# Topic 3: Conceptualising Interaction

SECV2113 Human-Computer Interaction

Faculty of Computing
Universiti Teknologi Malaysia

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02 CONCEPTUAL MODELS

03 INTERFACE METAPHORS

04 INTERACTION TYPES

# CONCEPTUALISIN G INTERACTION

# Conceptualising Design

- Proof of concept
  - Conceptualise what the proposed product will do
- Why the need to conceptualising design?
  - To scrutinise vague ideas and assumptions about the benefits of the proposed product and user experience in terms of their feasibility
  - How realistic is it to develop?
  - How desirable and useful?
- Many unknowns need to be considered in the initial stages of a design project
- Especially if it is a new product that is being proposed

# Consider Design Example 1

- A designer comes up with the idea of creating a mobile robot server:
  - help waiters in a restaurant take orders and deliver meals to customers
- Why ? What problem would this address?
- Putative benefits
  - Could help take orders and entertain customers by having a conversation with them at the table
- Design concerns
  - How would it need to move to appear to be talking?
  - What would the customers think of it?
  - Would it always be a pleasure for them to engage with the robot, not knowing what it would say on each new visit to the restaurant?
  - Would it be annoying or a fad?

# Consider Design Example 2

- An automated robot server that is functional

- In contrast to the idea of a waiter robot the robot server addressed a real-world problem
  - the cooks load up the trays on its shelves, and then sends it to a preset area of the dining room to deliver the food
  - the customers remove the food and drinks from the robot server

- It is like a tool, there to save waiters’ time rather than replacing them

# Which type of server is preferable and on what grounds?

Source: https://richtechrobotics.com/

# Assumptions and Claims

- Write down your assumptions and claims when deciding which one you prefer

- Try to defend and support them by what the two different servers will provide

# What is an Assumption?

- Taking something for granted when it needs further investigation, e.g.

  - The robot could take orders and entertain customers by having a conversation with them
  - The robot could make recommendations for different customers, such as restless children or fussy eaters

# What is a Claim?

- A claim is stating something to be true when it is still open to question

  - It will raise revenue by attracting more people to the restaurant
  - It will solve the labor crisis of there being not enough human waiters

- The real problem being addressed:

  "It is difficult to recruit good wait staff who provide the level of customer service to which we have become accustomed."

# Working through Assumptions

- Need to work through the initial stages of a design project
  - Where do your ideas come from?
  - What sources of inspiration were used?
  - Is there any theory or research that can be used to inform them?

- During the early ideation process
  - Ask questions, reconsider assumptions, and articulate concerns

# Poor Assumptions

- Those that are difficult to articulate
  - can highlight what ideas are vague or unrealistic
  - identify human activities and interactivities that are problematic

- Based on this kind of conceptual analysis iteratively work out how the design ideas might be improved

# A Framework for Analysing the Problem Space

- Are there problems with an existing product or user experience? If so, what are they?
- Why do you think there are problems?
- How do you think your proposed design ideas might overcome these?
- If you are designing for a new user experience, how do you think your proposed design ideas support, change, or extend current ways of doing things?

# Activity

- What were the assumptions and claims made about watching 3D TV?

A family watching 3D TV

Source: Andrey Popov, Shutterstock

# Assumptions and Claims: How realistic?

- There was no existing problem to overcome
  - What was being proposed was a new way of experiencing TV
- An assumption
  - People would really enjoy the enhanced clarity and color detail provided by 3D
- A claim
  - People would not mind paying a lot more for a new 3D-enabled TV screen because of the new experience

# From Problem Space to Design Space

- Having a good understanding of the problem space can help inform the design space
  - for example, what kind of interface, behavior, functionality to provide

- Before deciding upon these, it is important to develop a conceptual model

# Benefits of Conceptualising

- **Orientation**
  - Enables design teams to ask specific questions about how the conceptual model will be understood

- **Open-minded**
  - Prevents design teams from becoming narrowly focused early on

- **Common ground**
  - Allows design teams to establish a set of commonly agreed terms

# CONCEPTUAL MODEL

# Conceptual Model

- A conceptual model is:

  "…a high-level description of how a system is organised and operates" (Johnson and Henderson, 2002, p26)

- It enables:

  "…designers to straighten out their thinking before they start laying out their widgets" (Johnson and Henderson, 2002, p28)

- Provides a working strategy and framework of general concepts and their interrelations

# Components

- **Metaphors and analogies**
  - Understand what a product is for and how to use it for an activity
- **Concepts that people are exposed to through the product**
  - Task–Domain objects, their attributes, and operations (for example, saving, revisiting, organising)
- **Relationship and mappings between these concepts**
  - E.g. whether one object contains one another, and, whether one can revisit through looking at a list of visited sites

# …what concepts are needed to understand how to interact with this interface..?

Mappings?
Insert screwdriver
Turning screwdriver

# First Steps in Formulating a Conceptual Model

- What will people be doing when carrying out their tasks?
- How will the proposed model support these?
- What kind of interface metaphor, if any, will be appropriate?
- What kinds of interaction modes and styles to use?
- Keep in mind when making design decisions how the user will understand the underlying conceptual model

# Conceptual Models

- Many kinds and ways of classifying them

- The best conceptual models are often those that appear:
    - Obvious and simple
    - The operations they support are intuitive to use

# INTERFACE METAPHORS

# Interface Metaphors

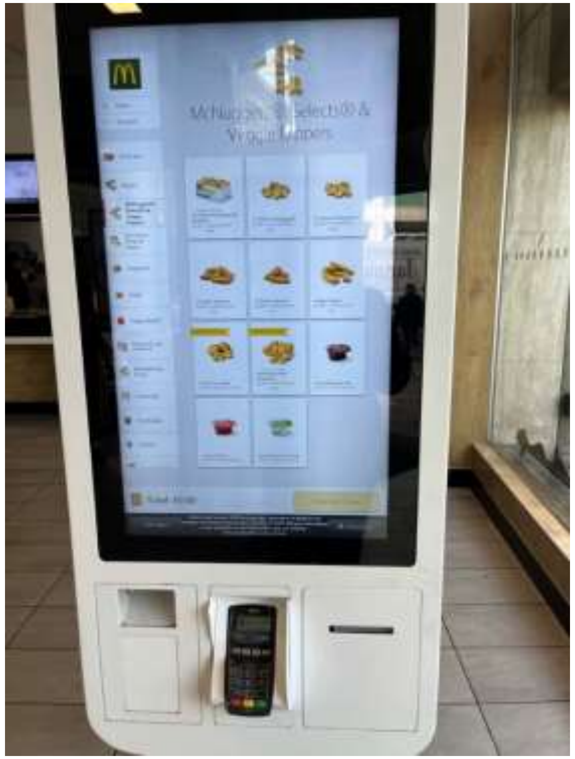
- Interface designed to be similar to a physical entity but also has own properties
  - e.g, desktop metaphor, web portals, search engine
- Can be based on activity, object, or a combination of both
- Exploit user’s familiar knowledge, helping them to understand ‘the unfamiliar’
- Conjures up the essence of the unfamiliar activity, enabling users to leverage this to understand more aspects of the unfamiliar functionality

# Examples of Interface Metaphors

- Conceptualising what users are doing
  - e.g, surfing the Web
- A conceptual model instantiated at the interface
  - e.g., the desktop metaphor
- Visualising an operation
  - e.g., an icon of a shopping cart into which the user places items

# The Card Metaphor

- The card is a very popular metaphor. Why?
  - It has familiar form factor
  - It can easily be flicked through, sorted, and themed
  - Cards have strong associations, providing an intuitive way of organising content that is "card sized"
  - Structures content into meaningful chunks



