Communication Theory

Lecture 1:
Introduction to Cognitive Theory

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What is Cognition?

Cognition concerns the mental processes that go on in our heads as we go about our lives.

Cognition comprises many processes including:

- Attention
- Learning
- Memory
- Perception
- Decision-making
- Planning
- Reading
- Speaking
- Listening

Cognition

- How can we explain and understand these processes?
- We can not see these processes so we must infer them from behaviour
- Traditionally cognitive scientists study the individual to analyse human cognitive processes.

Physical to Digital

- Emulate real world activity?

e.g stickie notes, to-do lists

- Key is to understand the nature of the problem in the digital application in relation to the strategies people use in the physical world

Conceptual Frameworks

Used to explain user interaction and predict user performance

- Mental models
- Information processing
- External Cognition

Mental Models

- Mental models are representations in the mind of situations
- Type and structure of mental model
- Erroneous mental models
- Are users mental models the same as those of the designer?

Information processing

- A metaphor to explain the mind as an information processor
- Information is believed to enter and leave the mind through a series of ordered processing stages
- Card et al (1983) the human processor model – modelling the cognitive processes of a user interacting with a computer
- This approach is based on processes taking place inside the head.

External Cognition

External cognition explores the cognitive processes involved when one interacts with different representations

Aim is to study the cognitive benefits of using different representations for varying cognitive activities and the processes involved:

- Externalising to reduce the memory load
- Computational offloading
- Annotating and cognitive tracing

The Problem

Many frameworks do not consider:

- Culture
- Context
- History
- Emotion

- Ignore how people interact with one another
- Ignore use of artefacts and external representations

Technology: Designing for Collaboration and Communication

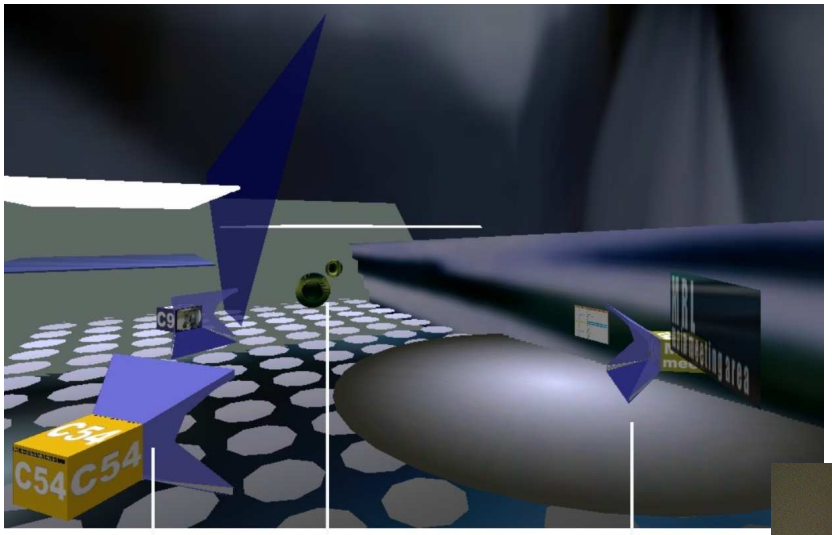
Designing to support collaboration and communication:

