

Interaction Techniques 2

SWVE 632
Fall 2015

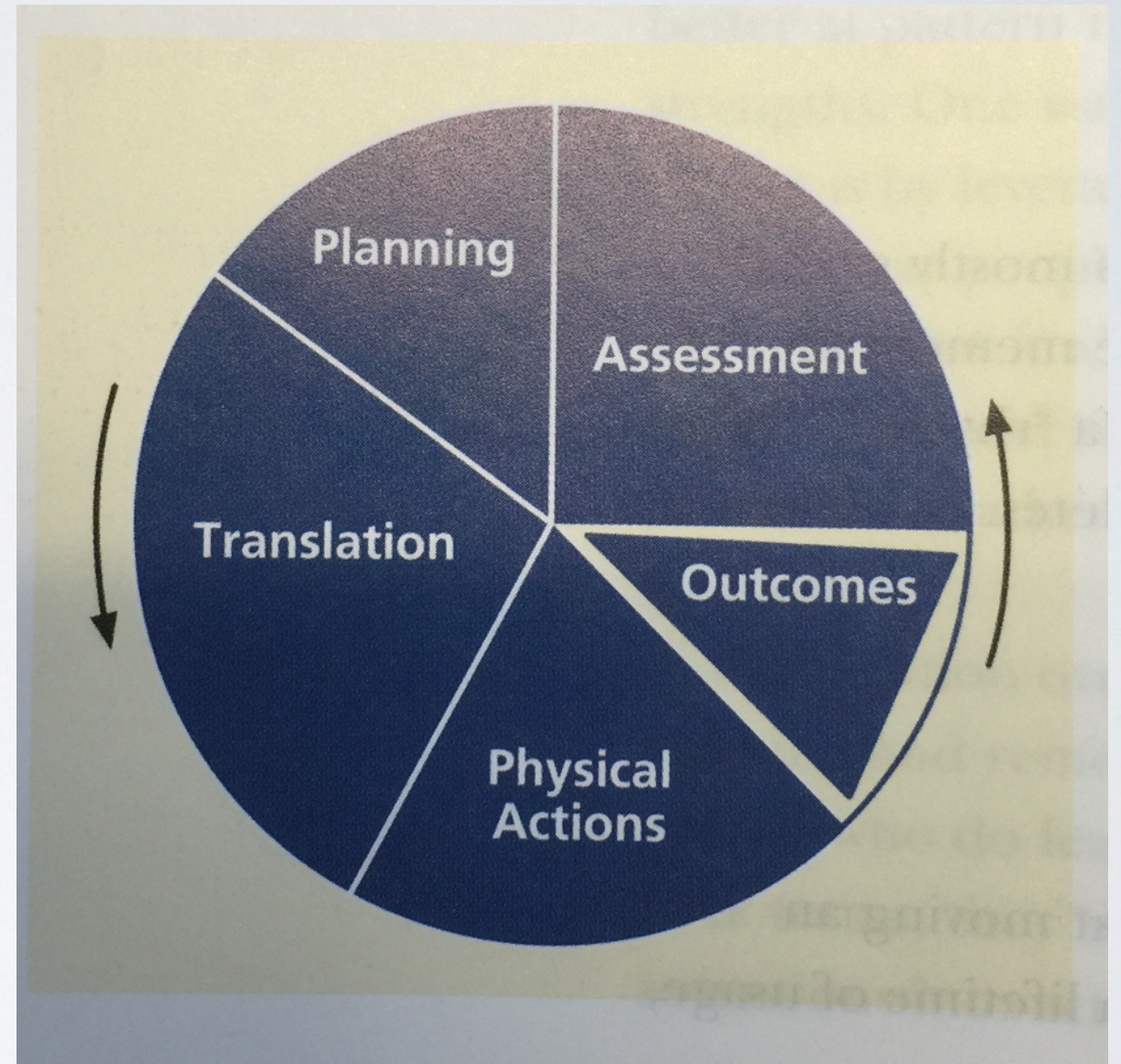
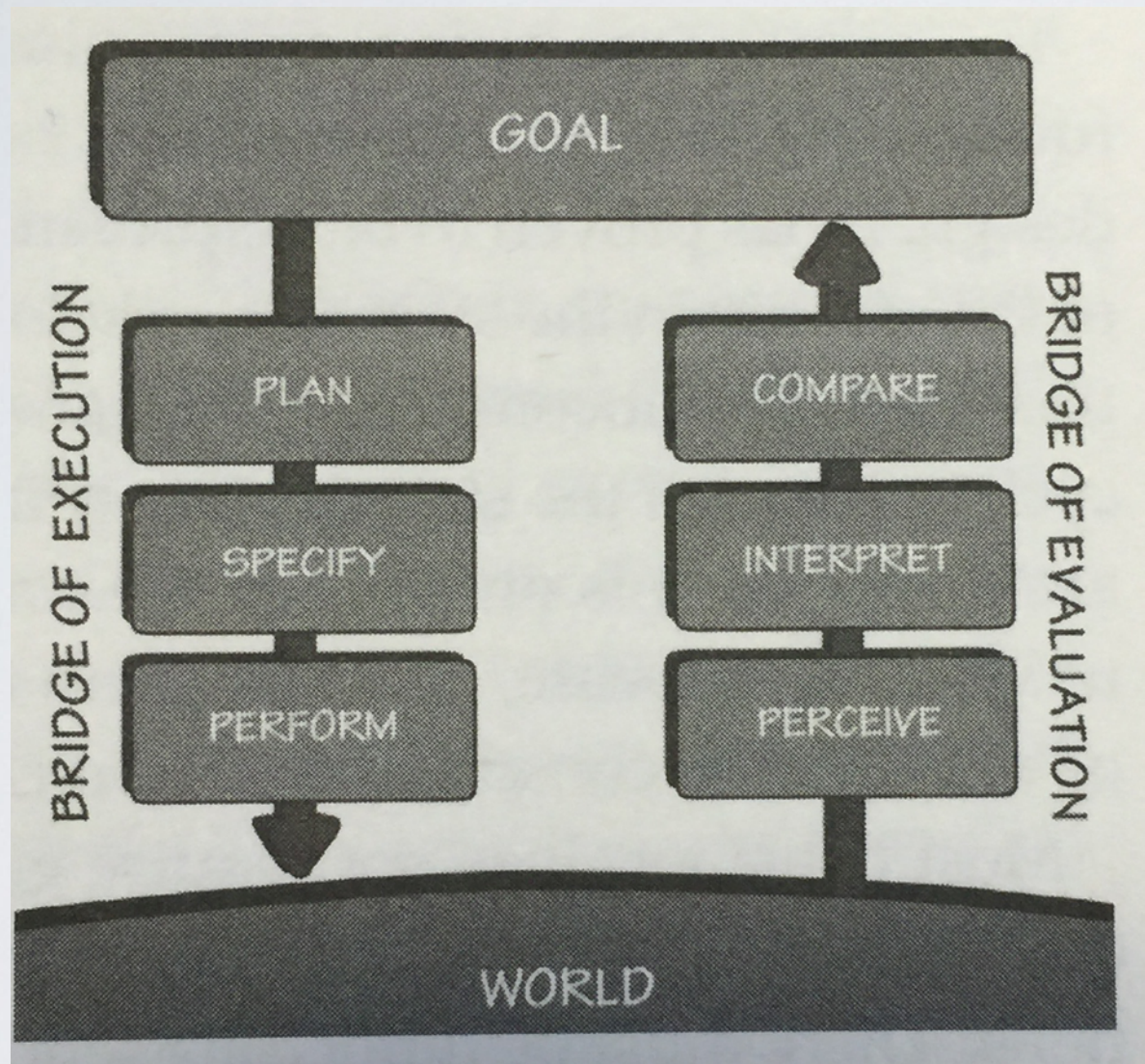


Administrivia

- HW 6 due today
- No class next week (Thanksgiving)
- HW 7 due on 12/3

Task structure

Hartson & Pyla Interaction Cycle



Task structure

- Flow of tasks and task steps
- Task design simplicity, flexibility, efficiency
- Maintenance of locus of control
- Direct manipulation

Separate long tasks into sequences

- Reduce STM demands by having user only work on one aspect of larger task at a time
- Don't interrupt users in the middle with unrelated tasks
- Provide closure of each subtask at the end

The screenshot displays the American Airlines website interface during a flight booking process. At the top, the header includes the American Airlines logo, navigation links (Home, Login, Hello, THOMAS), language selection (English), and a search bar. Below the header, a progress bar shows the current step: 'Travelers' (highlighted in blue), with other steps being 'Find Flights', 'Choose Flights', 'Trip Options', 'Select Seats', 'Review & Pay', and 'Finish'.

