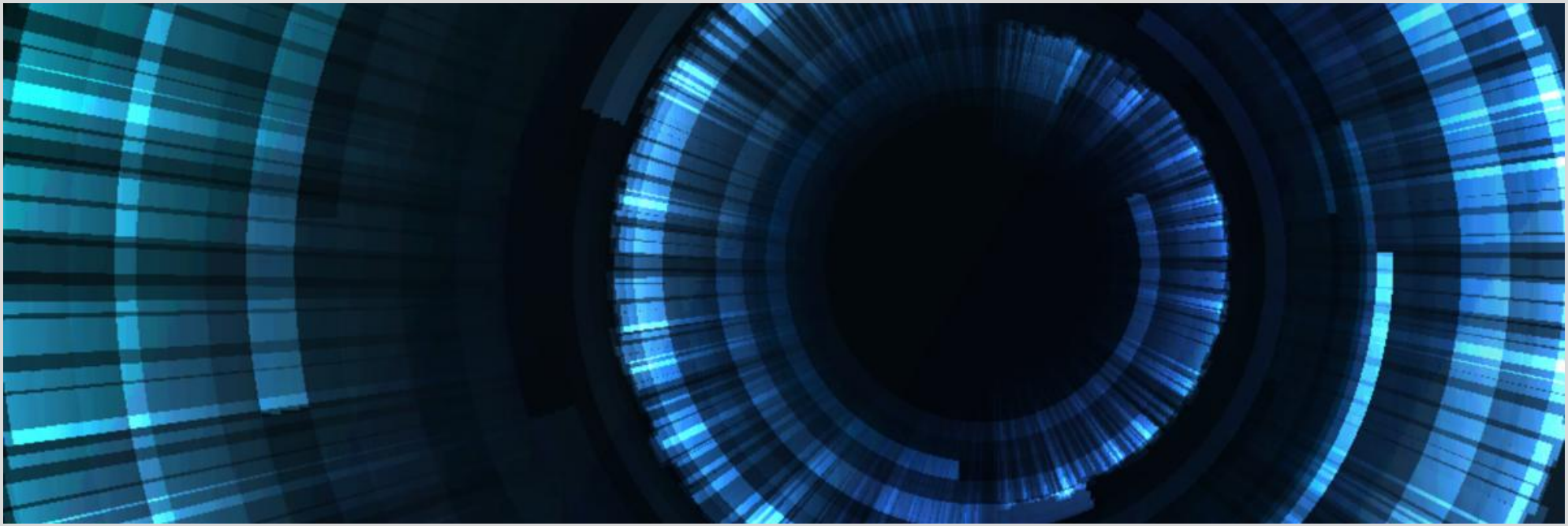
# Human Computer Interaction



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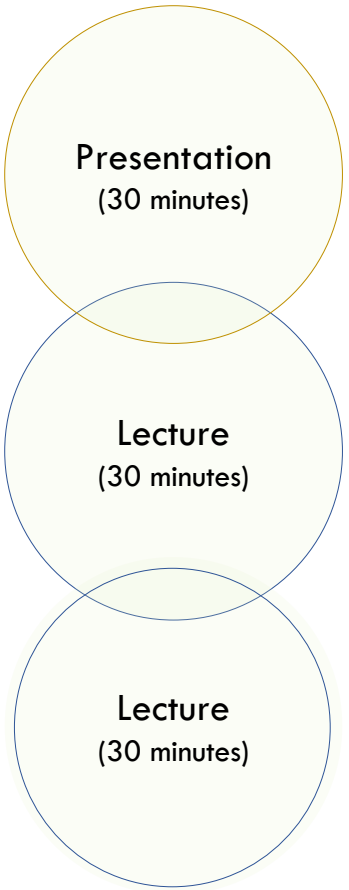
HUMAN CENTERED DESIGN

# Agenda – 29 January




> 10 minutes each team – 15, 22, 41 >

> Interaction >

> Interaction >

# This week – 24 & 29 January

**Monday 24 January**

TEAMS - 2, 31, 52

**Saturday 29 January**

TEAMS - 15, 22, 41,

# Next week – 31 January & 02 February

**Monday 31 January**

TEAMS - 6, 18, 32

**Wednesday 02 February**

TEAMS - 23, 39, 55

# Conceptual Model

*A conceptual model provides a working strategy and a framework of general concepts and their interrelations*

