“Spatial Models That Help Us Think”
from
*Envisioning Cyberspace: Designing 3-D Electronic Spaces*

by Peter Anders

*Presented by*
Maggie Swan
October 26, 2000
Outline

- Tools
- Mental models
- Externalizing Information
- Experiencing Information
- Mnemonic Structures
- Mental Spaces
- Spatial Matrix
- Space and Culture
- Conclusion
- Discussion Points
Tools

Cognitive + Physical = Perceived reality

Tools for thought or reference may be either cognitive or physical:

• Mental Models
• Objects
Mental Models

Advantages….

• Test hypotheses
• Strategize
• Evaluate likely outcomes
• Future projections
• Constantly updated
Externalizing Information

Our physical environment supports our thought processes…. 

• **Visual Perception**—A physical object is in front of you. Look at it within a narrow field (frame of attention).

• **Visual Thought**—Imagine an object and shift attention to relevant parts (attention window).
Externalizing Information

Problems with visual thought….

• Rough framework/structure dependent on memory
• Memories can be deceiving
• Driven by conceptual knowledge
• Images organized into a propositional structure

So, why externalize thought?

Externalizing thought helps us to think by verifying memories using feedback from the physical environment.
Experiencing Information

Information may be translated from one mode to another:

- Cognitive, internal space
- Perceived, experiential space

Translation Cycle (drawing, writing, modeling, speaking, etc.):

- Express
- Evaluate/critique artifact
- Re-internalize
- Reflect upon
- Resolution

"Spatial Models That Help Us Think"
Mnemonic Structures

What is a mnemonic device?

- Reference framework for detailed observation
- Each spatial image is simultaneously another framework for deeper investigation
- Large-scale view = overall configuration
- Smaller views = increasing detail
- Physical objects may be used as mnemonic devices to influence cognitive artifacts/mental images (referent geometry)
- Historical tradition in ‘memory palaces’…
  http://mappa.mundi.net/cartography/Palace/
Mnemonic Structures

Why use spatial frameworks?

• Spatial reference is a large part of our culture and language
• Enables mode shifting between cognitive and perceptual
• Larger spatial systems may “house” individual memory artifacts (i.e. a mentally constructed museum)
• Visualized objects can trigger recall of past events
Mnemonic Structures

Advantages of mnemonic memory structures:

- Navigating spaces and images lets us *make comparisons* between contents
- We may *draw inferences* from study of structure and space between memory images
- Building mental models allows us to *relate* cognitive and experiential thought
- Concepts may be *translated* into mental images in a *context* then manipulated and inspected
- Can be a useful tool for active, projective thought, beyond just a memory device
Mnemonic Structures

Relation to cyberspace models:

• Cyberspatial memory models are visually verifiable
• Users can keep track of changed locations without losing memories
• Might be instantly reconfigured for specific uses (i.e. a re-organizing museum space using sorting software)
• Multidimensional displays
• Extension of our mental processes
• Continuities between our internal and external worlds
• *Our internal cognition can be shared by others within a social realm
  – Build relationships and enhance society

"Spatial Models That Help Us Think" 11
Mental Spaces

How does space contribute to our identity?

• Spatial modeling allows us to make connections between mental spaces and spaces we perceive
• Gives us a sense of identity and presence in the world
• Allows us to situate objects and ourselves
• Informs objective reasoning
• Create distinctions between perception and cognition, and reality and imagination
• Develops from the day we are born through adulthood
Spatial Matrix

How does a spatial matrix affect someone’s environment?

• The spatial matrix allows us to situate objects in our environment relative to one another.

• Children develop the matrix around age 7-8 and are able to separate their point of view from objects they look at. (e.g. the idea of a building growing bigger upon approach is understood as an illusion)

• As adults, we are able to place ourselves in the matrix as objects, thus creating a new reference system.
Space and Culture

How does the outside world relate to cyberspace?

• Belief in the outside world is critical.
• Mental images may be processed according to our cultural or personal attributes.
• Cognitive spaces are more subject to linguistic/cultural interpretation than perceived space.
• Culture can determine what is ignored or noticed.
• Culture and language influence our perception of our environment and ability to draw inferences.
Conclusion

Important points:

- Perception and cognition intermingle in spatial representations during our daily lives.
- Cyberspace spaces and objects are somewhere in between the worlds of perception and cognition.
- Cyberspace design must incorporate activities that draw from human emotions and understanding.
- Aspects of childhood (magic and rich worlds) should influence our building of cyberspace.
Discussion Points

Issues for further study:

• Perceived and cognitive spaces are not always two distinct issues. How do they overlap? How are they the same?
• How can we create cyberspaces that account for linguistic and cultural differences?
• How can we make accurate judgments about images that we see in cyberspace but have never seen in reality?
• How are our cognitive images affected by perceptions of the physical world? Can we ever make sure that images will not be distorted?