

How People May Identify Objects

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Background

- Suggests one way in which people may identify objects that they sense
- Useful for understanding problems in HCI and collaboration
- Developed from psychological theory and experimental observation
- Likely applies to all forms of sensory stimuli although most of my thinking has been around the visual, kinesthetic/haptic, and auditory senses

Step 1: Perceptual Segmentation

Based on perceptual properties of the object
Gestalt grouping laws apply

- Proximity
- Similarity
- Common fate
- Continuation

Step 2: Feature Detection

- Features are the sub items used to compose objects
- Perceptual segmentation produces features
- Basic features are simple patterns of spatial relationships or changes in frequency

Concepts And Features

- Concepts have a list of features that are associated with that concept
- Concepts are stored in generic memory
- Features are stored in a modality neutral manner
- Some concepts have features that describe patterns in the spatial relationship of pixels or changes in frequency
- Feature lists are developed through experience and learning

Step 3: Semantic Association

- The feature lists associated with concepts are searched to find a match for the feature being identified
- The process starts with small features, e.g. lines, and gradually groups features together to form larger features, e.g. a square
- Increasingly larger features are used until the features being compared to the feature lists associated with concepts describe the whole object
- The number of features that can be compared at one time is limited by the capacity of working memory
- The process can lead to ambiguous results

Context And Practice

- Contexts = Concepts
- Practice creates contexts
- Concepts can reduce ambiguity through priming
- Priming increases the likelihood of a specific match being chosen over another

Implications: UI Design

- User interfaces are about communication
- Non-visual and non-spoken forms of communication use objects to transmit semantic content
- Misidentification of objects leads to miscommunication
- Miscommunication leads to difficult or impossible to use software
- To get communication right the features of an object need to match the feature list that the user has for the object being communicated

Implications: Collaboration

- People use the names of concepts to communicate rather than their feature lists
- Associations between concept names and their feature lists can differ between individuals
- Individuals can have slightly different feature lists for the same concept
- People may not have a feature list for the concept at all
- This can lead to encoding and decoding errors when people communicate, and this can lead to people performing the wrong action on the wrong object

Implications: Performance

- Object identification affects the presentation and network transmission of sensory stimuli
- Users may not use some features to identify some objects
- Unused features are effectively redundant
- Filtering out redundant features can lead to reductions in rendering and network operations and therefore performance gains