Comp 341/441 - HCI

Spring Semester 2020 - Week 3

Dr Nick Hayward

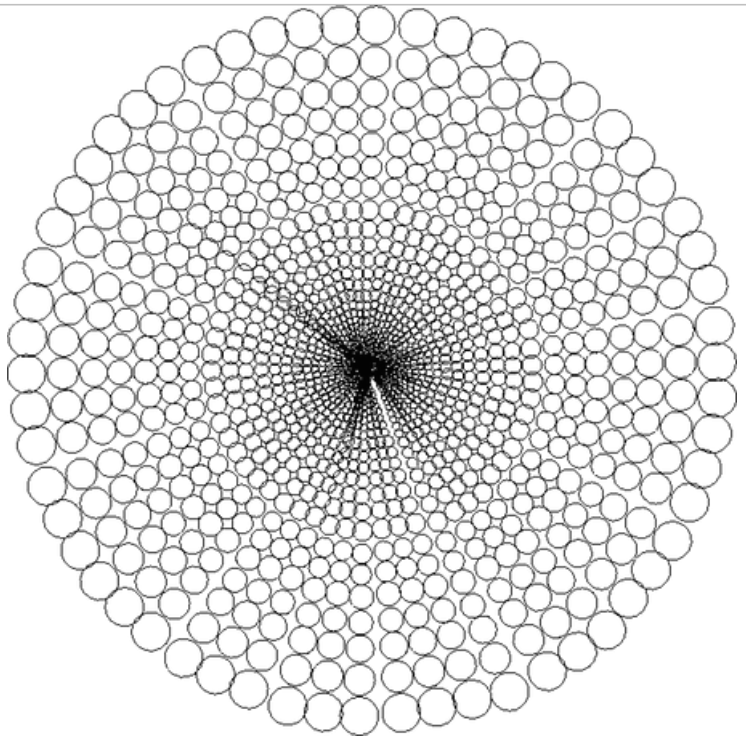
Peripheral vision

Peripheral vision - consider spatial resolution in human vision

- spatial resolution drops greatly from the centre to the periphery
- three known reasons for this phenomenon
  - *data compression*
    - information compressed, associated data loss from visual periphery
  - *pixel density*
    - eye has ~ 6-7 million cone cells in the retina
    - cones densely packed in centre of vision, known as **fovea**
  - *processing*
    - fovea is ~ 1% of the retina
    - brain's visual cortex uses ~ 50% of its area for input from the fovea
    - remaining area for other 99%
- vision has much greater resolution in the centre than elsewhere
  - *Waloszek, G. 2005*

Image - Vision & Resolution

foveal resolution



Foveal Image

Foveal Image (source: Illustrated Dictionary of Computer Vision)

is peripheral vision any use?

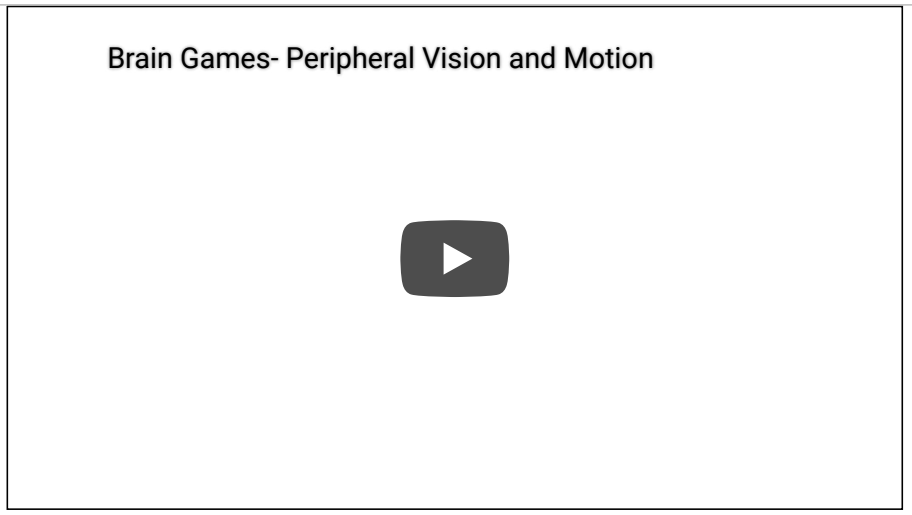
Is peripheral vision any use?

