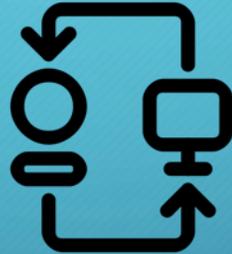


HUMAN-COMPUTER INTERACTION

CS255

LEC-2 : PRINCIPLES OF HCI



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OUTLINE

- **Principles of HCI**

- 1. “Know Thy User”**

- 2. Understand the Task**

- 3. Reduce Memory Load**

- 4. Prevent Errors / Reversal of Action Prevent Errors/**

- 5. Naturalness**

PRINCIPLES OF HCI

- **The good HCI design is generally difficult, mainly because it is a multi-objective task that involves simultaneous consideration of many things.**
- **Such as the types of users, characteristics of the tasks, capabilities and cost of the devices, lack of objective or exact quantitative evaluation measures, and changing technologies.**
- **A great knowledge in many different fields is required.**
- **In the next slide, there are a short review of the main HCI principles.**

1- “KNOW THY USER”

- This principle simply states that the interaction and interface should cater to the needs and capabilities of the target user of the system in design.
- Ideally, comprehensive information (e.g., age, gender, education level, social status, computing experience, cultural background) about the representative target user should be collected and analyzed to determine their probable preferences, tendencies, capabilities (physical and mental), and skill levels.
- Such information can be used to properly model interaction and pick the right interface solution for the target users.

“KNOW THY USER”

- **Usually, universal usability is achieved by justifying the investment required to build separate interfaces for distinct user groups.**
- **For example, in advanced countries, many government web pages are now legally required to provide interfaces in different languages and for color-blind and visually challenged users.**
- **Many interactive systems provide both menu-driven commands for novices and keyboard-based hot keys for experts.**

“KNOW THY USER”

MENU-DRIVEN INTERFACE



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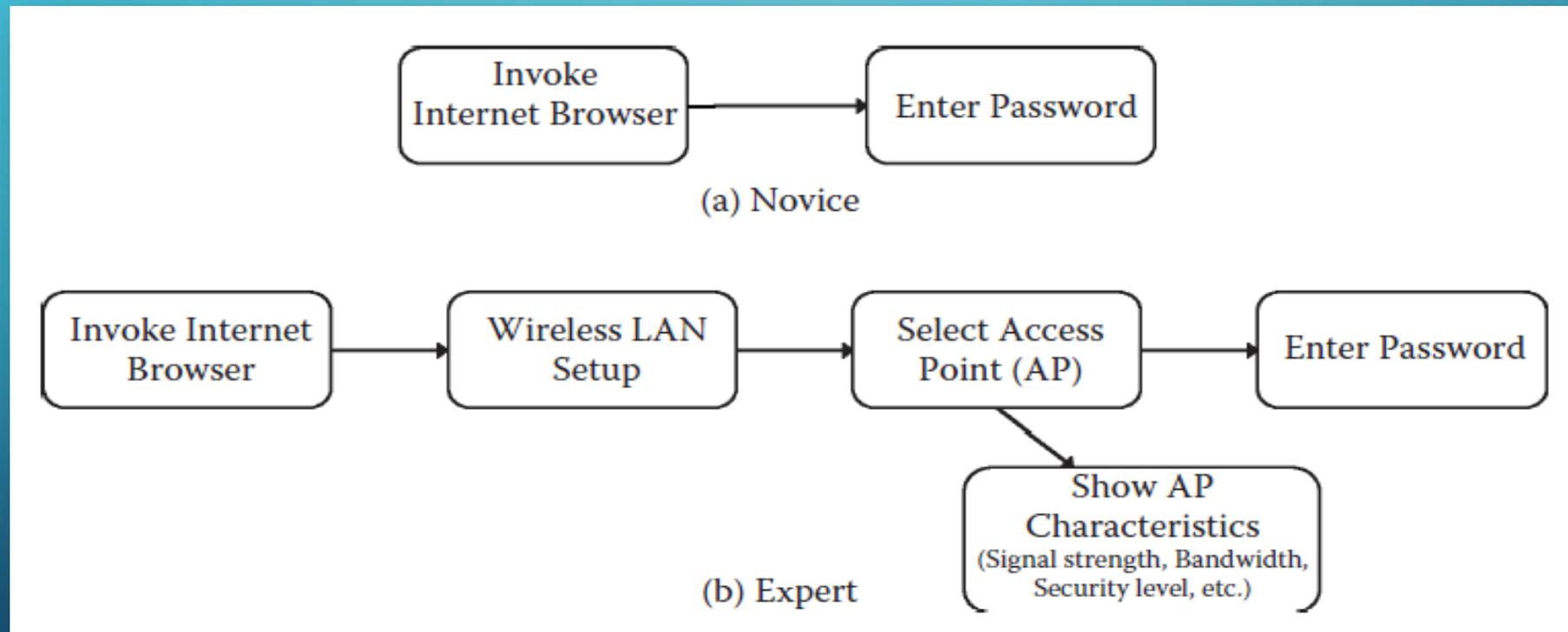
2. UNDERSTAND THE TASK