- Example - customer experience when at a shopping mall

- Metaphors
  - shopping cart or basket -> ready to make the purchase -> proceeding to checkout
- Patterns
  - don't start from scratch
- Design Concepts
  - visual elements : images, colour, labels

# Design Metaphors

- Example – the desktop

- Conceptual Model
  - the office
- Design Concepts
  - paper, folders, filing cabinets, and mailboxes,
- Goal
  - provide familiar entities that enable people readily to understand the underlying conceptual model and know what to do at the interface

# Formulating a Conceptual Model

- What will people be doing when carrying out their tasks
- How will the system support these
- What kind of interface metaphor, if any, will be appropriate
- What kinds of interaction modes and styles to use

- When making design decisions put yourself in the shoes of the users
  - How will they understand the underlying conceptual model

# Formulating Interface Metaphors

- Design to be similar to a physical object but also with its own properties
  - desktop metaphor, portals
- Can be based on activity, object, or a combination of both
  **connect, search engine,**
- Exploit user's familiar knowledge, helping them to understand 'the unfamiliar'
  add to cart, checkout
- Relate the metaphor to some aspect of unfamiliar activities,
  - enabling users to leverage this to understand more aspects of unfamiliar functionality

# Examples of Interface Metaphors

- Conceptualizing what users are doing
  - “surfing the Web”, "streaming",
- A conceptual model instantiated at the interface
  - the desktop metaphor
- Visualizing an operation
  - an icon of a shopping cart into which the user places items
  - **icons like save, trash, zoom in & out, print**

# Benefits of Interface Metaphors

- Makes learning new systems easier
- Helps users understand the underlying conceptual model
- Might make accessible to a greater diversity of users

# Challenges of Interface Metaphors

- Break conventional and cultural rules
  - For instance, recycle bin placed on desktop
- Constrain designers in the way that they conceptualize a problem space
- Conflicts with design principles
  **advertisements - dark patterns**
- Forces users to understand the system in terms of the metaphor
- Designers can inadvertently use bad designs and transfer these over
- Limits designers' imagination in coming up with new conceptual models

# Interaction Types

- Instructing
  - Issuing commands and selecting options, **eg payment process**
- Conversing
  - Interacting with a system as if having a conversation **eg chatbot, alexa/siri**
- Manipulating
  - Interacting with objects in a virtual or physical space by manipulating them **eg video games, ar, vr**
- Exploring
  - Moving through a virtual environment or a physical space **eg ar,vr, video games**
- Responding
  - The system initiates the interaction and the user chooses whether to respond **eg alerts, notifications**

# Choosing an Interaction Type

- Direct manipulation is good for 'doing' types of tasks, for example, designing, drawing, flying, driving, or sizing windows
- Issuing instructions is good for repetitive tasks, for example, spell-checking and file management
- Having a conversation is good for certain services, for instance, finding information or requesting music
- Hybrid conceptual models are good for supporting multiple ways of carrying out the same actions

# Interaction Type vs. Interface Style

## Interaction type:

- A description of what the user is doing when interacting with a system
  - for example, instructing, talking, browsing, or responding

## Interface style:

- The kind of interface used to support the interaction
  - for instance, command, menu-based, gesture, or voice

# *Interface styles*

# Interaction contexts

| Mode | Interaction |
|---|---|
| Websites | Navigation to content |
| Social Media | Connecting through user-generated content |
| Collaborative Environments | Working together on the same digital objects (docs, images, files) |
| Agents and avatars | Conversational AI (e.g. NLP) and virtual or VR characters |
| Ubiquitous computing | Embedded systems (e.g. Smart classroom, home, office) |
| Mobile computing | Context aware and small screen design |
| Wearable computing | Textiles and smart materials |
| Robotics | Companion devices, remote device control (Mars Rover), co-located coordination (e.g. industry |