The main content area is titled 'Travelers' and includes a red warning icon with the text 'Check below for errors'. Below this, a flight summary is shown: 'Washington to Raleigh/ Durham' for '1 Adult' on 'Sunday January 10, 2016 – Monday January 11, 2016'. A 'Show Trip Details' button is located below the summary. To the right of the flight summary, a box displays 'Your Trip Price: \$203.70 USD' with a link for 'Baggage and Optional Charges'.

Below the flight summary, there is a promotional banner for the AAdvantage program, featuring an image of a credit card and text: 'Earn 40,000 bonus miles, up to \$100 in statement credits, and your first checked bag free*!'. To the right of this banner, a price breakdown is shown: 'Your Trip Price: \$203.70 USD' and 'Statement Credit: - \$100.00 USD', resulting in a final price of '\$103.70 USD'.

At the bottom, there is a section titled 'Passenger Details' with a help icon. It includes instructions: 'Please enter all passenger names as they appear on the passenger's government-issued photo identification. More details on passenger names' and a link to 'TSA Privacy Notice'. A note at the bottom left of this section states '*Required'.

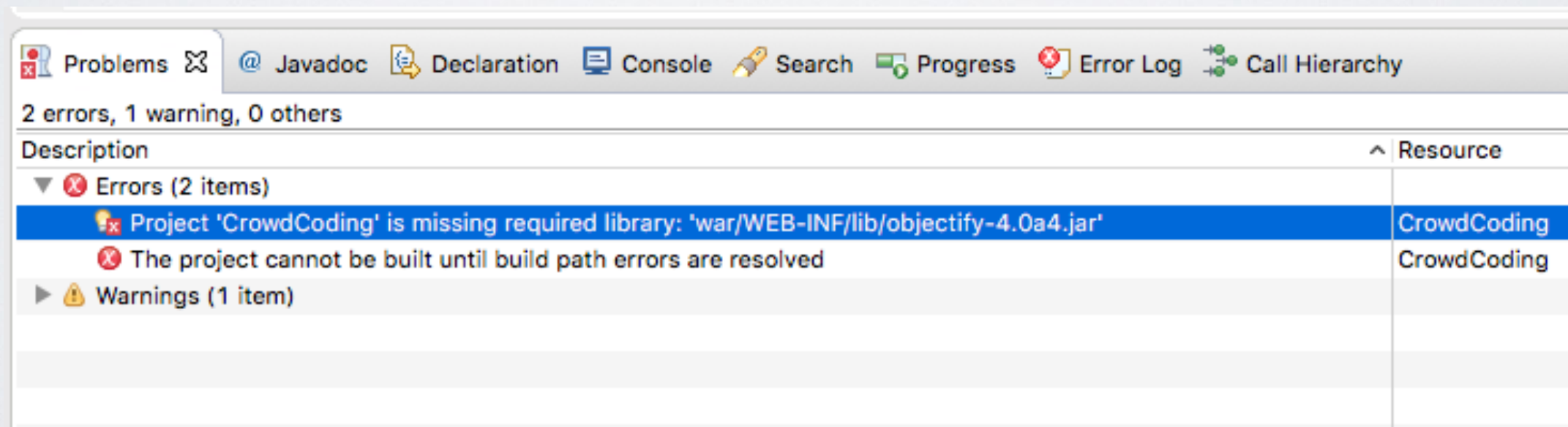
Design for flexibility & efficiency

- Users may take paths never envisioned by designer
- Using studies to identify different task flows, design flexible support for each

The screenshot shows the American Airlines website interface. At the top, the navigation bar includes links for Home, Login, Hello, THOMAS, English, and a search bar. The main navigation bar has tabs for Find Flights, Choose Flights, Travelers (active), Trip Options, Select Seats, Review & Pay, and Finish. The 'Travelers' section is titled 'Travelers' and includes a red warning icon and text: 'Check below for errors'. Below this, a flight summary box shows 'Washington to Raleigh/ Durham', '1 Adult', and the dates 'Sunday January 10, 2016 – Monday January 11, 2016'. To the right, a box displays 'Your Trip Price: \$203.70 USD' with a link for 'Baggage and Optional Charges'. A 'Show Trip Details' button is located below the flight summary. Further down, a promotional banner for AAdvantage credit cards offers 'Earn 40,000 bonus miles, up to \$100 in statement credits, and your first checked bag free*!'. To the right of this banner, a price breakdown shows 'Your Trip Price: \$203.70 USD' and 'Statement Credit: - \$100.00 USD', resulting in a total of '\$103.70 USD'. The 'Passenger Details' section is partially visible at the bottom, with a note to enter names as they appear on government-issued photo identification.

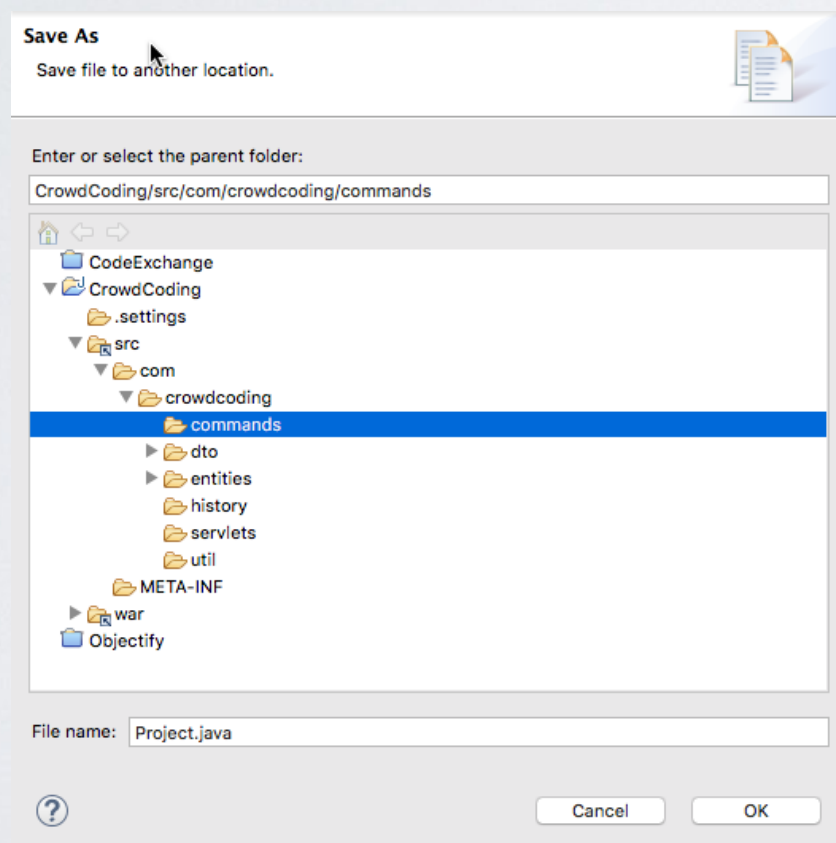
Show users how to fix errors

- Good: detecting user errors
- Better: directly showing how errors can be fixed
- (Best: using constraints to prevent errors from ever occurring)

