Spatial Knowledge

- Spatial representation
- Mental maps
- Large-scale space
- Small-scale space

Representation

- The cognitive system uses representations?
- Definition of a representation
  - Represented world
  - Representing world
  - Representing relations
  - Process that uses the representations

Represented World

Representing World

Representing Relations

Processes

The Representing World

- How is the representing world like the represented world?
  - Trying to represent space.

- The represented world is a space.
- The representing world is a space.
  - What kinds of processes can be used?

Another representation

- Must a space be used to represent a space?

Directions

1: Start out going South on RESEARCH BLVD.

2: Turn SLIGHT LEFT to take the US-183 SOUTH ramp towards (TX-1-LOOP SOUTH).

3: Merge onto US-183 S.

4: Take the I-35 SOUTH exit towards SAN ANTONIO.

5: Merge onto I-35 S.

6: Turn SLIGHT LEFT onto I-35 N.

7: Turn SLIGHT RIGHT onto 26TH ST E.

8: Turn LEFT onto SPEEDWAY.

- What processes can be used here?

Ease of processing

- The type of representation determines what is easy and hard to do
- Representing space with space
  - Easy to measure distance
  - Easy to determine relative direction
- Representing space with sentences (propositions)
  - Easy to create directions
  - Easy to communicate directions
  - Easy to refer to locations

Summary of Representation

- Represented world
- Representing world
- Relations between them
- Processes that act on representation
- Type of representation determines what is easy or hard to do
- These points are true for space, but also for cognitive processing in general.

Cognitive maps

- Maps of small-scale (navigable space)
  - Cognitive geography
- Maps of large-scale space
  - What is our sense of the locations of items in the world?

Large-scale space

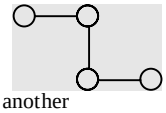
- Which is further north:
  - Austin, TX or Chicago, IL?
  - Portland, OR or Portland, ME?

- Suggests a hierarchical representation of locations

Hierarchical representation

- Relative locations of small regions is determined with respect to larger regions.
- USA is south of Canada
  - Maine is just south of Canada
  - Oregon is well south of Canada
    - Oregon must be south of Maine
    - Cities in Oregon must be south of cities in Maine

Small-scale space



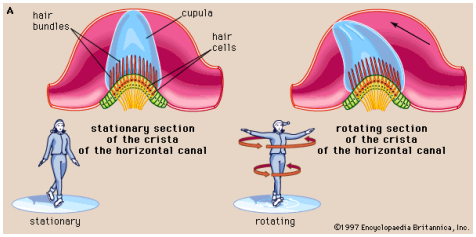
- Types of representations
- Route maps
  - Know how to get from one point to another
  - May not know relative locations of points
- Survey map
  - Overhead perspective
  - Relative locations
  - Easy to plan new routes

How are maps learned?

- From descriptions
  - Taylor & Tversky: People learned maps from survey and route descriptions
- From navigation
  - People can assess distance and direction traveled
  - Integration of information
    - Visual information
    - Vestibular information
  - Maps formed from video games are less accurate than maps in which people really move
    - Rotation is particularly important

Vestibular system

- Assists in balance
- Helps determine degrees of rotation



Summary

- Representation
- Spatial representation
- Large-scale space
  - Hierarchical representations
- Small-scale space
  - Route maps
  - Survey maps