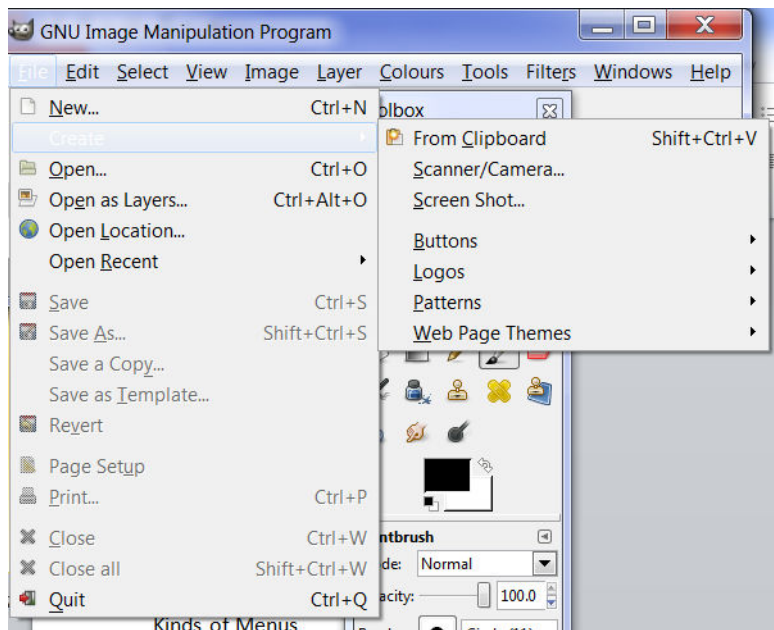
# Pointers

- important component
  - WIMP style relies on pointing and selecting things
- uses mouse, trackpad, joystick, trackball, cursor keys or keyboard shortcuts
- wide variety of graphical images



# Menus

- Choice of operations or services offered on the screen
- Required option selected with pointer



problem – take a lot of screen space

solution – pop-up: menu appears when needed

# Kinds of Menus

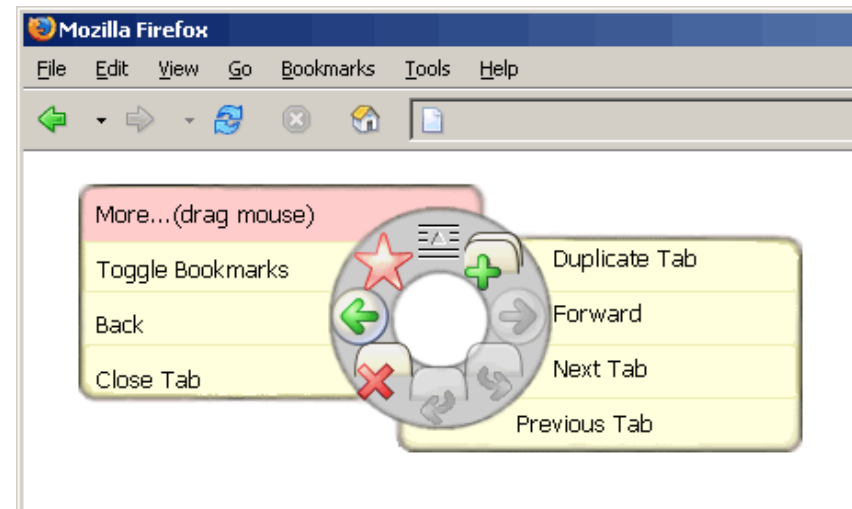
- Menu Bar at top of screen (normally), menu drags down
  - pull-down menu - mouse hold and drag down menu
  - drop-down menu - mouse click reveals menu
  - fall-down menus - mouse just moves over bar!
- Contextual menu appears where you are
  - pop-up menus - actions for selected object
  - pie menus - arranged in a circle
    - easier to select item (larger target area)
    - also called “Marking menus” if you can use them with a gesture
    - quicker (same distance to any option)  
... but not widely used!



# Try out Pie Menus!



Marking menu for Chrome:  
<http://goo.gl/I6fTFy>



Firefox Easy Gestures add-on:  
<http://easygestures.mozdev.org/index.html>

# Menus extras

- Cascading menus
  - hierarchical menu structure
  - menu selection opens new menu
  - and so in ad infinitum
- Keyboard accelerators
  - key combinations - same effect as menu item
  - two kinds
    - active when menu open – usually first letter
    - active when menu closed – usually Ctrl + letter
    - often different!