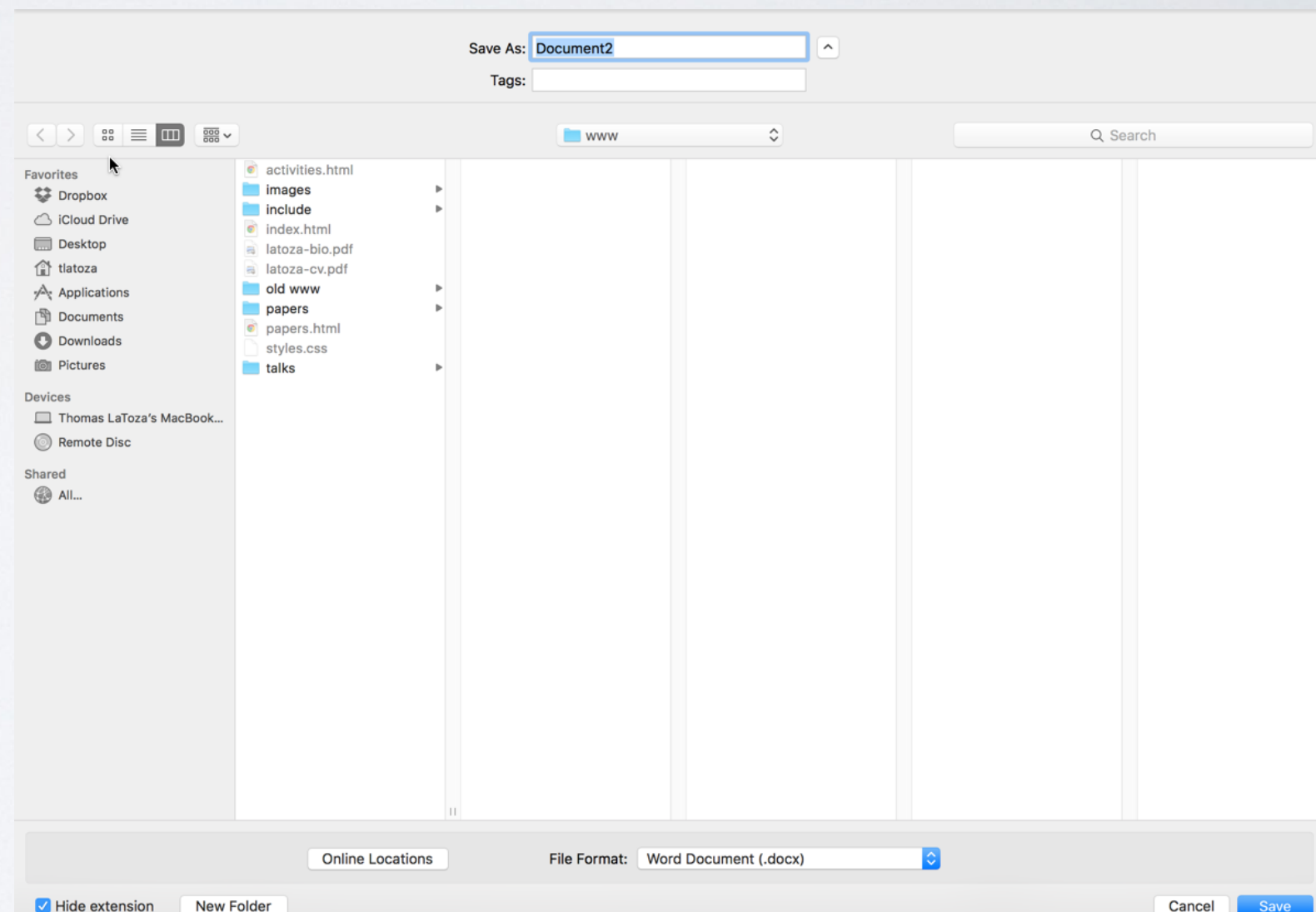


Anticipate likely next actions

- Based on typical observed task flows, surface options for user to take likely next steps



what if folder does not exist?



Keep users in control

- Important users do not feel constrained
- Want users to feel that they can do things the way they want to do them, not as software dictates to them

The screenshot shows the American Airlines website interface during a flight booking process. The top navigation bar includes the American Airlines logo, links for 'Plan Travel', 'Travel Information', and 'AAdvantage', along with user account options like 'Home', 'Login', and 'Hello, THOMAS'. A search bar is also present. Below the navigation bar, a progress bar indicates the current step is 'Travelers'. The main content area displays a flight from Washington to Raleigh/Durham for 1 adult on Sunday, January 10, 2016, to Monday, January 11, 2016. The trip price is shown as \$203.70 USD. A 'Show Trip Details' button is visible. Below this, there is a promotional banner for AAdvantage miles, offering 40,000 bonus miles and a \$100 statement credit, with a 'Learn More' link. The bottom section is titled 'Passenger Details' and includes instructions for entering passenger names as they appear on government-issued photo identification, along with a link to 'More details on passenger names' and a 'TSA Privacy Notice' link. A note at the bottom indicates that certain fields are required.

American Airlines Plan Travel Travel Information AAdvantage

Home Login Hello, THOMAS English Search aa.com

Find Flights Choose Flights **Travelers** Trip Options Select Seats Review & Pay Finish


Travelers

⚠ Check below for errors

✈ Washington to Raleigh/ Durham
1 Adult
Sunday January 10, 2016 – Monday January 11, 2016

Your Trip Price: **\$203.70 USD**
[Baggage and Optional Charges](#)

Show Trip Details

 Earn 40,000 bonus miles,
up to \$100 in statement credits, and your **first checked bag free***!
[Learn More](#)

