Lecture - 6

Cognitive Frameworks

6.1 Introduction

Cognitive Psychology

Psychology is concerned primarily with understanding human behavior and the mental processes that underlie it. To account for human behavior, cognitive psychology has adopted the notion of information processing. Everything we see, feel, touch, taste, smell and do is couched in terms of information processing.

The objective cognitive psychology has been to characterize these processes in terms of their capabilities and limitations. For example, one of the major preoccupations of cognitive psychologists in the 1960s and 1970s was identifying the amount of information that could be processed and remembered at any one time. Recently, alternative psychological frameworks have been sought which more adequately characterize the way people work with each other and with the various artifacts, including computers, that they have use. Cognitive psychology has attempted to apply relevant psychological principles to HCI by using a variety of methods, including development of guidelines, the use of models to predict human performance.

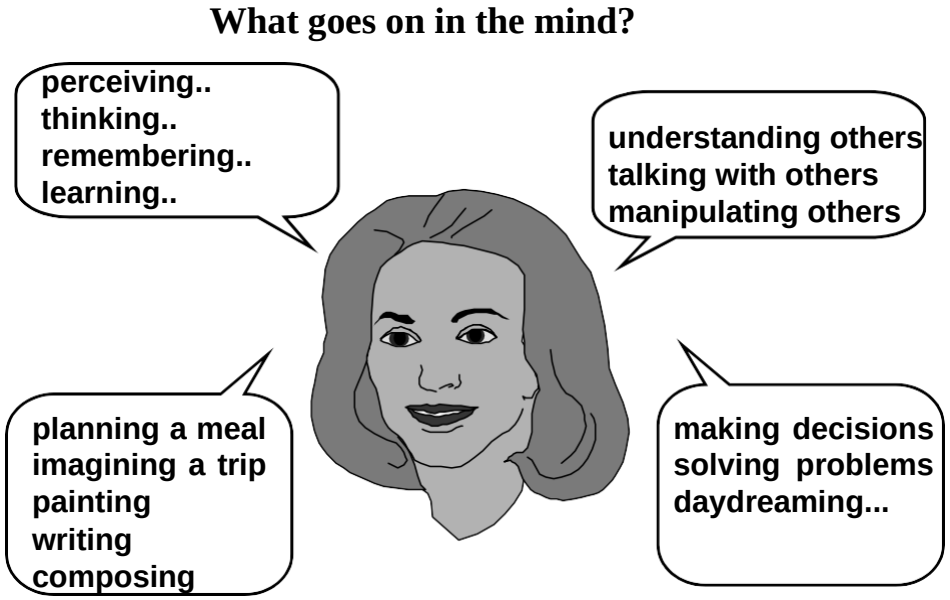
Cognition

The dominant framework that has characterized HCI has been cognitive. Let us define cognition first:

Cognition is what goes on in out heads when we carry out our everyday activities.

In general, cognition refers to the processes by which we become acquainted with things or, in other words, how we gain knowledge. These include understanding, remembering, reasoning, attending, being aware, acquiring skills and creating new ideas.

As figure indicates there are different kinds of cognition.



The main objective in HCI has been to understand and represent how human interact with computers in term of how knowledge is transmitted between the two. The theoretical grounding for this approach stems from cognitive psychology: it is to explain how human beings achieve the goals they set.
Cognition has also been described in terms of specific kinds of processes. These include:

- Attention
- Perception and recognition
- Memory
- Learning
- Reading, speaking, and listening
- Problem solving, planning, reasoning, decision-making.

It is important to note that many of these cognitive processes are interdependent: several may be involved for a given activity. For example, when you try to learn material for an exam, you need to attend the material, perceive, and recognize it, read it, think about it, and try to remember it. Thus, cognition typically involves a range of processes.

6.2 Modes of Cognition

Norman distinguishes between two general modes:

1. Experiential cognition
2. Reflective cognition

Experiential cognition

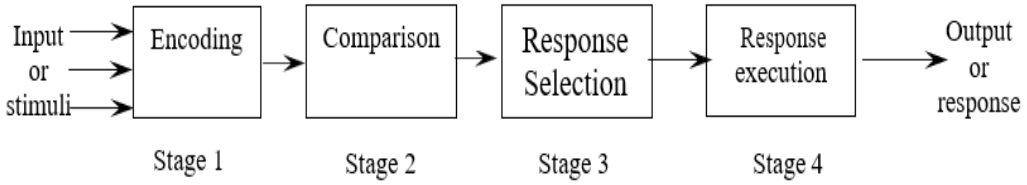
It is the state of mind in which we perceive, act, and react to events around us effectively and effortlessly. It requires reaching a certain level of expertise and engagement. Examples include driving a car, reading a book, having a conversation, and playing a video game.

Reflective cognition

Reflective cognition involves thinking, comparing, and decision-making. This kind of cognition is what leads to new ideas and creativity. Examples include designing, learning, and writing a book.
Norman points out that both modes are essential for everyday life but that each requires different kinds of technological support.

Information processing

During the 1960s and 1970s the main paradigm in cognitive psychology was to characterize humans as information processors; everything that is sensed (sight, hearing, touch, smell, and taste) was considered to be information, which the mind processes. Information is thought to enter and exit the mind through a series of ordered processing stages. As shown in figure, within these stages, various processes are assumed to act upon mental representations. Processes include comparing and matching. Mental representations are assumed to comprise images, mental models, rules, and other forms of knowledge.



Stage1 encodes information from the environment into some form of internal representation. In stage 2, the internal representation of the stimulus is compared with memorized representations that are stored in the brain. Stage 3 is concerned with deciding on a response to the encoded stimulus. When an appropriate match is made the process passes on to stage 4, which deals with the organization of the response and the necessary action. The model assumes that information is unidirectional and sequential and that each of the stages takes a certain amount of time, generally thought to depend on the complexity of the operation performed.

To illustrate the relationship between the different stages of information processing, consider the sequence involved in sending mail. First, letters are posted in a mailbox. Next, a postman empties the letters from the mailbox and takes them to central sorting office. Letters are then sorted according to area and sent via rail, road, air or ship to their destination. On reaching their destination, the letters are further sorted into particular areas and then into street locations and so on.

6.3 Human processor model

The information processing approach is based on modeling mental activities that happen exclusively inside the head. However, most cognitive activities involve people interacting with external kinds of representations, like books, documents, and computers. For example, when we go home from wherever we have been we do not need to remember the details of the route because we rely on cues in the environment (e.g., we know to turn left at the red house, right when the road comes to a T-junction, and so on.). Similarly, when we are at home we do not have to remember where everything is because information is “out there.” We decide what to eat and drink by scanning the items in the fridge.

Conceptual Models

Conceptual models are (these are the various ways in which systems are understood by different people) to help designers develop appropriate interfaces.

Interface Metaphor

Interface metaphors are (these are GUIs that consists of electronic counterparts to physical objects in the real world) to match the knowledge requirements of users.