# Menus design issues

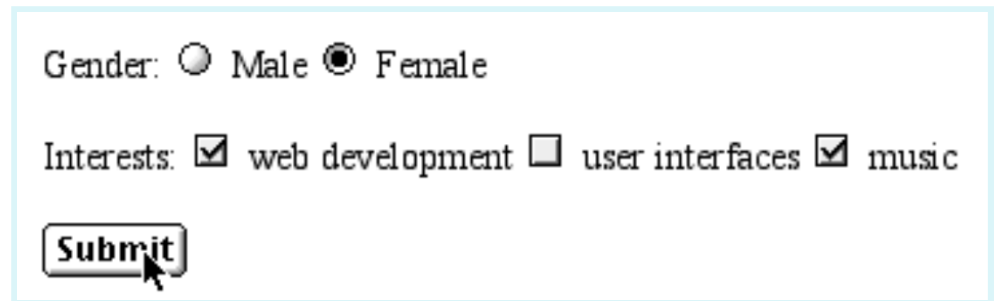
- which kind to use
- what to include in menus at all
- words to use (action or description)
- how to group items
- choice of keyboard accelerators

# Buttons

- individual and isolated regions within a display that can be selected to invoke an action

- Special kinds

- radio buttons
  - set of mutually exclusive choices
- check boxes
  - set of non-exclusive choices

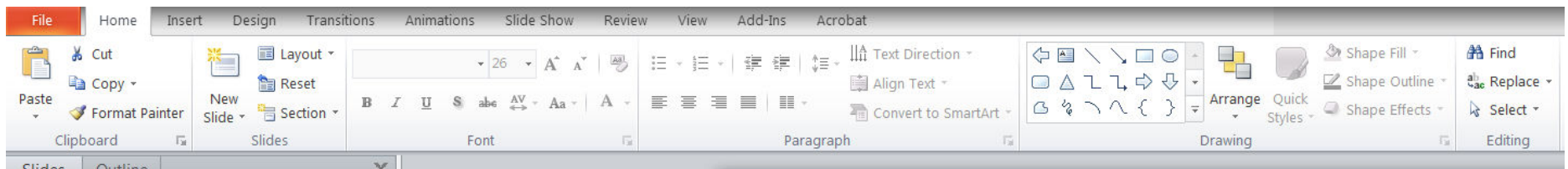


Gender: ☐ Male ☒ Female

Interests: ☒ web development ☐ user interfaces ☒ music

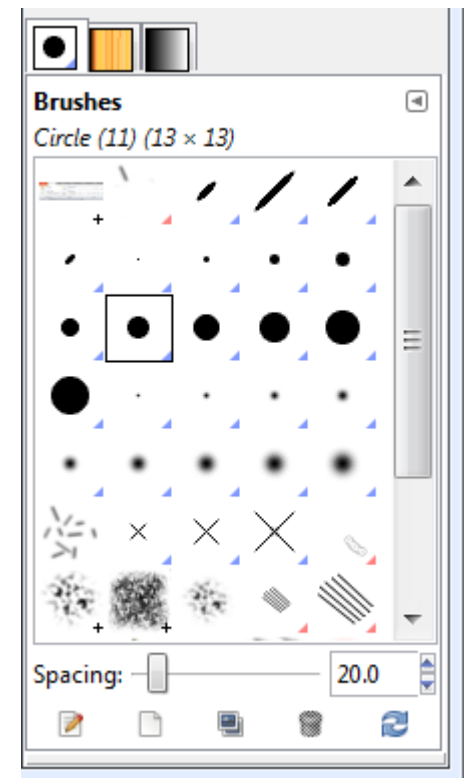
# Toolbars

- long lines of icons ...  
... but what do they do?
- fast access to common actions
- often customizable:
  - choose which toolbars to see
  - choose what options are on it
  - large toolbars: “the ribbon”



# Palettes and tear-off menus

- Palettes – little windows of actions
  - shown/hidden via menu option
  - e.g. available shapes in drawing package
- Tear-off and pin-up menus
  - menu ‘tears off’ to become palette



# Dialog boxes

- information windows that pop up to inform of an important event or request information.
  - e.g: when saving a file, a dialog box is displayed to allow the user to specify the filename and location. Once the file is saved, the box disappears.