Your Trip Price: \$203.70 USD
Statement Credit: - \$100.00 USD
\$103.70 USD

Passenger Details ⓘ

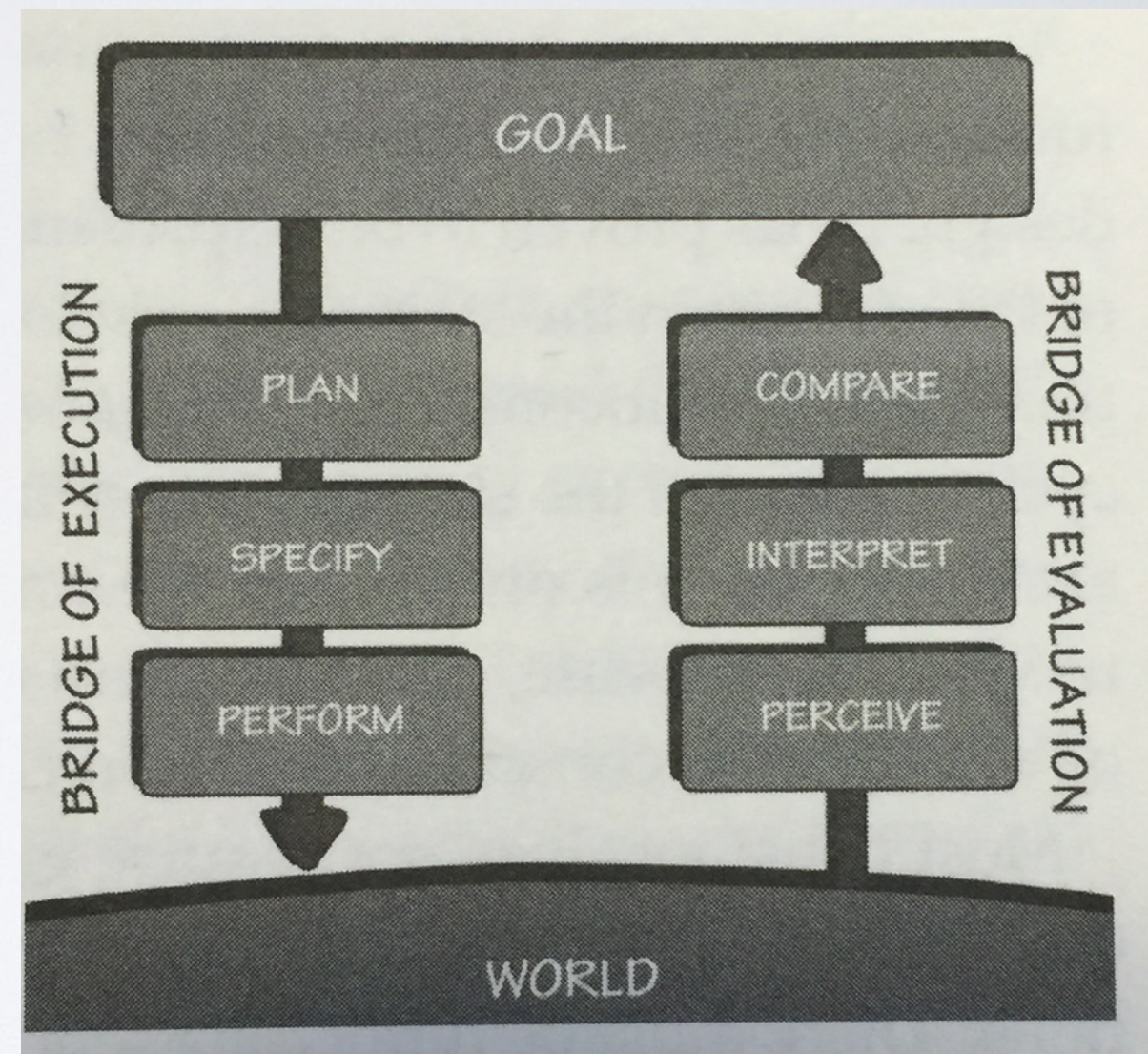
Please enter all passenger names as they appear on the passenger's government-issued photo identification. [More details on passenger names](#)
[TSA Privacy Notice](#)

*Required

Direct manipulation

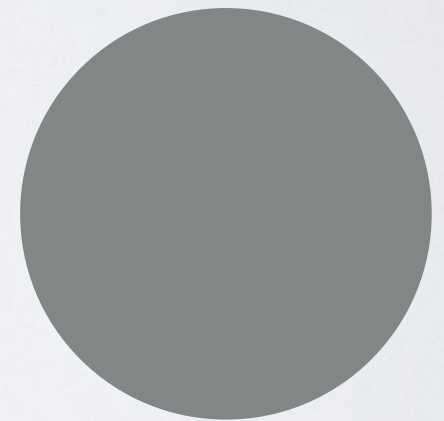
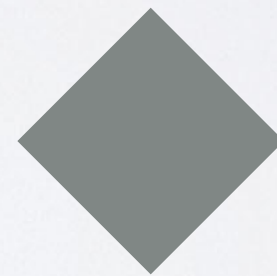
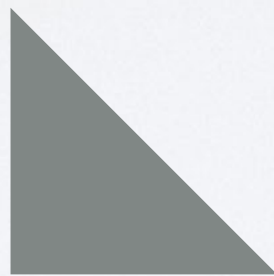
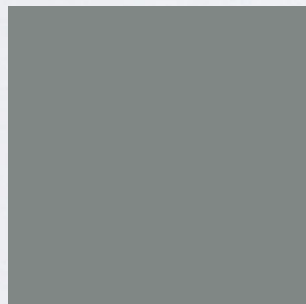
Motivation

- User is trying to do a task, manipulating some [model] of world
- Hard to plan out long sequence of actions in advance
- Gulf of execution: hard to know if took correct action
- Gulf of evaluation: hard to understand if successfully manipulated world
- Hard to compare hidden world to desired world



Direct manipulation

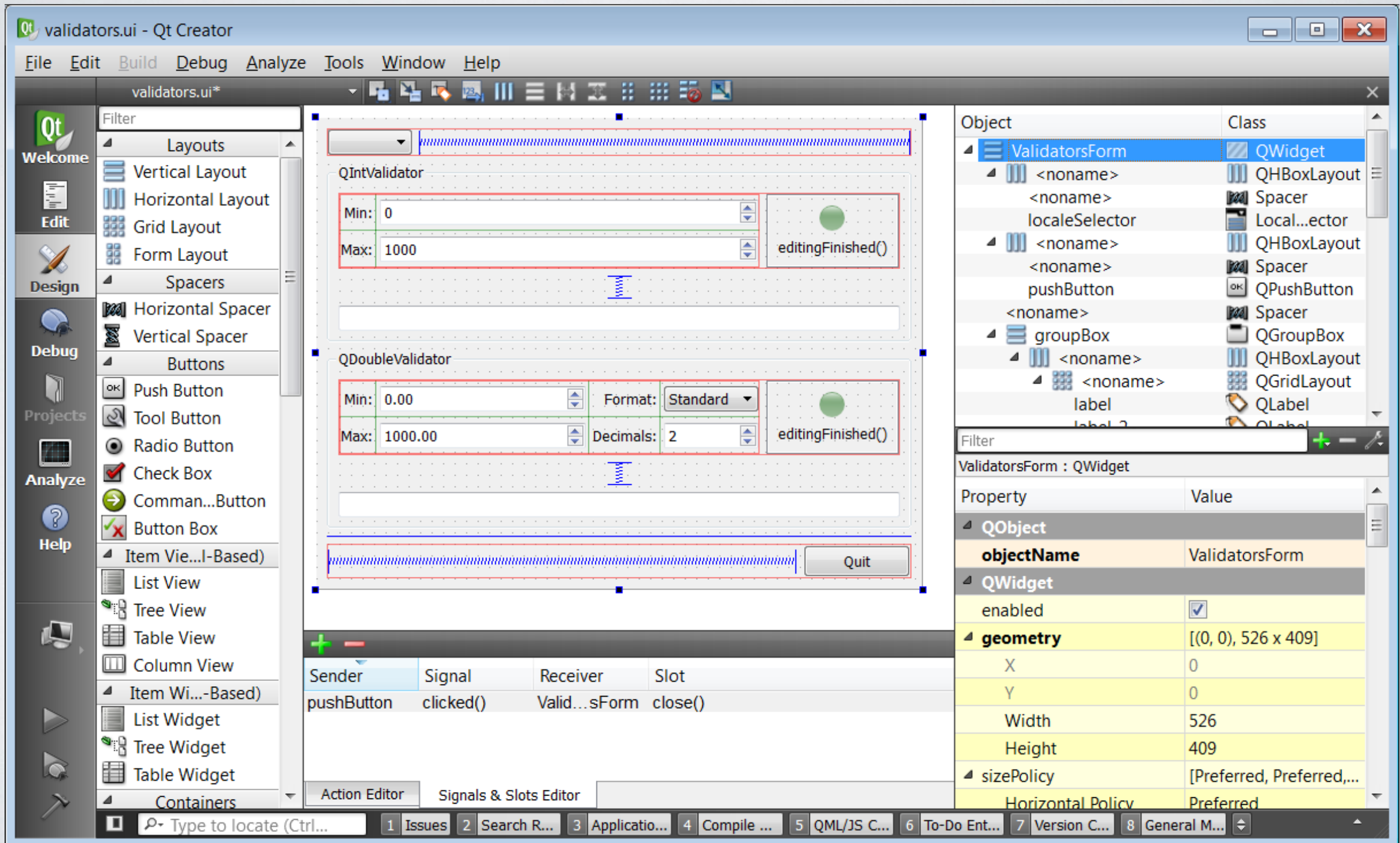
- “Rapid incremental reversible operations whose impact on the objects of interest is immediately visible” (Shneiderman, 1982)