# Types of interfaces

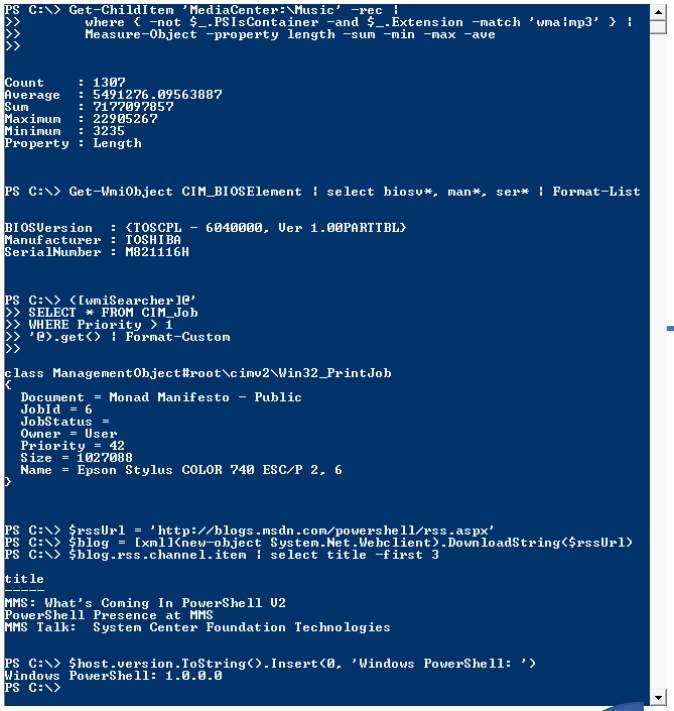
| Interface type | See also |
|---|---|
| 1. Command-based | WIMP and web |
| 2. WIMP and GUI | Augmented and mixed reality |
| 3. Multimedia | Multimedia |
| 4. Virtual reality | Mobile and multimedia |
| 5. Information visualization and dashboards | Mobile |
| 6. Web | Augmented and mixed reality |
| 7. Consumer electronics and appliances | Shareable, touch |
| 8. Mobile | Shareable, air-based gesture |
| 9. Speech | Tangible |
| 10. Pen | Multimodal |
| 11. Touch | Speech, pen, touch, gesture, and haptic |
| 12. Air-based gesture | Touch |
| 13. Haptic | Virtual reality |
| 14. Multimodal | |
| 15. Shareable | |
| 16. Tangible | |
| 17. Augmented and mixed reality | |
| 18. Wearable | |
| 19. Robots and drones | |
| 20. Brain–computer interaction (BCI) | |

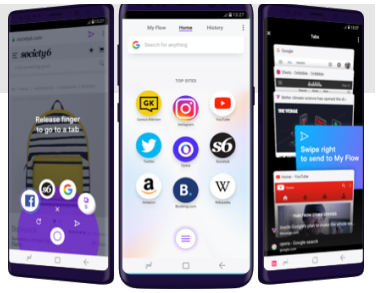
*WIMP (Windows, Icons, Menus, Pointer) GUI (Graphical User Interface)*



"Interaction Design: beyond human-computer interaction" 5th Edition – Chapters 2 & 6

# 1) Command line to Graphical User Interface (GUI)



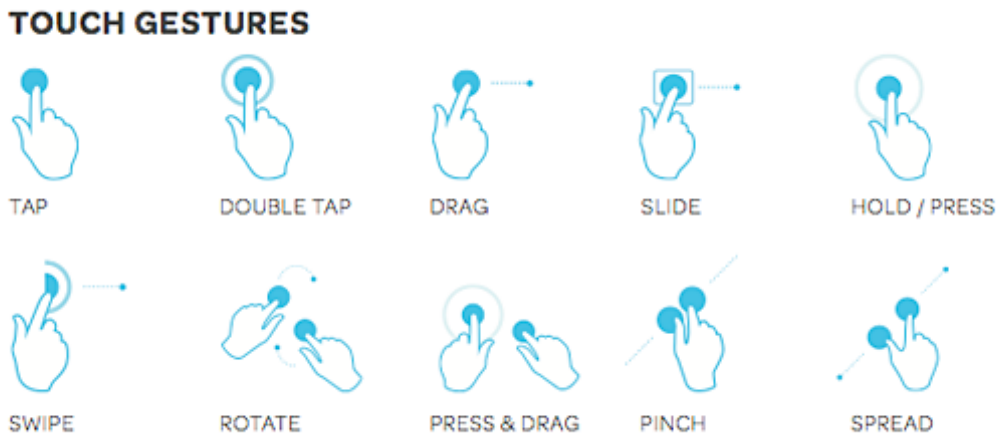



## 2) Mobile Interfaces

- Handheld devices intended to be used while on the move
- Have become pervasive, increasingly used in all aspects of everyday and working life
- Apps running on mobiles have greatly expanded, e.g.
  - used in restaurants to take orders
  - car rentals to check in car returns
  - supermarkets for checking stock
  - in the streets for multi-user gaming
  - in education to support life-long learning