# Other WIMP features

- Wikipedia has an extensive list of WIMP features:
  - [http://en.wikipedia.org/wiki/Window\\_manager](http://en.wikipedia.org/wiki/Window_manager)





(Source: Ubuntu website - <http://www.ubuntu.com/products/whatisubuntu/804features/>)

# WIMP Interfaces

- **Advantages:**
  - Very flexible and expressive
  - Can be used for a variety of different systems
- **Disadvantages:**
  - Some interface features can be hard to learn
    - However, not to the same extent as command-line interfaces

# The WIMP story...



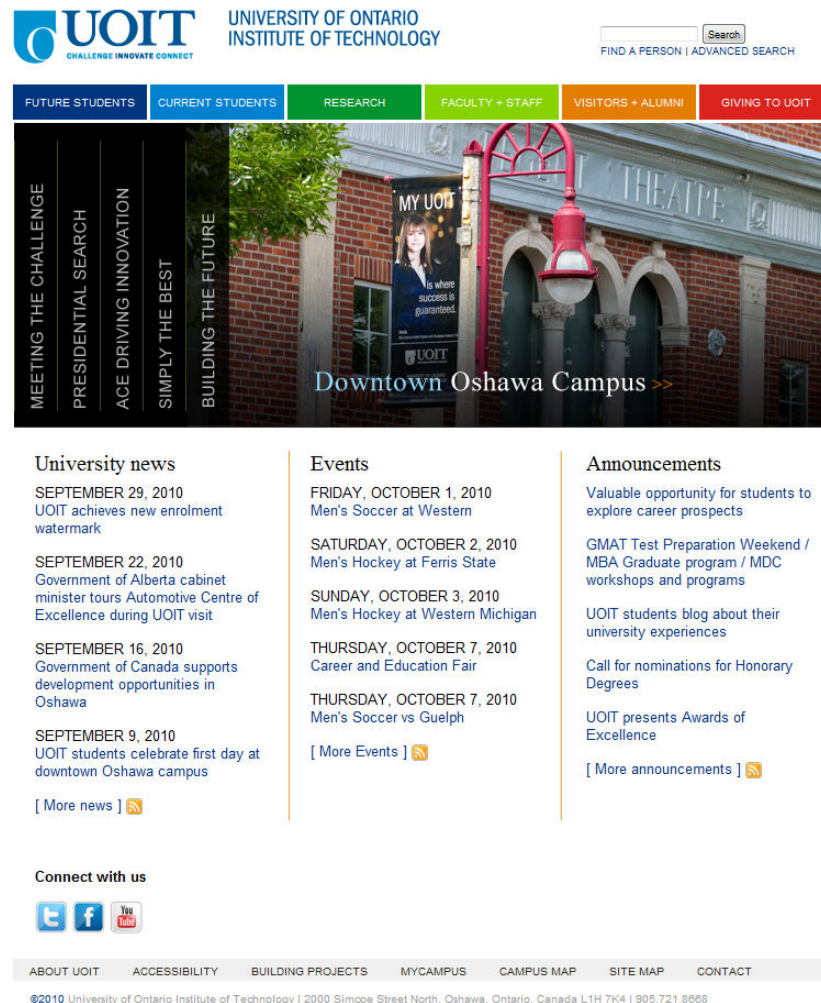
# Composite Window Managers

- Advanced graphical features
  - Transparency
  - 3D
  - Deformations
  - Live thumbnails
- Example – Compiz for Linux
- What do you think of this?



# Point-and-Click Interfaces

- The most common example of this interface is **web pages!**



(Source: UOIT website – <http://www.uoit.ca>)

# Point-and-Click Interfaces

- **Advantages:**
  - **Simpler** than WIMP
- **Disadvantages:**
  - Doesn't work for all systems