A fast food display

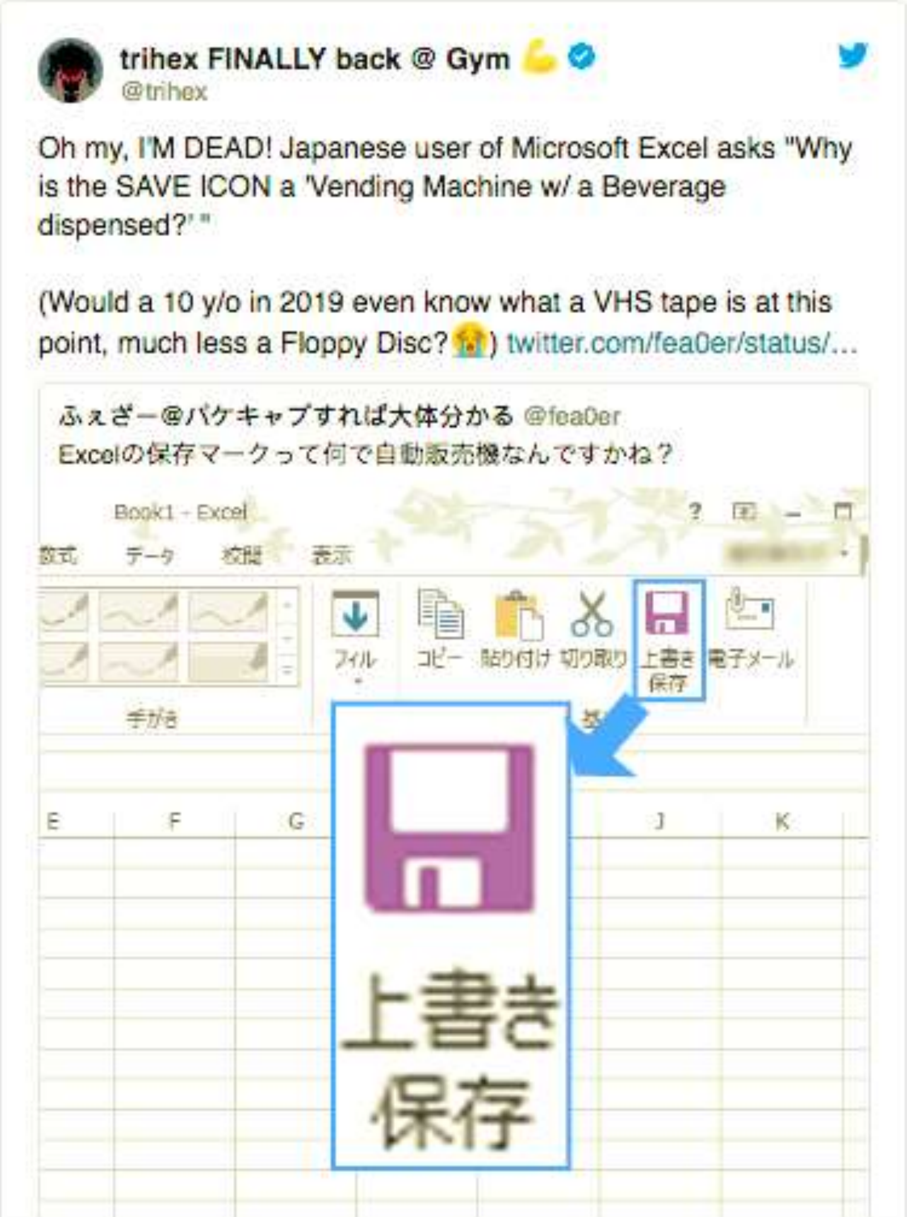
# Benefits of Interface Metaphors

- Makes learning new systems easier
- Familiar artefact or action helps people understand the underlying conceptual model
- Can be innovative and enable apps to be made accessible to a greater diversity of people

# Problems with Interface Metaphors

- Break conventional and cultural rules
  - e.g, recycle bin placed on desktop
- Can constrain designers in the way that they conceptualize a problem space
- Can conflict with design principles
- Designers can inadvertently use bad existing designs and transfer the bad parts over
- Limits designers' imagination in coming up with new conceptual models
- Often don't scale very well, especially when trying to describe how complex systems work (Cooper, 2020)

# Problem with Interface Metaphor Example



trihex FINALLY back @ Gym 💪
@trihex

Oh my, I'M DEAD! Japanese user of Microsoft Excel asks "Why is the SAVE ICON a 'Vending Machine w/ a Beverage dispensed?' "

(Would a 10 y/o in 2019 even know what a VHS tape is at this point, much less a Floppy Disc?😭) twitter.com/fea0er/status/...