## 2) Mobile Interfaces: Research and design issues

- Mobile interfaces can be tricky and cumbersome to use for those with poor manual dexterity or 'fat' fingers
- Key concern is designing for small screen real estate and limited control space
- Consider gestures to use



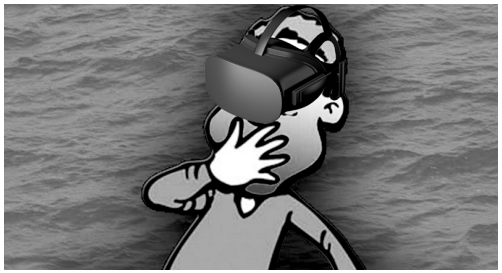
## 3) Virtual reality

- Enabling users to interact with objects and navigate in 3D space
- Highly engaging user experiences
- Computer-generated graphical 3D simulations :
  - the illusion of participation in a synthetic environment rather than external observation of the environment

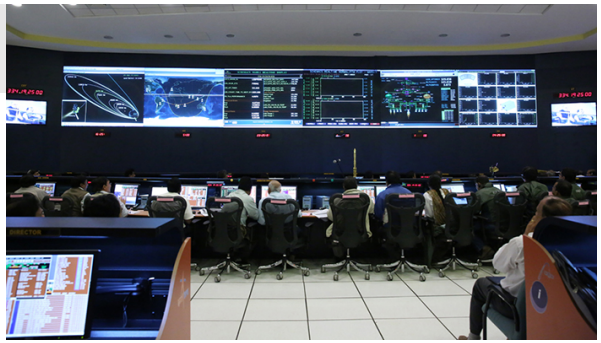
# 3) Virtual reality: Research and design issues

- How to design safe and realistic VRs to facilitate training
  - e.g. flying simulators
  - help people overcome phobias (e.g. spiders, talking in public)

- Design issues
  - how best to navigate through them (e.g. first versus third person)
  - how to control interactions and movements (e.g. use of head and body movements)
  - how best to interact with information (e.g. use of keypads, pointing, joystick buttons)
  - level of realism to aim for to engender a sense of presence



