

Text: Hershenson, M. (1999) Visual Space Perception: A Primer, Cambridge, MA: The MIT Press.

Syllabus

The Problem of Visual Space Perception (Chapter 1)

- A. The physical world and the perceptual world
- B. Geometrical relationships: Physical and Perceptual space, Relationships among spaces
- C. Distal-proximal relationships: Projective geometry: geometrical optics, Proximal geometry: geometry of perspective
- D. The problem of visual space perception

Part I: Binocular Perception

Spatial Localization: Visual Directions (Chapter 2)

- A. Monocular localization of directions: Monocular visual field, Binocular visual field, Objective directions: Visual lines, Subjective directions: Visual directions
- B. Binocular localization: Wells's experiments, Cyclopean eye, Law of Identical Visual Directions, Corresponding points, Fusion, Horopter and Vieth-Muller circle, Absolute visual directions

Stereopsis: Fusion and Horopters (Chapter 3)

- A. Longitudinal horopter and retinal disparity
- B. Fusion and double images
- C. Panum's fusional areas
- D. Different horopters: Vertical and torsional disparity, cyclofusion, Longitudinal horopter, point horopter, and fusion horopter, Distance horopters: Equidistance and frontoparallel plane measurements, Hering-Hillebrand deviation

Stereopsis: Traditional Stereograms (Chapter 4)

- A. Stimulus components of stereoscopic half-images: Contour or edge disparity, Differential perspective, Binocular interposition, Gradient of binocular disparity
- B. Perceptual Outcomes from Traditional Stereograms: Stereoscopic depth constancy
- C. Dichoptic stimulation: Binocular rivalry, suppression, and luster

Cyclopean Perception (Chapter 5)

- A. Random-dot stereograms, Wallpaper phenomenon, autostereogram
- B. Stereoscopic contours: Stereo contours in homogeneous space
- C. Two mechanisms for stereoscopic depth

First Quiz somewhere around here

Part II: Monocular Perception

Stimulus Inadequacy: Fundamental Problem of Monocular Perception (Chapter 6)

- A. Stimulus Inadequacy: Visual angle, Equivalent configurations
- B. Invariance, Noninvariance, and Constancy
- C. Three Kinds of Theories: Empiricist (Helmholtzian) view, Psychophysical (Gibsonian) view, Automatic perceptual system activity
- D. Chair Demonstration

Pictorial Cues, Oculomotor Adjustments, Automatic Organizing Processes, and Observer Tendencies (Chapter 7)

- A. Pictorial Cues: Linear perspective, outline shape, Relative size, Texture gradient, Height in picture plane, Occlusion, overlay, interposition, or superposition, Illumination and reflectance edges, Shading and shadow, Aerial perspective
- B. Information from Oculomotor Adjustments: Accommodation and convergence, Gradient of focus, Eye elevation
- C. Automatic Organizing Processes: Figure-ground organization, Gestalt organizational laws, Apparent motion, Induced motion, Subjective contours
- D. Observer Tendencies

Empiricist View: Perceived Size and Shape (Chapter 8)

- A. Perceived Size of Afterimages: Emmert's law of afterimages, Registered distance
- B. Hypotheses of Invariance: Size-distance invariance hypothesis, Shape-slant invariance hypothesis
- C. Perceived Size of Objects: Measuring perceived size: Brunswick and Thouless ratios, Size constancy, Familiar size, Perceived visual angle, Perceived distance in a scene
- D. Perceived Shape of Objects: Shape constancy, Familiar shape, Distorted room
- E. Noninvariance Perceptions: S-motion demonstration, Moon illusion

Gibson's Psychophysics--Basic Concepts (Chapter 9)

- A. Psychophysical Correspondence
- B. Texture and Optical Texture Gradient: Texture, Optical texture
- C. The Ground and Perceptual Constancy: Distance and the layout of space, Perceived size and distance, Size constancy
- D. Intersection of Surfaces: Corner, Edge

Second Quiz somewhere around here

Lateral or Parallax Motion (Chapter 10)

- A. Motion Parallax
- B. Optic Flow, Velocity Gradients: Motion perspective, Dynamic occlusion
- C. Continuous Perspective Transformations

Motion in Depth (Chapter 11)

- A. The Stimulus: Size-change, Expansion/contraction
- B. Apparent Object Motions: Kinetic Invariance Hypothesis, KIH and size constancy, Rigidity and the implicit scales of space
- C. Movement of Perceiver: Heading and focus of expansion, Time-to-contact and time-to-passage
- D. Information for Controlling Activity: Visual kinesthesia, Balance and stance

Perceived Object Motions (Chapter 12)

- A. Rotating Stimuli: Rotating trapezoidal window, Kinetic depth effect
Stereokinetic effect
- C. Johansson's Vector Analysis: Unity principle, Rigidity principle, Common and relative vectors, Nonrigid perceptions: Bending, folding, and stretching
- D. Computation or Artificial Intelligence Approach: Patterns of deformation: Differential invariants of optic flow

Detecting Motion (Chapter 13)

- A. Motion in the Frontal Plane: Linear motion detector, Occluded motion: The aperture problem, Occluded motion: Movement-dependent subjective contours
- B. Size-Change Detector
- C. Expansion/Contraction or Motion-in-Depth Detector
- D. Deformation Analysis and Detectors
- E. Psychophysical Evidence for Detectors: Linear vs. expansion/contraction, Size-change vs. expansion/contraction, Independence of expansion/contraction detector, Linear vs. rotation, Direction of stereomotion in depth and the VL/VR ratio

Concluding Thoughts (Chapter 14)

- A. Distal vs. proximal stimulus
- B. Emergent quality of perception
- C. Global aspect of perception
- D. Automatic mechanisms and cognitive factor

Final Quiz during Last Class

A quiz consists of two short essay questions worth ten points each. Lowest score is dropped at end of semester.

"If you are a student with a documented disability at Brandeis University and if you wish to request a reasonable accommodation for this class, please see me immediately. Please keep in mind that reasonable accommodations are not provided retroactively."