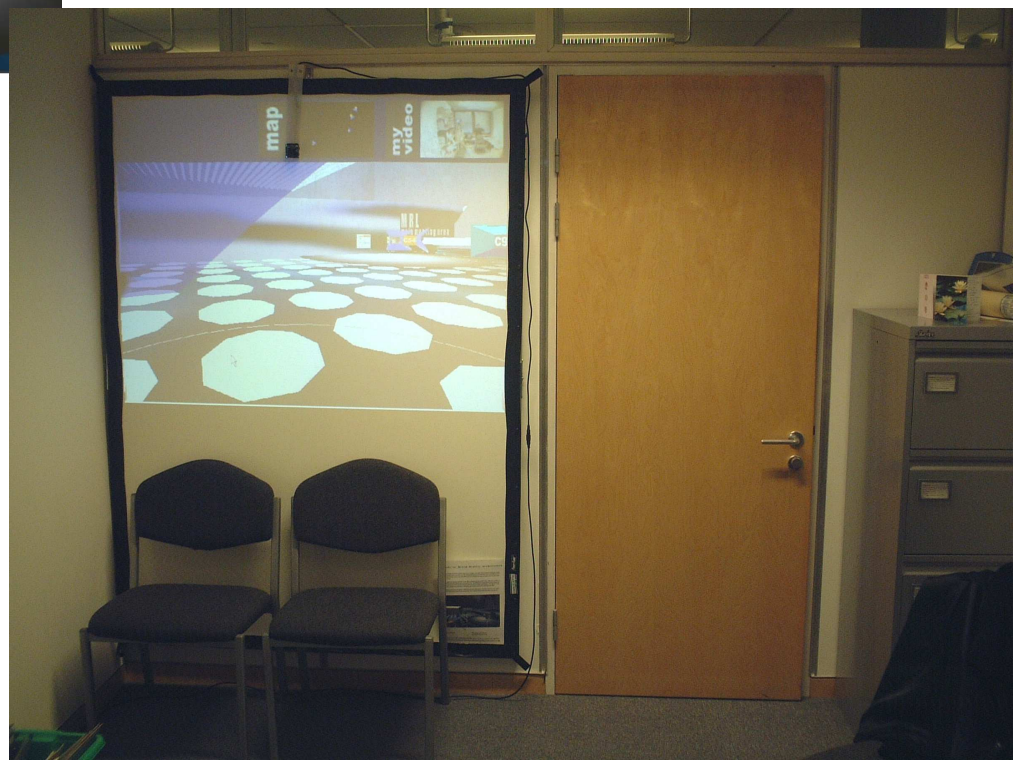
- Synchronous
- Asynchronous
- Combined activity

Designing for:

- Conversation
- Coordination
- Awareness

Example application: The Mixed Reality Boundary





One alternative conceptual framework: Distributed Cognition

Distributed cognition is a theoretical approach that is concerned with the interactions between people, artifacts and both internal and external representations. Rather than focusing exclusively on an individual's internal cognitive processes, that traditional cognitive approaches do, it focuses on the processes that take place in an extended 'cognitive system'. These include verbal and non-verbal behavior, the coordinating mechanisms used by social actors, the forms of communication that take place and the way tacit and explicit knowledge is shared and accessed. One major benefit is the explication of the complex interdependencies between people, artifacts and technological systems that can be often overlooked when using traditional theories of cognition (Rogers, 2004).

Distributed Cognition

- More socially orientated – looks for cognitive processes wherever they may occur
- Does not focus on just the individual but also the interaction between internal processes, the manipulation of objects

Hutchins suggests that:

- It is possible to determine the processes and properties of such cognitive systems more reliably as they can be observed directly
- The processes may be different and thus not possible to reduce to the cognitive properties of an individual.

Distributed Cognition

- Individuals working together on a collaborative task possess different kinds knowledge and so will engage in interactions that will allow them to pool the various resources to accomplish their tasks.

- Individuals in a cognitive system have overlapping and shared access to knowledge that enables them to be aware what others are doing. This enables the coordination of expectations to emerge that turn form the basis of coordinated action (e.g., glancing and nodding at someone signal it is their turn to do something rather than explicitly asking or telling them).

Exercise

- Read

  Stanton, D., Bayon, B., Abnett, C., Cobb, S and O'Malley, C. (2002). The effect of tangible interfaces on children's collaborative behaviour. In Proceedings of Human Factors in Computing Systems (CHI 2002) ACM Press. P.820

Which type of theory would you apply to this work?

Video example

Cognition in the Wild

- Human culture in its natural habitat
- Naturally occurring
- Culturally constituted human activity

Can cognition be understood without understanding the context in which it occurs?

References

Card, S. K., Moran, T. P. and Newell, A. (1983). *The Psychology of Human Computer Interaction*. Hillsdale, NJ:Lawrence Erlbaum Associates.

Hutchins, E. (1995). *Cognition in the Wild.* Mass: MIT Press.

Rogers, Y., Sharp, H., and Preece, J. (2002) *Interaction Design: Beyond Human Computer Interaction.* Wiley.

Rogers, Y. (2004) An updated introduction to Distributed Cognition. To appear in *The Encyclopedia of Language and Linguistics 2nd Edition.*

Slides available online at:

http://staff.bath.ac.uk/pssds/Communication%20Theory.html