# 4) Information visualization & dashboards

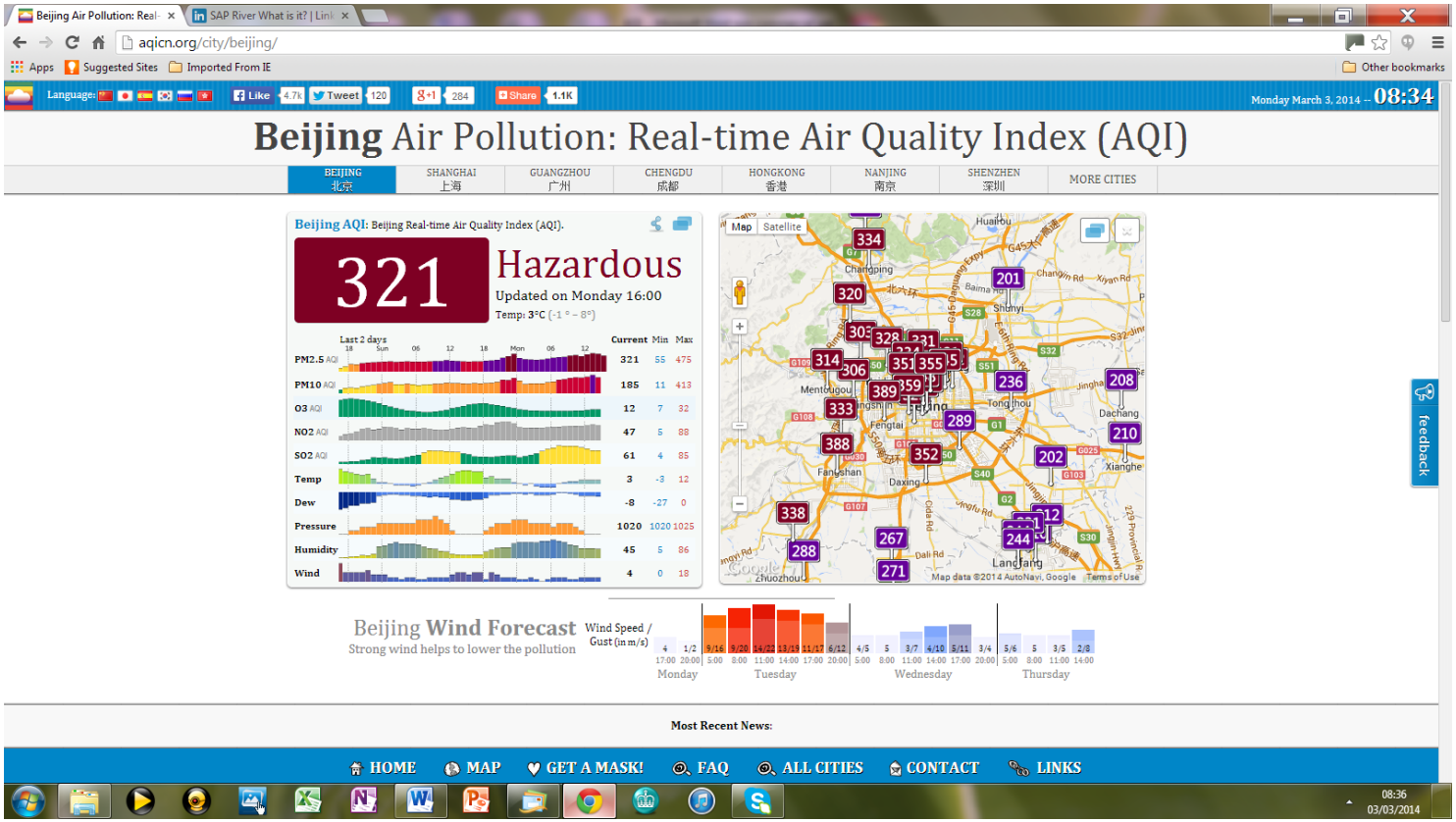


- Computer-generated interactive graphics of complex data
- Amplify human cognition, enabling users to see patterns, trends, and anomalies in the visualization
- Aim is to enhance discovery, decision-making, and explanation of phenomena
- Techniques include:
  - 3D interactive maps that can be zoomed in and out of and which present data via webs, trees, clusters, scatterplot diagrams, and interconnected nodes

## 4) Dashboards

- Show screenshots of data updated over periods of time - to be read at a glance
- Usually not interactive - slices of data that depict current state of a system or process
- Need to provide digestible and legible information for users
  - design its spatial layout so intuitive to read when first looking at it
  - direct a user's attention to anomalies or unexpected deviations

# 4) Dashboards



# 4) Dashboards

## 4) Information visualization & dashboards: Research and design issues

- Whether to use animation and/or some interactivity
- What form of coding to use, e.g. color or text labels
- Whether to use a 2D or 3D representational format
- What forms of navigation, e.g. zooming or panning
- What kinds and how much additional information to provide, e.g. rollovers or tables of text
- Too many variables are depicted in the same visualization