Three primary functions for peripheral vision:

- better vision in the dark
- detects motion
- guides the fovea, our centre of vision

Video - Vision & Resolution

brain games



Peripheral Vision and Motion

Source - Brain Games - YouTube

Vision & Interfaces

application in user interfaces

- one of the primary issues is a user's focal point relative to other interface elements
- error messages are an example of this issue
  - *user's focal point at button or clicked link…*
  - *messages often missed if presented within peripheral vision relative to link…*
  - *messages need to be obvious relative to focal point of fovea*
- other design considerations for peripheral vision
  - *standard design options*
    - colour, font or icon size, relative positioning, opacity…

Vision & Interfaces

make messages visible…

- use a user's focal point to our advantage as designers
  - *put the message at the focal point*
- user's tend to focus in a predictable manner with user interface interaction
- inherent predictability can be used to guide design
  - *western users tend to follow a pattern of movement for forms, panels &c.*
    - top left to bottom right
    - click a link and obtain focal point
- mark an error prominently to help users
  - *normally place the message near the source of the error*
  - *or relocate to focal point if discrepancy in the user interface*

Vision & Interfaces

make messages visible…cont'd

- consider adding an error icon or symbol to the message output
  - *ensure icon or symbol is consistent throughout application, website…*
- reserve a single colour for error messages throughout the interface
  - *customarily red colour used for error and danger messages*
    - consider red colour relative to company or brand image
    - red considered good luck, auspicious in Chinese culture
      - often associated with death in Egypt…
    - if necessary, change colour and add error icon &c. to help reinforce different colour

overt interface options

There are also more obvious options for attracting a user's attention.

- a message in an error dialog or modal box
  - *gets attention quickly and forces a user to interact before continuing*
  - *use with caution, can be very annoying if abused*
  - *carefully consider context before deploying modal options*
  - *traditional popups can be overridden in browser settings*
- use sound to reinforce an error message
  - *system beep or warning common tool for notifying users*
  - *notifies a user to check the interface for more information*
  - *consider as a support, reinforcement to visual messages*
  - *again, quickly becomes annoying if abused*
  - *environmental conditions important as well*
  - *vibrations an alternative for mobile apps…*

Vision & Interfaces

overt interface options…cont'd

- animated notifications work with our peripheral vision's motion tracking
  - *peripheral vision's ability to detect motion*
  - *detection causes reflexive eye movement towards the screen*
  - *animations often seen in interface menu selections*
    - menu blinks or flashes to indicate selection of option

Considerations

- these options should be used sparingly in a user interface design
- such visual options are often associated with annoying advertisements
- context is important
- consider advanced options to cancel or limit such interface options

Vision & Interfaces

positive highlighting and focus

- peripheral vision useful as a trigger for the fovea to focus
- moving, overt objects and triggers quickly draw the fovea's attention
- *searching* is another important role for our vision
  - *peripheral vision plays key role*
  - *dependent upon search target, style, colour, movement…*
- design can help our vision focus upon search target
  - *text decoration, highlighting, weight, emphasis…*
  - *bold that **pops***

text example 1

Test 1

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nunc et libero et mi porttitor scelerisque. Mauris gravida enim nec mi vulputate, quis aliquet dolor suscipit. Aenean rutrum sapien vitae lobortis bibendum. Donec vitae interdum diam. Maecenas dapibus facilisis elit vel imperdiet. Cras ultrices tempor dictum. Fusce ex eros, egestas at congue non, venenatis nec nisl. Donec fringilla pulvinar augue eu vulputate. Etiam metus est, aliquam quis sem et, ultricies tincidunt arcu. Integer eu sem nisi. Proin gravida odio urna, vitae scelerisque enim ornare et. Integer placerat massa viverra, aliquam arcu et, porta augue. Aliquam erat volutpat.

