Lecture - 7

Human Input-Output Channels

7.1 Input Output channels

A person's interaction with the outside world occurs through information being received and sent: input and output. In an interaction with a computer the user receives information that is output by the computer, and responds by providing input to the computer.

Input in human is mainly through the senses. There are five major senses:

- Sight
- Hearing
- Touch
- Taste
- Smell

Of these first three are the most important to HCI. Taste and smell do not currently play a significant role in HCI. However, vision hearing and touch are central.

Similarly, there are a number of effectors:

- Limbs
- Fingers
- Eyes
- Head
- Vocal system

In the interaction with computer, the fingers play the primary role, through typing or mouse control, with some use of voice, eye, head and body position.

7.2 Information presentation

The way information is displayed can also greatly influence how easy or difficult it is to attend to appropriate pieces of information. Look at the figure below, two different ways of structuring the same information at the interface: one makes it much easier to find information than the other. Look at the top screen and (i) find the price for a double room at the Holiday Inn in Lahore: (ii) find the phone number of the Sheraton in the Karachi. Then look at the bottom screen and (i) find the price of for a double room at the Pearl Continental in Faisalabad; (ii) find the phone number of the Holiday Inn in the Islamabad. Which took longer to do? Experiments showed that the two screens produced quite different results: it took an average of 3.2 seconds to search the top screen and 5.5 seconds to find the same kind of information in the bottom screen. Why is this so, considering that the both displays have the same density of information? The primary reason is the way the characters are grouped in the display; in the top they are grouped into vertical categories of information that have columns of space between them. In the bottom screen the information is bunched up together, making it much harder to search through.

City	Hotel	Area Code	Phone	Rates Single	Double
Lahore	Holiday Inn	042	6300634	2000	4000
Lahore	Sheraton	042	5456322	1800	3500
Lahore	Perl Continental	042	4565654	2500	5000
Karachi	Holiday Inn	021	1645656	2000	4000
Karachi	Sheraton	021	6545646	1800	3500
Karachi	Perl Continental	021	9545656	2500	5000

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Islamabad: Holiday Inn
(051) 4544556 S:2000 D:4000
Islamabad: Sheraton
(051) 2135466 S:1500 D:3500
Islamabad: Pearl Continental
(051) 6565322 S:3000 D:6000
Faisalabad: Holiday Inn
(041) 4544556 S:2000 D:4000
Faisalabad: Sheraton
(041) 2135466 S:1500 D:3500
Faisalabad: Pearl Continental
(041) 6565322 S:3000 D:6000
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7.3 Memory

Indeed, much of our everyday activities rely on memory. As well as storing all our factual knowledge, our memory contains our knowledge of actions or procedures. It allows us to repeat actions and to use new information received via our senses.

Short-term memory acts as a kind of "scratch-pad" for temporary recall of the information which is being processed at any point in time. It can be thought of as the ability to remember and process information at the same time. It holds a small amount of information

Long-term memory is, intended for storage of information over a long period of time. It can store unlimited amount of information.

Episodic memory represents our memory of experiences and specific events in time in a serial form, from which we can reconstruct the actual events that took place at any given point in our lives. It is the memory of autobiographical events (times, places, associated emotions and other contextual knowledge) that can be explicitly stated.

7.4 Reasoning

Reasoning is the process by which we use the knowledge we have to draw conclusions or infer something new about the domain of interest. There are a number of different types of reasoning:

- Deductive reasoning
- Inductive reasoning
- Abductive reasoning

Deductive reasoning

"The act or process of using logic or reason to form a conclusion or opinion about something" or "*the act or process of deducing something*."

For example,
If it is Friday then he will go to work
It is Friday.
Therefore, he will go to work.

Inductive reasoning

Induction is generalizing from cases we have seen to infer information about cases we have not seen.

For example, if every elephant we have ever seen has a trunk, we infer that all elephants have trunks. Of course, this inference is unreliable and cannot be proved to be true; it can only be proved to be false. We can disprove the inference simply by producing an elephant without a trunk. However, we can never prove it true because, no matter how many elephants with trunks we have seen or are known to exist, the next one we see may be trunkless. The best that we can do is gather evidence to support our inductive inference.

Abductive reasoning

The third type of reasoning is abduction. Abduction reasons from a fact to the action or state that caused it. *This is the method we use to derive explanations for the events we observe.*

For example, suppose we know that Tom always drives too fast when he has been drinking. If we see Tom driving too fast, we may infer that he has been drinking. Of course, this too is unreliable since there may be another reason why he is driving fast: he may have been called to an emergency.