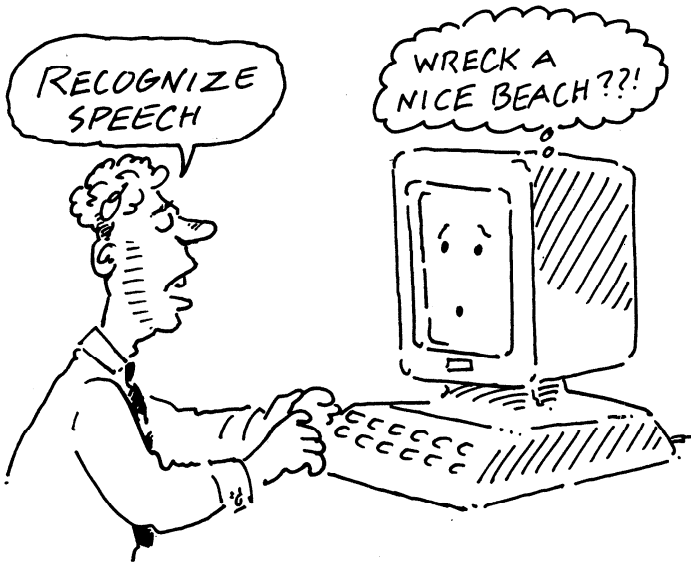
## 5) Speech

- Person talks with a system that has a spoken language application, e.g. timetable, travel planner
- Used most for inquiring about very specific information, e.g. flight times or to perform a transaction, e.g. buy a ticket
- Also used by people with disabilities
  - e.g. speech recognition word processors, page scanners, web readers, home control systems

# 5) Speech: Research and design issues

- How to design systems that can keep conversation on track
  - navigate efficiently through a menu system
  - easily recover from errors
  - guide vague or ambiguous requests to information or services

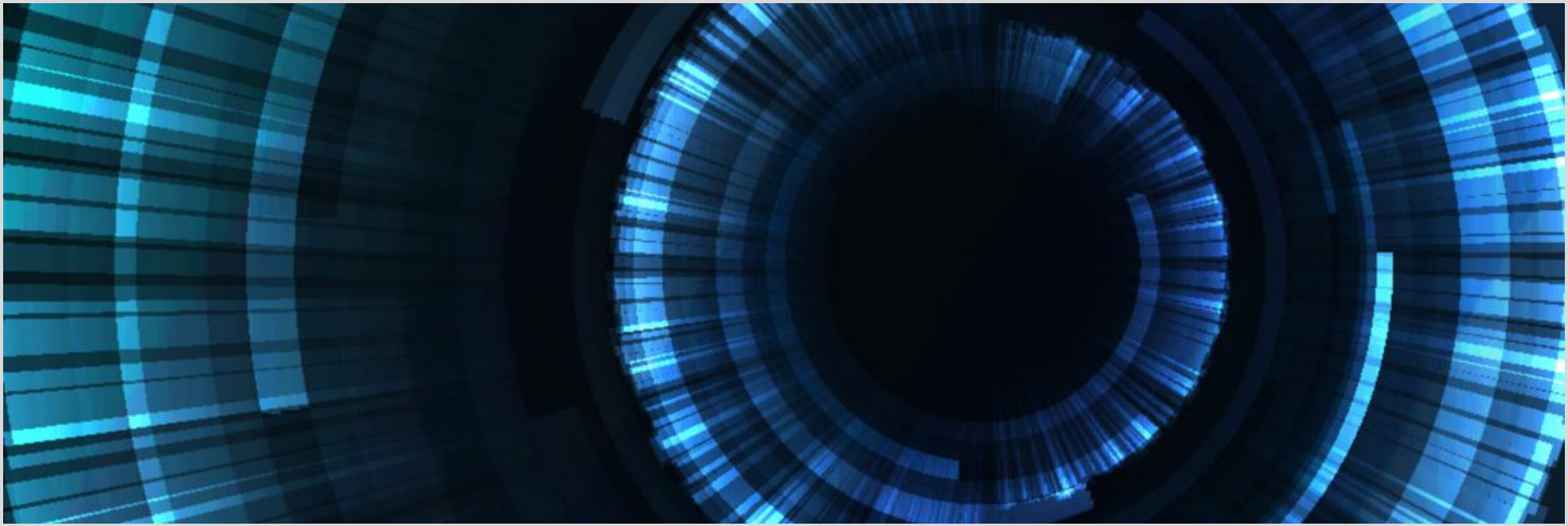
- Type of voice actor (e.g. male, female, neutral, or dialect)
  - female or male voice, regional accent, etc. ?



## Summary

- Many innovative interfaces have emerged post the WIMP/GUI era, including speech, wearable, mobile, brain and tangible
- Which to use will depend on task, users, context, cost, robustness, etc.
- New interfaces that are context-aware or monitor raise ethical issues concerned with what data is being collected and what it is used for

# Human Computer Interaction



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