text example 2

Test 2

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text example 3

Test 3

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Video - Vision & Interfaces

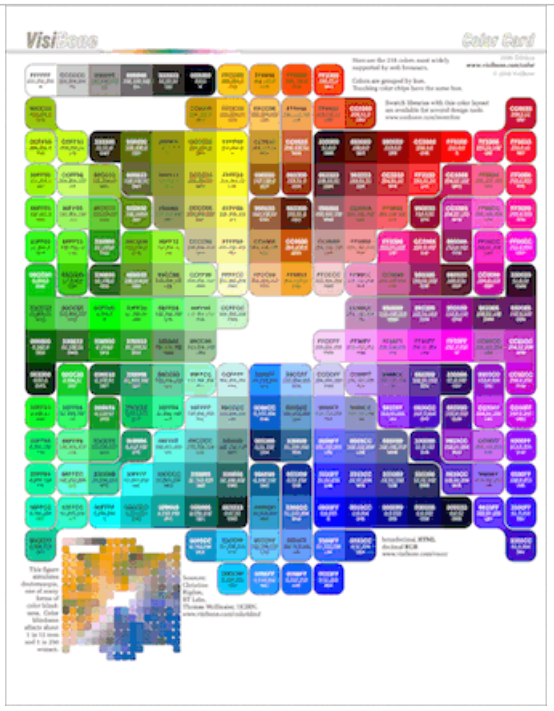
UI Pop

Samsung One UI 2: Designed for everyday simplicity

Source - One UI 2 - YouTube

Image - Vision & Interfaces

web safe & browser colours

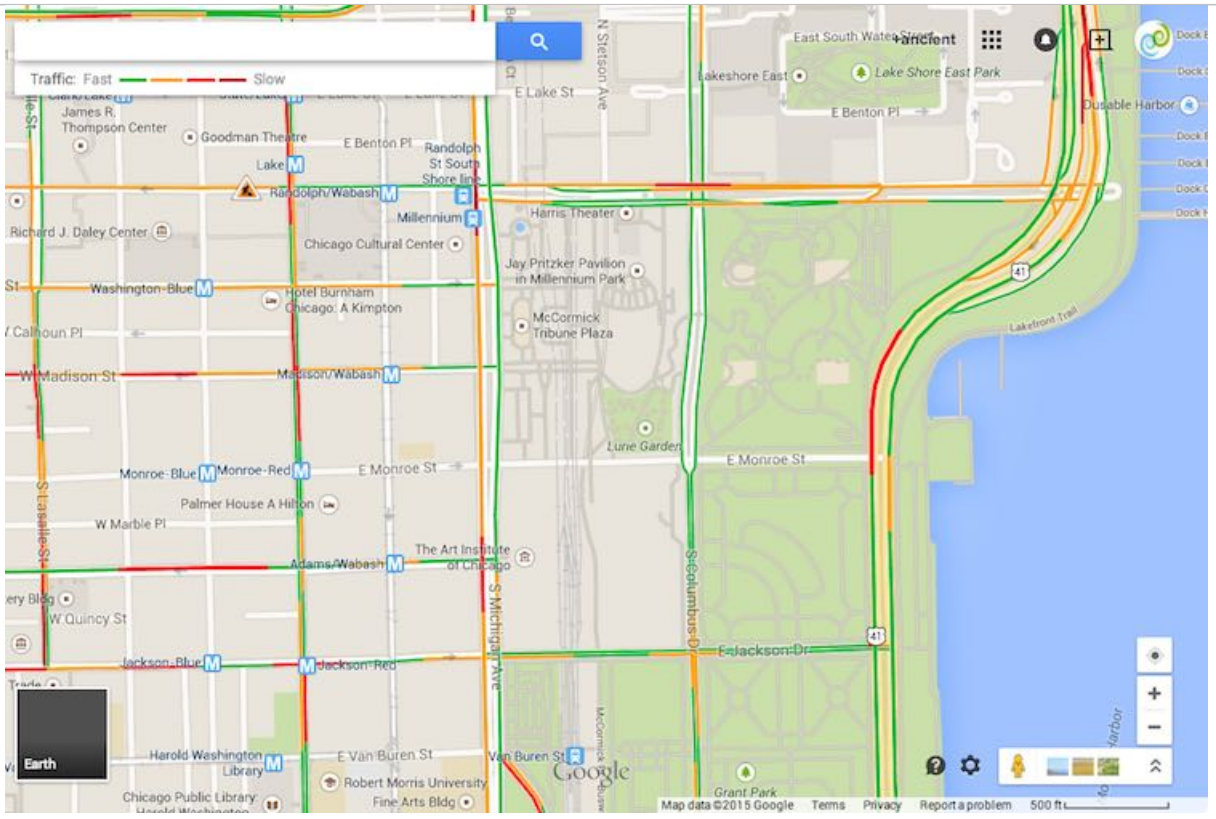


Safe Colours

Browser colours & colour blindness (source: VisiBone)

Image - Vision & Interfaces

design pop...