ふぇざー@パケキャプすれば大体分かる @fea0er
Excelの保存マークって何で自動販売機なんですかね？

# Activity

- Describe the components of the conceptual model underlying most shopping websites, for example:
  - Shopping cart
  - Proceeding to check-out
  - 1-click
  - Gift wrapping
  - Cash register

# INTERACTION TYPES

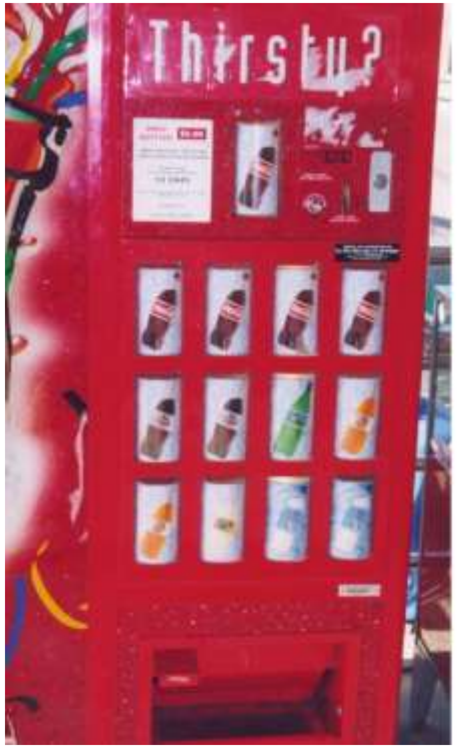
# Interaction Types

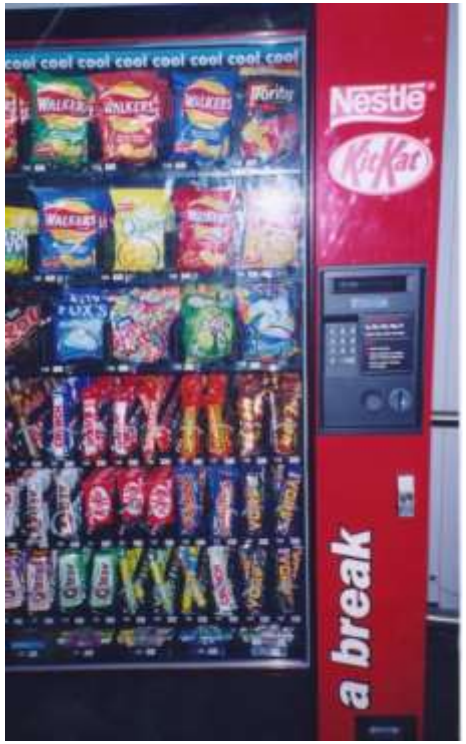
1. **Instructing**
   - Issuing commands and selecting options
2. **Conversing**
   - Interacting with a system as if having a conversation
3. **Manipulating**
   - Interacting with objects in a virtual or physical space by manipulating them
4. **Exploring**
   - Moving through a virtual environment or a physical space
5. **Responding**
   - The system initiates the interaction and the person chooses whether to respond