- **Another almost-commonsensical principle is to base HCI design on the understanding of the task.**
- **The term task refers to the job to be accomplished by the user through the use of the interactive system.**
- **In fact, understanding the task at hand is closely related to the interaction modeling and user analysis.**
- **It really boils down to identifying the sequence and structure of subtasks at an abstraction level appropriate for the typical user within the larger application context.**

UNDERSTAND THE TASK

- **Take the subtask (for a larger application) for “changing the Wi-Fi connection access point” for a smartphone.**
- **For an expert user experienced in computer networks, the task might be modeled with detailed steps, asking the user to select from a pool of available nearby access points based on their characteristics such as the signal strength, bandwidth, security level, and so forth.**
- **On the other hand, for a casual user, the subtask might only involve entering a password for the automatically selected access point**

TWO INTERACTION MODELS AT DIFFERENT LEVELS OF DETAIL FOR THE TASK OF “CONNECTING TO THE INTERNET FROM A SMARTPHONE,” DEPENDING ON THE USER TYPE.

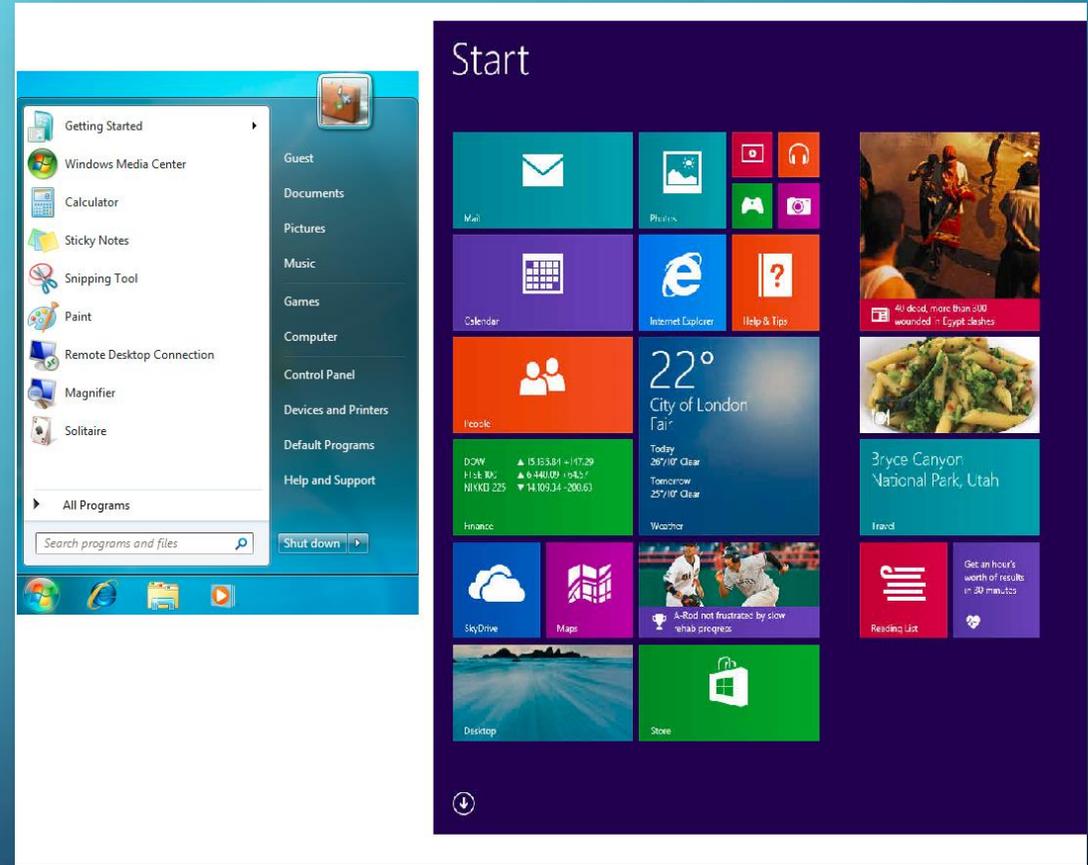


3. REDUCE MEMORY LOAD

- **Humans are certainly more efficient in carrying out tasks that require less memory burden, long or short term.**