Traffic

Image - Vision & Interfaces

design example

Art Institute

Email Survey - (source: Art Institute Chicago)

Users & Interaction

consideration of interaction

- GUIs tend to present graphical controls for user interaction
  - *buttons, drop-down boxes and menus, sliders…*
- users interact either directly or indirectly
  - *gesturing on a touchscreen…*
  - *pointing device such as a mouse, keyboard…*
- inherent assumption users know required actions for a given application

Users & Interaction

hierarchical breakdown

- normally a predictable model involving a hierarchical breakdown
  - ***goals**: user's high-level goal for interaction with application*
    - write a letter, take a photo, read a book, book a holiday…
    - goals become *what* the user wants to do
    - instead of *how* they will do it
  - ***tasks**: allow a user to fulfill their goals*
    - perform some general steps
    - follow a structured path of activities
  - ***actions**: user carries out their tasks by performing interface actions*
    - specific operations in the user interface
      - click a button, select a menu item, drag and drop an element, text entry…

example

Example - user editing of photo metadata within image library application

- users wants to edit some metadata for a photo in their image library application
  - *open the required image document in image application*
  - *select a menu item to view the current metadata record*
  - *edit existing text entries in the metadata record*
  - *enter new text for missing data*
  - *spell check user input*
  - *preview the updated image metadata*
  - *tag or categorise the image*

example

Example - user editing of photo metadata within image library application

- click a menu item to select metadata record
- click on *edit* option to start modifying record
- delete some data from the record
- enter some new text data
- click the *update* or **save** button to close the metadata record

Users & Interaction

patterns emerging

- important to realise and understand is that a predictable pattern emerges
- **goals** often achieved by means of various sets of **tasks**
- **tasks** often be achieved by various sets of **actions**
- such interface patterns can be achieved in multiple ways
  - *e.g. both keyboard shortcuts and mouse inputs*
- pattern from **goal** to **task** to **action**
  - *will, more often than not, be the same*
- necessary to keep such actions flexible and re-usable
  - *combine and mix them to achieve multiple disparate tasks*

Video - Users & Interaction

digital accessibility

What is digital accessibility?

Source - Digital Accessibility - YouTube

Users & Interaction

consideration of interaction - brief recap

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Video - Users & Interaction

filter photos based on metadata

- Filter photographs based on metadata
- Source: Adobe Lightroom Tutorials

Users & Interaction

hierarchical breakdown - brief recap

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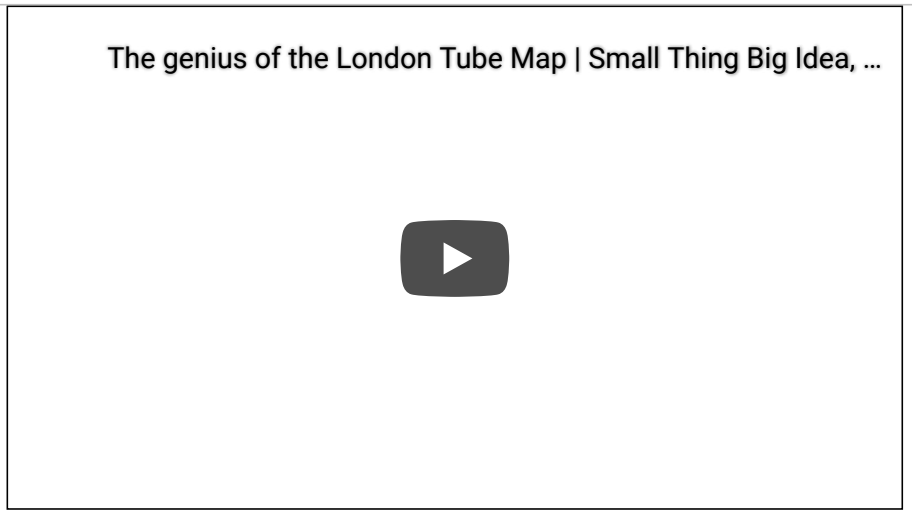
Video

Design Genius



TED: The Genius of the London Tube Map
Source: Genius of the London Tube Map - YouTube

stages of action

Stages of Action

- tends to be easier and quicker for experienced users
  - *tasks are known to achieve goal*
- new users more hesitant at first
  - *uncertain of the required actions to accomplish a task*
  - *may be uncertain of the tasks necessary to achieve their goal*
- some users consult documentation, online tutorials, help forums…
- many simply begin with exploratory approach
- user may continue cycle of exploration through application
- continue until goal completed satisfactorily
  - *or, until the user gets stuck and can't move on*