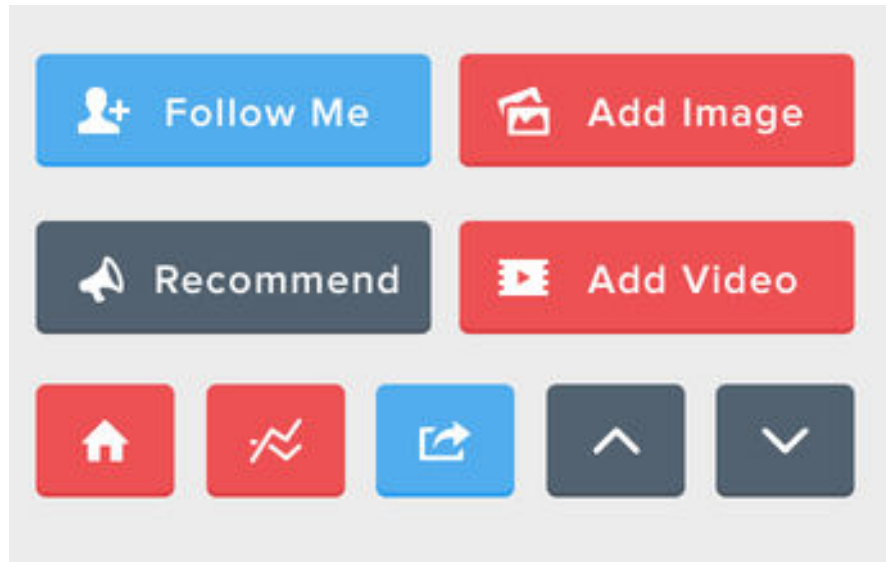


# 3D Interface

- 3D interfaces are unique from all of the other interfaces from the simple fact that they are not 2D
- There are many different kinds of 3D interfaces such as:
  - Virtual Reality
  - 3D implementations of WIMP interfaces
  - 3D as a visual affordance

# 3D as a Visual Affordance

flat buttons ...



click me!





Your World. Your Imagination.

[Resident Login](#) | [Join](#)

[WHAT IS SECOND LIFE?](#) [SHOWCASE](#) [COMMUNITY](#) [LAND](#) [BLOG](#) [SUPPORT](#)

## WHAT IS SECOND LIFE?

### The World

- Create an Avatar
- Explore
- Meet People
- Virtual Land
- Have Fun

### The Creations

- Create Anything
- Building
- Scripting

### The Marketplace

- Economy
  - Economy Graphs
  - Economic Statistics
  - LindeX Market Data
  - Business Opportunities
  - IP Rights
- ### Memberships & Pricing
- Membership Plans
  - Land Pricing & Use Fees

## The Marketplace

Make real money in a virtual world. That's right, **real money**.

Here's how it works:

- The Second Life world has a fully-integrated [economy](#) architected to reward risk, innovation, and craftsmanship.
- Residents create their own virtual goods and services. Because residents retain the [IP rights](#) of their creations, they are able to sell them at various in-world venues.
- [Businesses](#) succeed by the ingenuity, artistic ability, entrepreneurial acumen, and good reputation of their owners.
- Residents who have amassed lots of Linden™ dollars are matched with residents who want to buy Linden dollars at the [LindeX™](#) exchange (our official Linden dollar exchange), or at other unaffiliated third-party exchanges.
- The Second Life real estate market provides opportunities for Residents to establish their own communities and business locations. See [Land Pricing & Use Fees](#) for details.



Search Secondlife.com

## JOIN NOW

*Free Basic Membership*

### Resident Referral

Tell your friends about Second Life.

[MORE](#)

### Private Regions

Buy your own private region today!

[MORE](#)

### Got Questions?

Get the answers from our support channels!

[MORE](#)

## VIRTUAL LAND

- » [Mainland Pricing & Fees](#)
- » [Private Region Pricing & Fees](#)
- » [Land Portal \(Beta\)](#)
- » [Land Auctions](#)



Make it more real with a 3D mouse and premium headset.

(Source: Second Life website - <http://secondlife.com/whatis/marketplace.php>)

# 3D Interfaces

- **Advantages:**
  - Flexible and expressive
- **Disadvantages:**
  - Depending on the environment can require expensive equipment for input/output (e.g., virtual reality)
  - Very difficult to use with standard input hardware

# Touch / Gesture

- Touch is an input modality, but like speech, it is so different that it leads to different models of interaction
- Within touch, there are many types of interaction:
  - Tapping (single touch)
  - Gestures (single touch, sequence of movement)
  - Multitouch gestures (sequence of touch movements)

AT&T

1:46 PM

35%


## Notifications

Done





Pull down to update...


Last updated: 10-08-22 1:46 PM


 Anne Katz-Hanna commented on **Alex Kerner's link**. Fri 7:02 PM

 Alex . commented on **Alex Kerner's link**. Fri 4:12 PM

 Lindsay MacDonald tagged you in a **post**. Fri 2:15 PM

 m Tohidi likes your **link**. Fri 11:58 AM

 Petra Riedlberger also commented on **Anastasia Kutt's photo**.  
Thu 1:41 PM

 Tobias Isenberg also commented on his **status**. Wed 2:21 PM








## Notifications

Done



Release to update...