Benefits

- Supports exploration
 - Don't plan long sequence of actions: pick an action, try it, can change mind if want to do something else instead
- Provides immediate feedback
 - Can quickly see what outcome of actions are in manipulating the world
 - Easy to compare desired state of the world to actual state of the world

Example - GUI builder



Example - Spreadsheets

FlyCalc - WIG2004.XLS

File Edit View Insert Format Tools ?

100% Support Chat OFF

Formula :

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1		788	355	564	399	413	897	444	523	413						
2		800	923	233	307	864	355	90	877	864						
3		657	788	755	444	455	478	432	405	455						
4		599	866	233	201	413	361	455	233	413	Sep 2005	Oct 2005	Nov 2005	Dec 2005		Jan 2006
5		899	755	673	311	780	400	614	754	780						Feb 2006
6			334	953	888	214	644	789	361	978						
7		233	644	766	446	231	977	577	453	847	455	507	690	700		788
8		577	533	968	897	541	977	475	358	975	355	478	361	400		355
9											742	267	599	700		564
10	Bryant Park	965	365	233	708	564	344	78	359	997	352	215	836			399
11	Keokuk	670	607	233	846	980	544	613	523	877	405	233	754			413
12	Westport	855	732	908	556	352	315	635	413	864	455	413	780			897
13	Temple	607	244	641	908	561	555	314	467	900	378	723	382			444
14	Lockhart	222	645	999	182	388	905	814	444	190	432	455	614			523
15	Stonington	344	756	600	481	339	489	144	399	307	444	201	311			413
16																
17	Subtotal	5455	4380	5088	5002	4521	4866	4084	4342	5667	3718	3890	5477			4796
18																
19	U.K. Factories															
20																
21	Clacton	855	315	908	556	352	556	635	413	864	455	413	780			980
22	Penge	506	605	860	222	459	222	521	897	355	478	361	400			670
23	Runcorn	670	544	233	846	980	846	613	523	877	405	233	754			2242
24	Worcester Park	344	489	600	481	339	481	144	399	307	444	201	311			899
25	Wapping	855	315	908	556	352	556	635	413	864	455	413	780			600
26	Tooting Bec	506	605	860	222	459	222	521	897	355	478	361	400			600
27	Balham	222	905	999	182	388	182	814	444	90	432	455	614			797
28	Wigan	670	544	233	846	980	846	613	523	877	405	233	754			800
29	Ashby de la Zouche	855	315	908	556	352	556	635	413	864	455	413	780			413
30	Bude	607	555	641	908	561	908	314	467	900	378	723	382			361
31	Looe	344	489	600	481	339	481	144	399	307	444	201	311			455
32	Scunthorpe	674	677	790	650	666	679	677	566	756	567	685	433			900
33																
34	Subtotal	5073	4761	5982	5078	4750	5078	4433	4478	5441	3896	3233	5086			7167
35																
36	Canadian Factories															
37																
38	Deception Bay	344	489	600	600	481	339	521	897	355	478	361	233			846
39	Mississauga	855	315	908	600	481	339	481	855	315	908	556	352			481
40	WIG															

FlyCalc 1.1 - Copyright Natum 2003-2006

Example - Programming

- Bret Victor's Learnable Programming

Example - Microsoft TerraServer

The screenshot displays the Microsoft TerraServer USA website interface. The top navigation bar is blue with the "TerraServer USA" logo on the left. Below the logo is a search section titled "Search TerraServer" with input fields for "Street", "City", and "State", and a "GO" button. To the right of the search bar, the text "The National Map San Francisco, California, United States 2/27/2004" is displayed. The main map area shows an aerial view of a multi-lane highway in San Francisco, with a "NORTH" arrow in the top right corner. A sidebar on the left of the map contains a vertical scale bar with "OUT" and "IN" labels, and a "Size" legend with three colored squares (blue, yellow, blue). At the bottom left, there is a "ClickWeather.com" link and a "Powered by" logo.