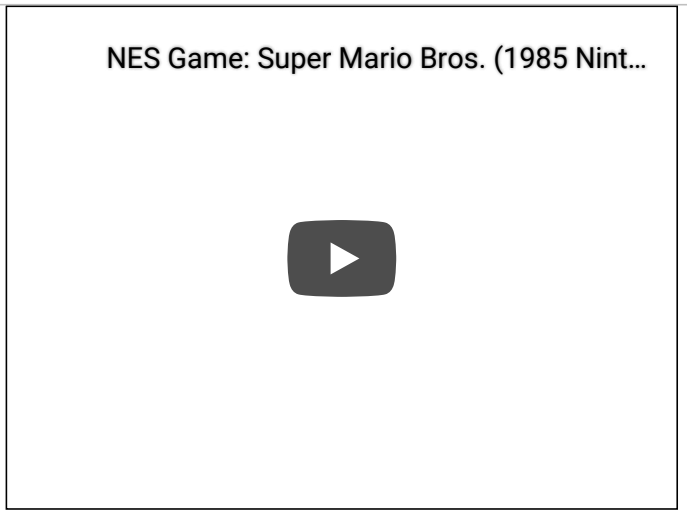
Video - Users & Interaction

Super Mario Bros. speed run

Super Mario Bros. Speed Run - Source: YouTube

Video - Users & Interaction

Super Mario Bros. standard play



NES Game: Super Mario Bros. (1985 Nintendo) - Source: YouTube

Users & Interaction

seven-stage action cycle model

- formalised model named **Seven-Stage Action Cycle Model**
  - *Norman, D. The Design of Everyday Things. Basic Books. 2013.*
- the model consisted of the following steps:
  1. *Identifying an immediate goal*
  2. *Forming an intention to act*
  3. *Determining a plan of specific actions*
  4. *Carrying out the actions*
  5. *Observing the results by perceiving the state of the system and the world*
  6. *Interpreting the results*
  7. *Evaluating whether the actions had the desired results*

Users & Mental Models

intro

- mental models formed as a user learns tasks within an application
- conceptual representation in our user's mind of how a system works
  - *how to operate an application's interface*
- naturally reflects a user's current stage of learning and understanding
- this understanding is subject to change
  - *changes to reflect new learning, experience…*
  - *may diminish or disappear as a user forgets details over time*
- a user relies on a mental model for an application, scenario..,
- user's will also develop expectations based upon such models
- compare a user's mental model to a system's implementation model
  - *can begin to explain usability issues and problems*

Users & Mental Models

elements of a mental model relative to apps & UIs

1. interface appearance
2. interface concepts, syntax, general rules…
3. navigation map
4. plans and strategies for accomplishing tasks and reacting to problems &c.
5. heuristics, conventions…
6. perception of application’s implementation model

Users & Mental Models

interface appearance

- users form visual images of the **places** they encounter and repeatedly use within an interface
  - *e.g. various pages, screens, tabs, windows…*
- for most users, recall of mental images will be vague and inherently imperfect
  - *excluding those with eidetic memories*
- interface familiarity leads to familiarity with general layout
  - *frequency of use is also important*
- a user is unlikely to be able to sketch in detail an application's interface from a mental model

Image - Users & Mental Models

Super Mario Kart - 1992

Super Mario Kart - 1992

Image - Users & Mental Models

Mario Kart 64 - 1996

Mario Kart 64 - 1996

Image - Users & Mental Models

Mario Kart 7 - 2011

Mario Kart 7 - 2011

Users & Mental Models

Mario Kart through the years...

Super Mario Kart - 1992	Mario Kart 64 - 1996	Mario Kart 7 - 2011
		

Resources

- Card, S.K., Moran, T.P. and Newell, A. *The psychology of human-computer interaction*. Lawrence Erlbaum Associates. 1983.
- Krug, S. *Don't make me think, revisited: A common sense approach to web usability.* 3rd Edition. New Riders. 2014.
- Miller, G. A. *The magical number seven, plus or minus two: Some limits on our capacity for processing information.*. Psychological Review, Vol. 63, Issue 2. PP. 81-97. 1956.
- Norman, D. *The Design of Everyday Things.* Basic Books. 2013.