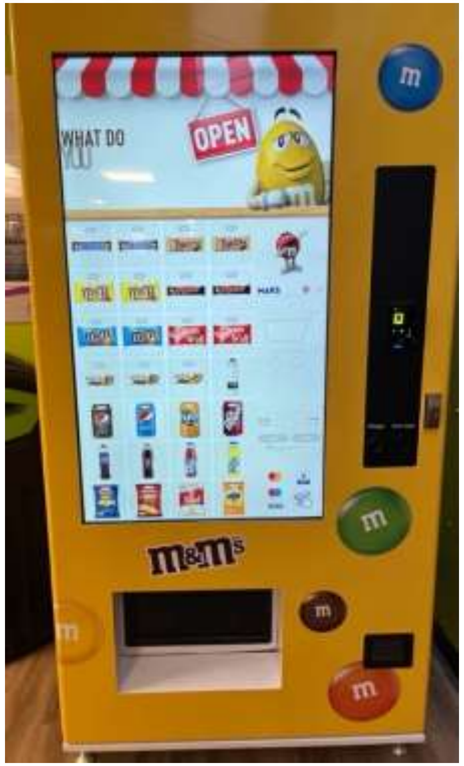
# 1. Instructing

- Where someone instruct a system and tells it what to do
  - e.g.Tell the time, print a file, or save a file
- Very common conceptual model underlying a diversity of devices and systems
  - e.g. Word processors, VCRs, vending machines
- The main benefit is that instructing supports quick and efficient interaction
  - Good for repetitive kinds of actions performed on multiple objects

# Which is easiest and why?







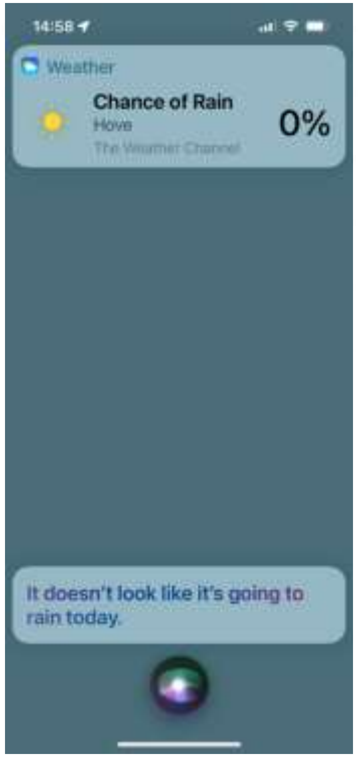
# 2. Conversing

- Underlying model of having a conversation with another human
- Ranges from simple voice recognition menu-driven systems to more complex ‘natural language’ dialogs
- Examples include timetables, search engines, advice-giving systems, help systems, virtual agents, chatbots, toys, and pet robots designed to converse with people

# Pros and Cons of Conversational Model

- Allows people to interact with a system in a way that is familiar to them
  - can make them feel comfortable, at ease, and less scared

- Misunderstandings can arise when the system does not know how to parse what someone says
  - e.g, voice assistants can misunderstand what children say



It doesn't look like it's going to rain today.

Siri's response when asked if
a person needs an umbrella today

# Pros and Cons of Conversational Model

"If you'd like to press 1, press 3.
If you'd like to press 3, press 8.
If you'd like to press 8, press 5..."

# 3. Manipulating

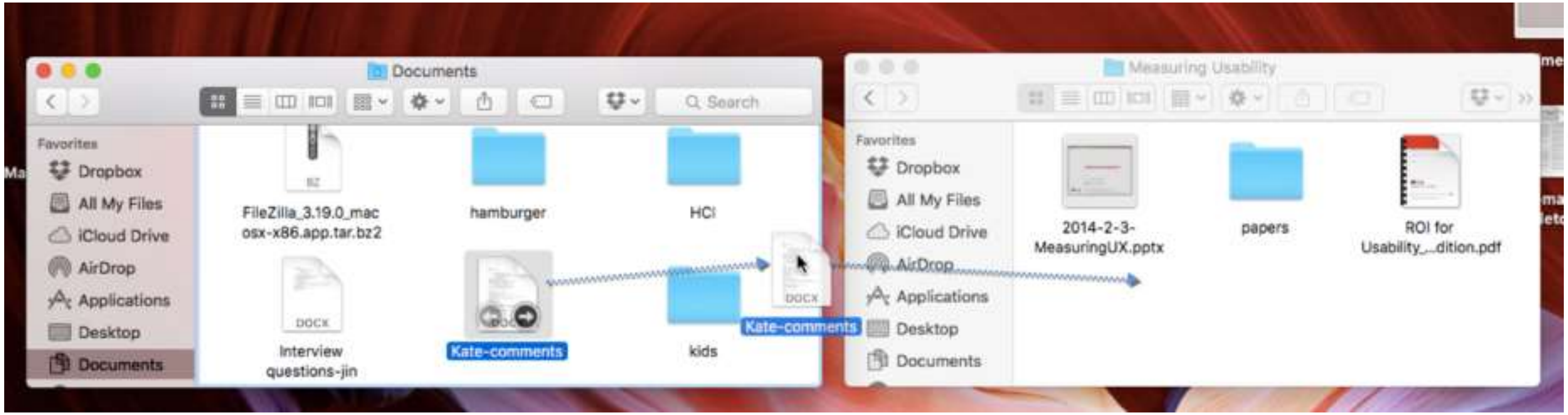
- Involves dragging, selecting, opening, closing and zooming actions on virtual objects
- Exploit's someone's knowledge of how they move and manipulate in the physical world
- Can involve actions using physical controllers or air gestures to control the movements of an on-screen avatar
- Tagged physical objects (for instance, balls) that are manipulated in a physical world result in physical/digital events (such as animation)