TerraServer USA

Search TerraServer

Street
City
State

GO

Longitude: -122.36667 Latitude: 37.80776

GO

ClickWeather.com

Click to get Weather Forecast Maps for this point

Powered by

The National Map San Francisco, California, United States 2/27/2004

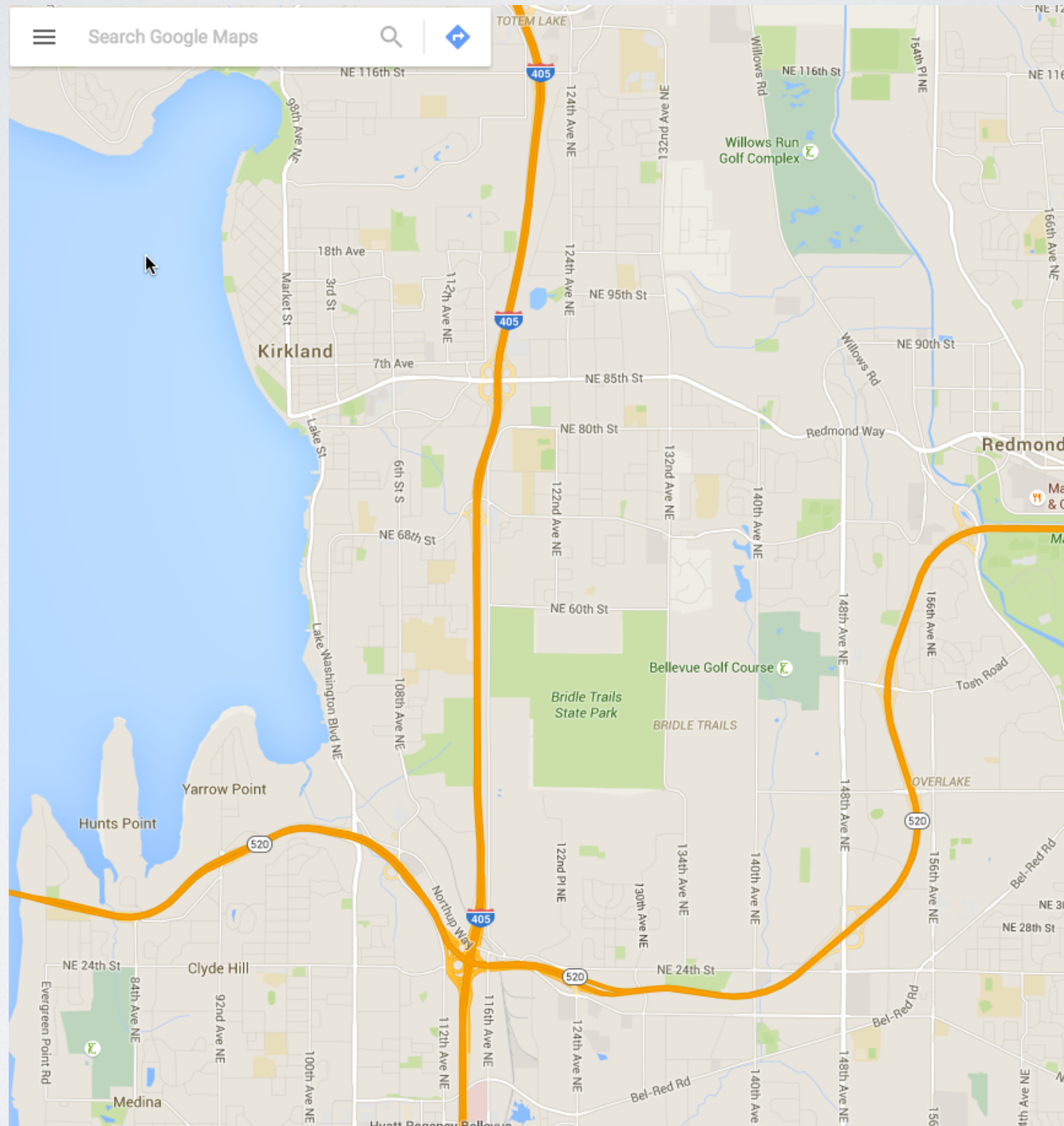
Size

OUT

IN

NORTH

Example - Google Maps



Physical actions

Provide intermediate feedback during interactions

- As user is interacting with objects, provide feedback on interactions
- Examples
 - While dragging object, show new position
 - As selecting text, show selection
 - While clicking on button, show button changing

Avoid physical awkwardness

- Switching between input devices takes time
- Avoid forcing user to constantly switch between input devices (e.g., keyboard & mouse)
 - e.g., Effective tab order between fields
- Avoid awkward keyboard combinations

Dimensions of user disabilities

- **Perception** - visual & auditory impairments
 - Blindness or visual impairments
 - Color blindness
 - Deafness & hearing limitations
- **Motion** - muscle control impairments
 - Difficulties with fine muscle control
 - Weakness & fatigue
- **Cognition** - difficulties with mental processes
 - Difficulties remembering
 - Difficulties with conceptualizing, planning, sequencing actions

Design for all

- How can users with physical disabilities be supported in user interactions?
- Good: **assistive design** - offering equivalent actions for disabled users that cannot take normal actions
- Better: **design for all** - designing interactions so broadest set of users across age, ability, status in life can use normal actions

Example - Curb cut

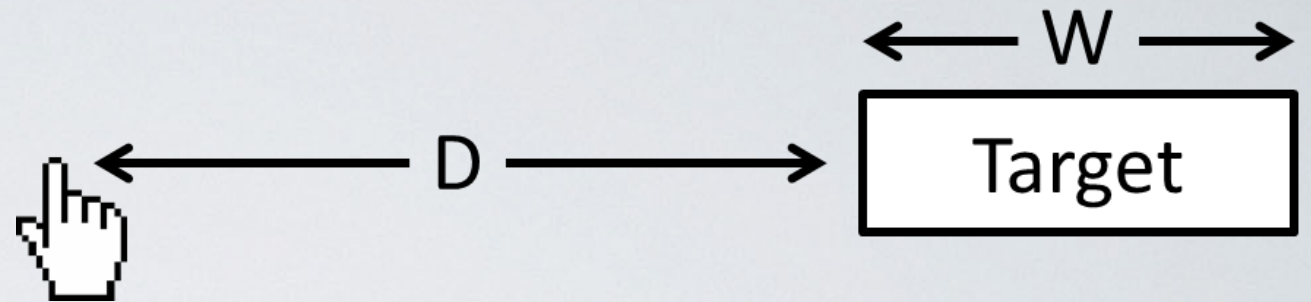


- Initially designed for **accessibility** - support for disabled & wheel chairs
- But potentially benefits **all users** of public spaces - people w/ suitcases, hand carts, roller blades, bikes, ...

7 Principles of Universal Design

- **Equitable use:** The design is useful and marketable to people with diverse abilities
- **Flexibility in use:** The design accommodates a wide range of individual preferences and abilities
- **Simple and intuitive:** Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level
- **Perceptible information:** The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities
- **Tolerance for error:** The design minimizes hazards and the adverse consequences of accidental or unintended actions
- **Low physical effort:** The design can be used efficiently and comfortably and with a minimum of fatigue
- **Size and space for approach and use:** Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility

Fitt's law



- Time required to move to a target **decreases** with target **size** & **increases** with **distance** to the target
- Movements typical consist of
 - one large quick movement to target (**ballistic** movement)
 - fine-adjustment movement (**homing** movements)
- Homing movements generally responsible for most of movement time & errors
- Applies to rapid pointing movements, not slow continuous movements