Last updated: 10-08-22 1:46 PM

-  Anne Katz-Hanna commented on **Alex Kerner's link**. Fri 7:02 PM
-  Alex . commented on **Alex Kerner's link**. Fri 4:12 PM
-  Lindsay MacDonald tagged you in a **post**. Fri 2:15 PM
-  Maryam Tohidi likes your **link**. Fri 11:58 AM
-  Riedlberger also commented on **Anastasia Kutt's photo**.  
PM

1:46 PM


## Notifications

Done





Updating...


Last updated: 10-08-22 1:46 PM


 Anne Katz-Hanna commented on **Alex Kerner's link**. Fri 7:02 PM

 Alex . commented on **Alex Kerner's link**. Fri 4:12 PM

 Lindsay MacDonald tagged you in a **post**. Fri 2:15 PM

 Maryam Tohidi likes your **link**. Fri 11:58 AM

 Petra Riedlberger also commented on **Anastasia Kutt's photo**.  
Thu 1:41 PM

 Tobias Isenberg also commented on his **status**. Wed 2:21 PM



# Leap Motion



# Touch / Gesture

- **Advantages:**
  - Flexible and natural
- **Disadvantages:**
  - Input modality leads to frequent slips
  - Slower for some tasks (text entry)
  - Poorly designed and inconsistent gestures are difficult to remember

# Mixing Styles of Interaction

- We have examined 8 interaction styles:
  - Command-line interfaces
  - Menus
  - Natural language
  - Question/answer dialogs
  - Forms
  - WIMP interfaces
  - Point-and-click interfaces
  - 3D interfaces
- Interfaces also combine or **mix** different styles
  - **Example:** web pages often combine point-and-click interfaces with forms

# *Mixing 2D/3D*

# VisLink: Revealing Relationships Amongst Visualizations



CHRISTOPHER COLLINS  
&  
SHEELAGH CARPENDALE

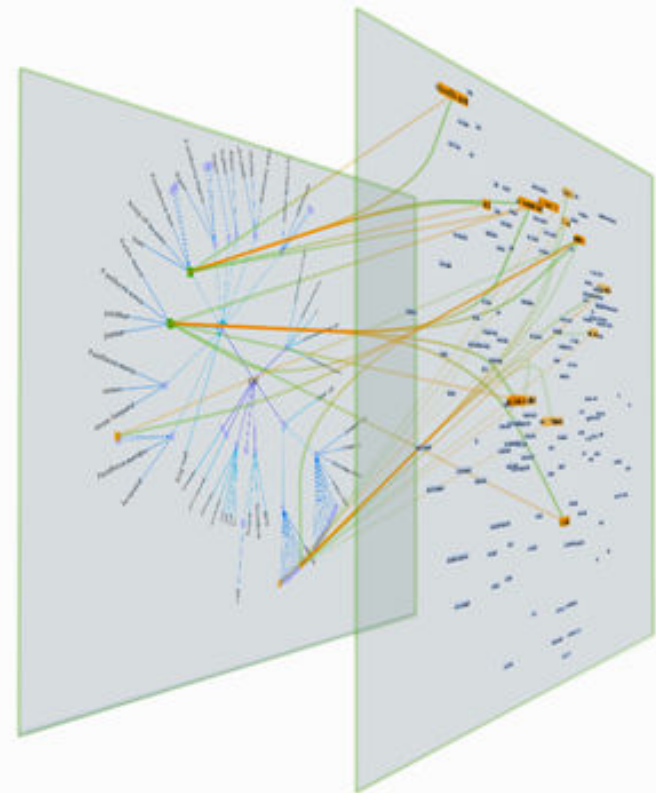
ccollins@cs.utoronto.ca, sheelagh@ucalgary.ca



UNIVERSITY of TORONTO



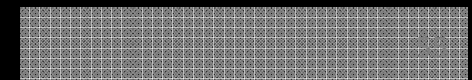
UNIVERSITY OF  
CALGARY



# *Mixing WIMP/3D*

**Keepin' It Real:  
Pushing the Desktop Metaphor with Physics,  
Piles and the Pen in BumpTop**

Anand Agarawala, Ravin Balakrishnan  
Dynamic Graphics Project  
[www.dgp.toronto.edu](http://www.dgp.toronto.edu)



# Summary

- Today we:
  - Reviewed various *styles of interaction*



# Your Action Items

- Group project part 2b
- Readings from the textbook posted online
- Midterm exam on next Friday

# Ongoing Course Evaluation

- Please complete the Lecture 10 daily feedback form!