# Direct Manipulation

- Ben Shneiderman (1983) coined the term

- Three core properties:
  - Continuous representation of objects and actions of interest
  - Physical actions and button pressing instead of issuing commands with complex syntax
  - Rapid reversible actions with immediate feedback on object of interest

# Direct Manipulation



Moving a file on MacOS using direct manipulation involves dragging that file from the source folder and moving it into the destination folder.

Source: https://www.nngroup.com/articles/direct-manipulation/

# Benefits of Direct Manipulation

- Novices can learn the basic functionality quickly
- Experienced users can carry out a wide range of tasks efficiently and rapidly
- Intermittent users can retain operational concepts over time
- Error messages rarely needed
- Users can immediately see if their actions are furthering their goals, and if not, do something else
- Users experience less anxiety
- Users gain confidence and mastery and feel in control

# Disadvantages

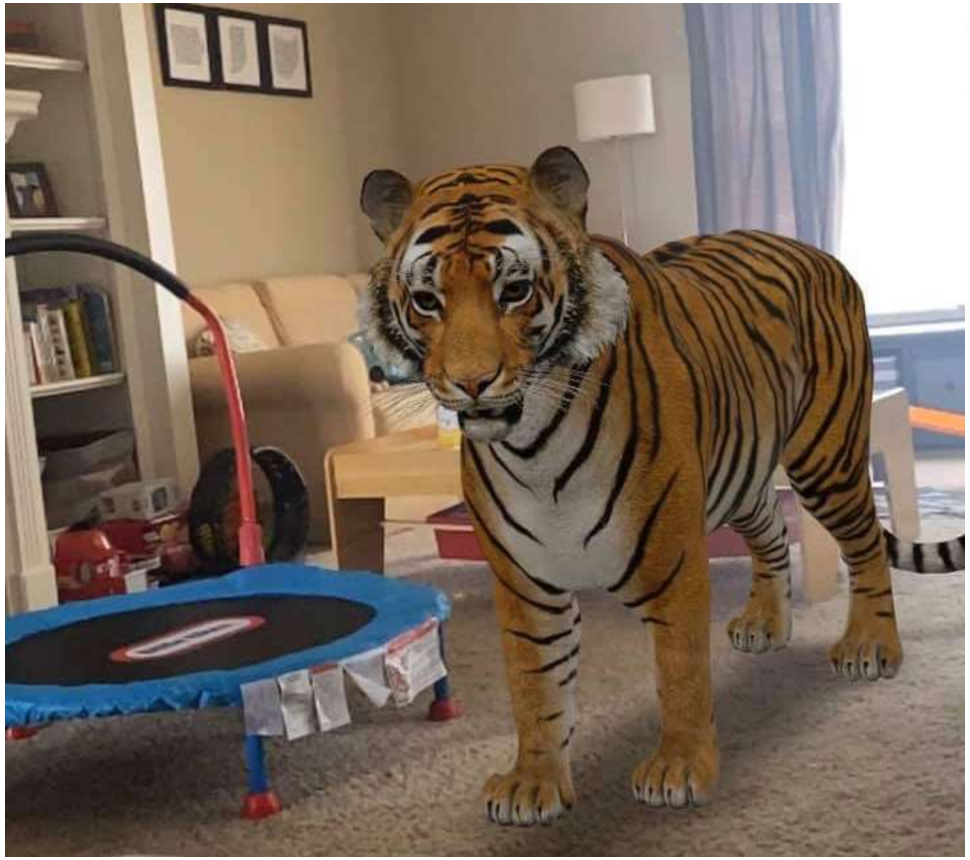
- Some people take the metaphor of direct manipulation too literally
- Not all tasks can be described by objects, and not all actions can be done directly
- Some tasks are better achieved through delegating, for example, spell checking
- Can become screen space ‘gobblers’
- Moving a cursor using a mouse or touchpad can be slower than pressing function keys to do the same actions