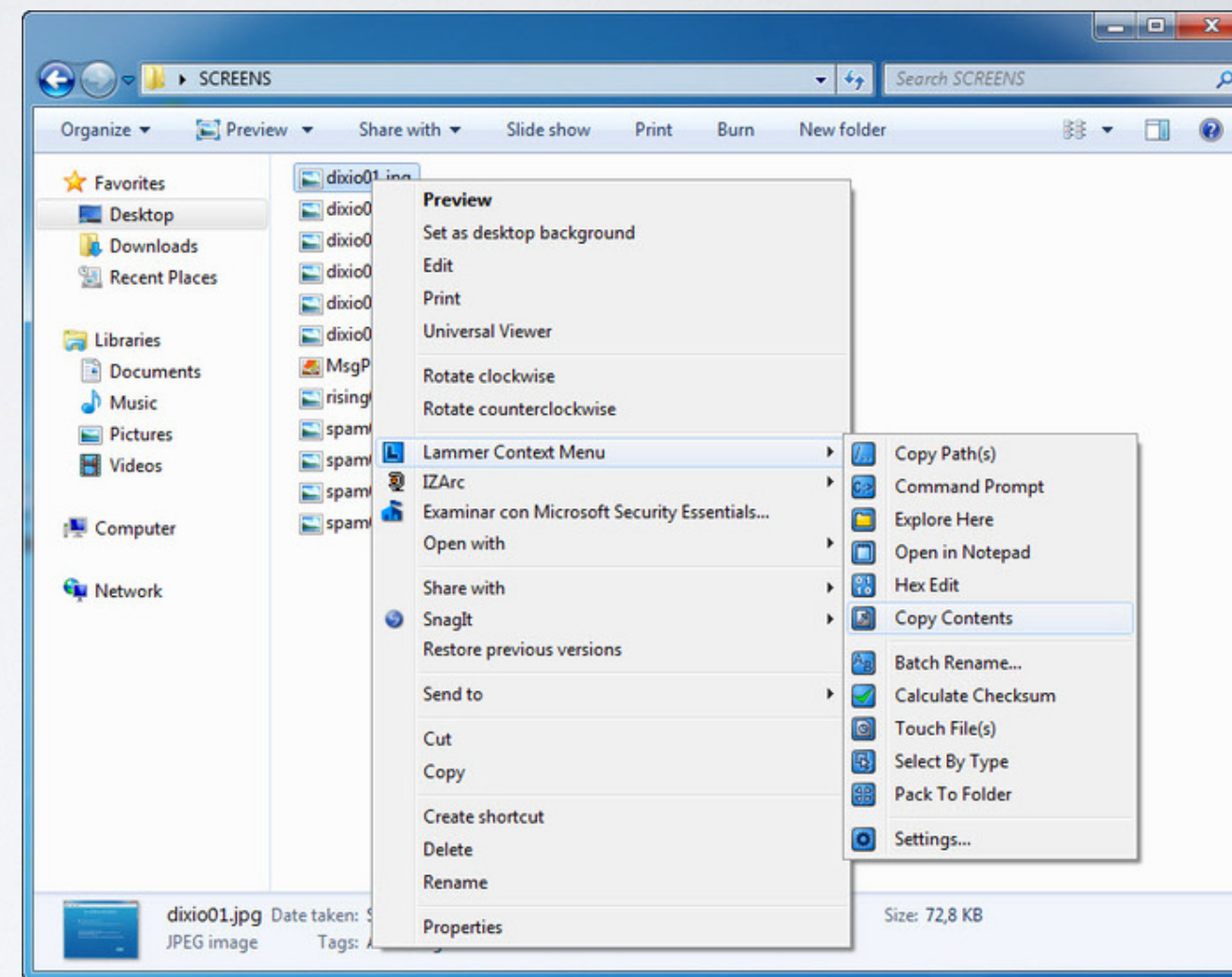
Design implications of Fitt's law

- **Constraining** movement to one dimension dramatically increases speed of actions
 - e.g., scroll bars are 1D



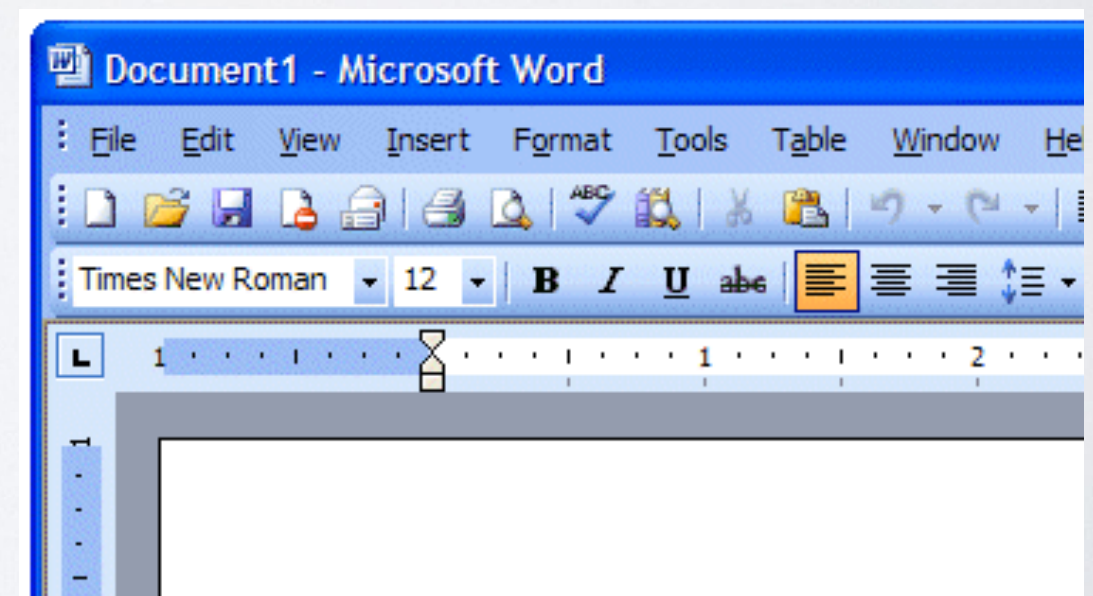
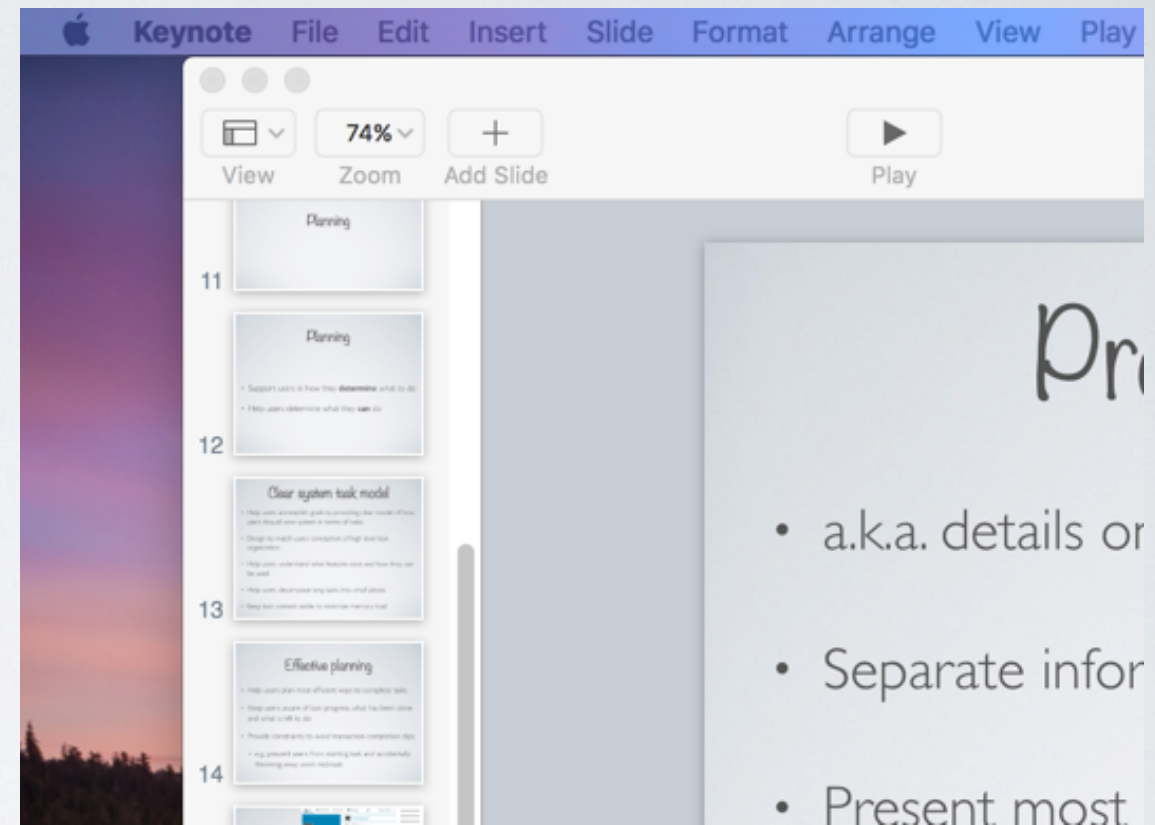
Design implications of Fitt's law

- Making controls **larger** reduces time to invoke actions
- Locating controls closer to user **cursor** reduces time
- e.g., context menus



Design implications of Fitt's law

- Positioning button or control along **edge** of screen acts as barrier to movement, substantially reducing homing time & errors