- **Keeping the user's short-term memory load light is of particular importance with regard to the interface's role as a quick and easy guidance to the completion of the task.**
- **The capacity of the human's short-term memory (STM) is about 5–9 chunks of information (or items meaningful with respect to the task), famously known as the “magic number” [3].**
- **Light memory burden also leads to less erroneous behavior.**

INTERFACES DESIGNED FOR MINIMAL SHORT-TERM MEMORY

- This fact is well applied to interface design, for instance, in keeping the number of menu items or depth to less than this amount to maintain good user awareness of the ongoing task or in providing reminders and status information continuously throughout the interaction.



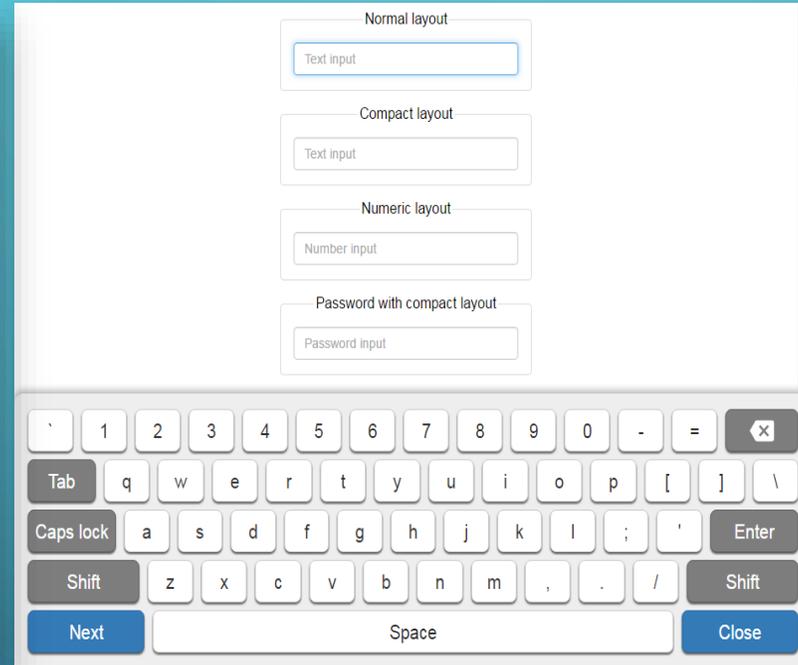
4. PREVENT ERRORS / REVERSAL OF ACTION

- **Naturally, one effective technique is to present or solicit only the relevant information/action as required at a given time. Inactive menu items are good examples of such a technique.**
- **Also, having the system require the user to choose from possibilities (e.g., menu system) as figure (a) is generally a safer approach than to rely on recall (e.g., direct text input) as figure (b).**
- **Despite employing some of the principles and techniques described here, there is always a chance that the user will make mistakes. Thus, a very obvious but easy-to-forget feature is to allow an easy reversal of action as figure (c).**
- **This puts the user into a comfortable state and increases user satisfaction as well.**