# 4. Exploring

- Involves moving through virtual or physical environments
  - People can explore aspects of a 3D environment
  - Physical environments can also be embedded with sensors that when detect the presence of someone will trigger digital or physical events to happen

- Many examples of virtual environments, including cities, parks, buildings, rooms, and datasets
  - enable people to fly over them and zoom in and out of different parts

# Seeing things larger than life and in situ in AR



A virtual lion appearing in someone's living room created with Google 3D object

Source: www.cnet.com/tech/services-and-software/google-3d-animals-how-to-use-cool-ar-feature-at-home-list-of-objects

# Exploring Data in VR

Someone using Immersive data analytics allowing them to explore Tableau data in 3D

# 5. Responding

- This type suggested by Christopher Lueg et al. (2018)
- System takes the initiative to alert user to something that it “thinks” is of interest
- System does this by:
  - detecting the location and-or presence of someone in a vicinity and notifying them on their phone or smartwatch
  - what it has learned from their repeated behaviors
- Examples:
  - alerts the user of a nearby coffee bar where some friends are meeting
  - A wearer’s fitness tracker notifies them of a milestone reached
- Automatic system response without any requests made by the user

# Potentials Cons of System-initiated Notifications

- Can get tiresome or frustrating if too many notifications or the system gets it wrong
- What does it do when it gets something wrong?
  - Does it apologise?
  - Does it allow the user to correct the advice or information?

# 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 finding out information, requesting music/TV or learning
- Hybrid conceptual models are good for supporting multiple ways of carrying out the same actions

# Difference between Interaction Types and Interface Styles

- **Interaction type:**
  - A description of what a person 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

# Many Kinds of Interface Styles Available (More in the next topic)

- Command
- Speech
- Data-entry
- Form fill-in
- Query
- Graphical
- Web
- Pen
- Augmented reality
- Gesture

# Which Interaction Type to Choose?

- Need to determine requirements and user needs
- Take budget and other constraints into account
- Also will depend on suitability of technology for activity being supported

# Watch these videos!

- VW’s vision of its future car can be seen in this video: https://www.youtube.com/watch?v=AyihacflLto
- See Stanford university’s video on HAI: http://www.youtube.com/watch?v=4W2kXBBFDw4&t=4s
- You can watch a video about the Apple Knowledge Navigator here: https://www.youtube.com/watch?v=HGYFEI6uLy0

# Activity

- Please watch the movie Atlas (available on Netflix or YouTube trailer here: https://www.youtube.com/watch?v=Jokpt_LJpbw).
- This film provides an interesting perspective on affective computing, neural link, and how adaptive systems can learn and interact emotionally with humans.
- It's a great example of how future human-computer interaction might evolve beyond conventional interfaces.
- Watch it to gain innovative ideas and inspiration for your HCI project or discussions on intelligent and emotional interaction design.

# Summary

- Developing a conceptual model involves:
  - Understanding the problem space
  - Being clear about your assumptions and claims
  - Specifying how the proposed design will support people in their activities
- A conceptual model is a high-level description of a product in terms of:
  - What users can do with it and the concepts they need to understand how to interact with it
- Interaction types provide a way of thinking about how to support user's activities