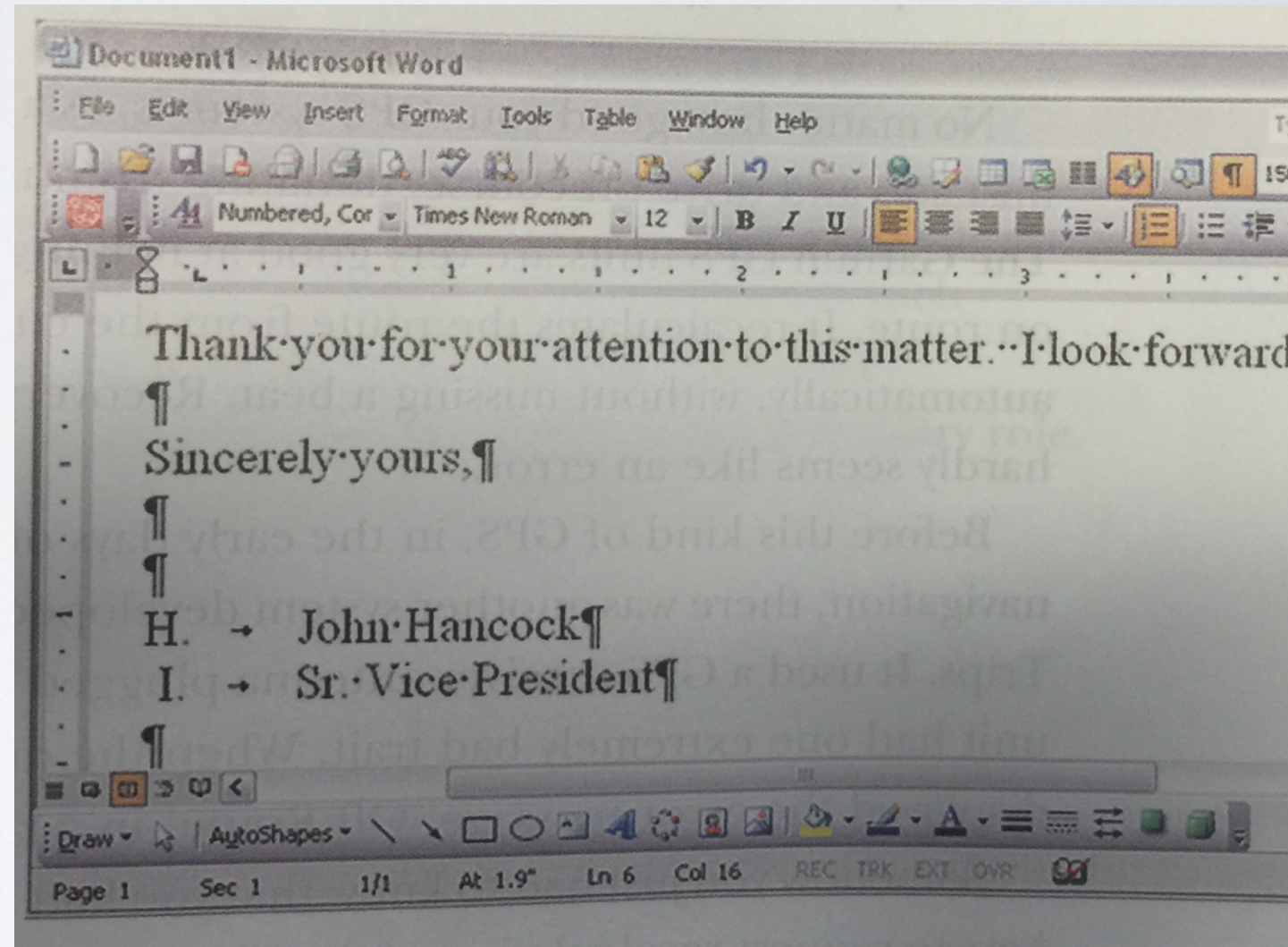
System feedback

System response times

- 0.1 second - reacting **instantaneously**
 - requiring no special feedback except displaying result
 - limit for direct manipulation of objects in UI
- 1.0 second - **freely** navigating commands
 - noticeable delay, limit for keeping user's flow of thought uninterrupted
- 10 seconds - keeping users **attention**
 - limit for keeping user's attention focus in UI
 - longer delays create task breaks
- [Nielsen, Usability Engineering, 1993]

Automation

- Keep user in control at highest task levels
- Take control from user when need is obvious & user is busy
- Provide visibility of automation & opportunities to correct when necessary

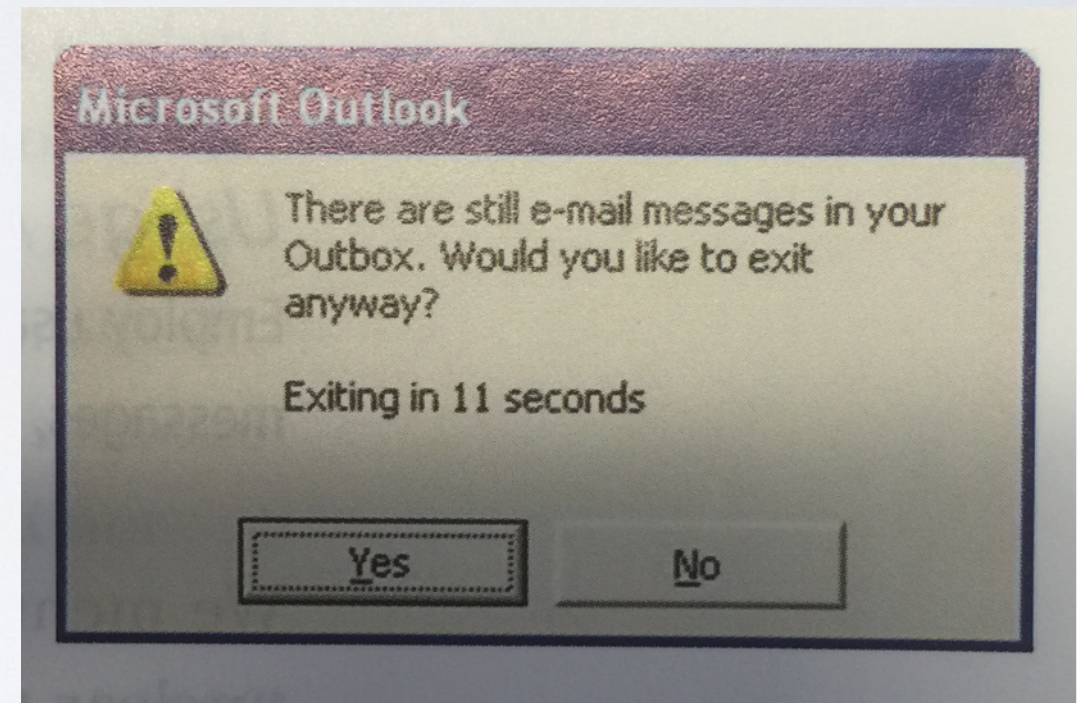


Provide feedback for all user actions

- Feedback helps keep users on track in accomplishing goals
- Request confirmation to prevent costly errors (but use sparingly)
- Make feedback visible, noticeable, legible, located w/ in users focus of attention
- Provide feedback early
- Provide feedback consistently

Crafting feedback text

- Clarity - support clear understanding of outcome
- Precise wording
- Completeness - include enough information to fully understand outcomes



Tone of feedback

- Establishes relationship with user
- Important not to take user feel “stupid”
- Make the system take blame for errors
- Be positive, to encourage
- Provide helpful messages, not cute messages
- Avoid violent, negative, demeaning, threatening terms (e.g., illegal, invalid)

Avoid anthropomorphism (in most contexts)

- Anthropomorphism - the attribution of human characteristics to non-human objects
 - e.g., “Sorry, I but I cannot find the file you need”
- Provides a false mental model
 - leads to user thinking they can interact with system as person
 - can be over promising & condescending
- May work in spoken interaction settings, where system does match user’s mental model

In Class Activity

Interaction design critique

- In groups of 2
 - Pick an application or web app you know well
 - Should be something with long and complex user tasks (e.g., Photoshop, Illustrator, Word, Excel, Eclipse, VS)
 - Critique the application from an interaction perspective
 - Identify interaction strengths of the application
 - Identify interaction weaknesses of the application