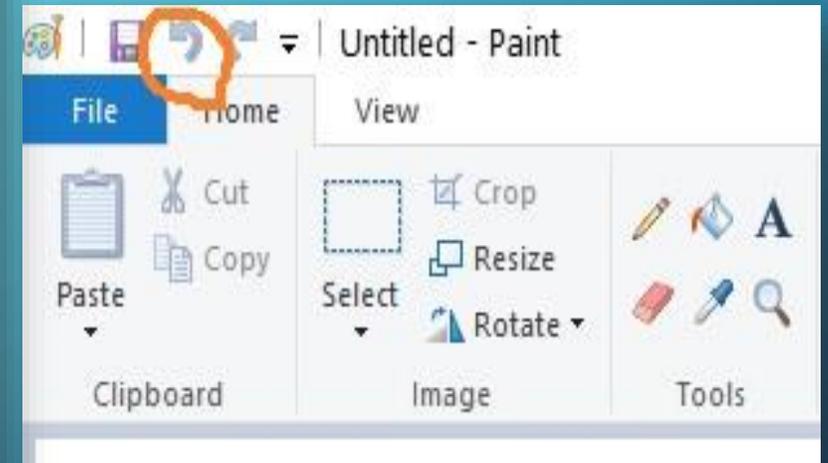
EXAMPLES



(a)



(b)



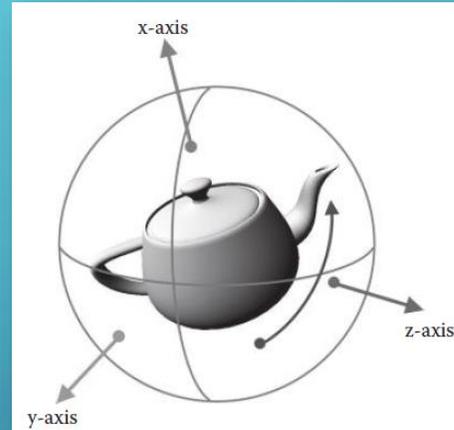
(c)

5. NATURALNESS

- **The final major HCI principle is to favor “natural” interaction and interfaces. Naturalness refers to a trait that is reflective of various operations in our everyday life.**
- **For instance, a perfect HCI may one day be realized when a natural language-based conversational interface is possible, because this is the prevalent way that humans communicate.**
- **However, it can be tricky to directly translate real-life styles and modes of interaction to and for interaction with a computer.**

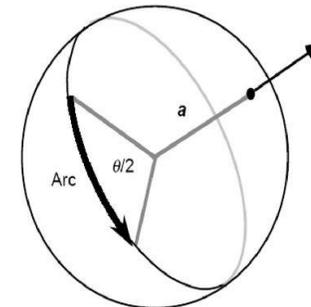
NATURALNESS

- In the example of the ARCBall, the spherical shape of the rotator GUI may be regarded to exhibit a high level of affordance, requiring no explanation as to how to rotate the object.

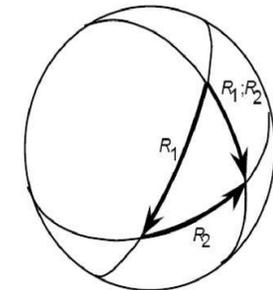


ArcBall

- ▶ **Definition:** interface for rotating a 3D object, by using just a mouse



Arc Interpretation
a – rotation axis
 θ – rotation angle



Arc Combination

REFERENCES

- The Handbook of Formal Methods in Human-Computer Interaction (Human–Computer Interaction Series) 1st ed. 2017 Edition, Kindle Edition by Benjamin Weyers (Editor), Judy Bowen (Editor), Alan Dix (Editor), Philippe Palanque (Editor) Format: Kindle Edition.
- Gerard J. Kim, ” Human–Computer Interaction Fundamentals and Practice”, International Standard Book Number-13: 978-1-4822-3390-2,2015.
- [3] Miller, George A. 1956. The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review* 63 (2): 81–97.



*Thank
You*