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MUEN D156, 09:30–10:45 TR

Study Guide for the first examination (Tuesday, 3 March 2009). Be able to answer the following questions and be familiar with the concepts involved in the answers.

1. Drawing on your experience in Lab 1, draw a psychometric function illustrating discriminating dimmer and brighter lights from a standard light. Be sure to label the axes. Indicate on the graph how the discrimination "threshold" (JND) is defined? How does the theoretical concept of a noisy representation explain the psychometric function?

2. Define hit rate and false alarm rate in a detection experiment. Describe the receiver operating characteristic (ROC) predicted by the High Threshold Model and by the Signal Detection Theory of detection. How do you compute sensitivity (d') from the hit rate and the false alarm rate for the equal-variance dual-Gaussian signal detection model? (Memorize the formula).

3. Draw a diagram of the eye including the following structures: cornea, lens, pupil, iris, sclera, aqueous humor, vitreous humor, choroid, retina, fovea, optic disk and optic nerve.

4. Define the term "receptive field." Describe the receptive fields of retinal ganglion cells and compare and contrast them with simple receptive fields in the primary visual cortex.

5. Offer an explanation of the Hermann Grid phenomenon based on ganglion cell receptive field characteristics. Can you think of a reason why this explanation can not be correct?

6. What happens to contrast sensitivity and visual acuity as the level of illumination goes down? Why is it hard to read at night without artificial illumination?

7. Discuss the evidence that our color vision is based on three different types of cone receptors. What is the evidence supporting the existence of opponent-process color mechanisms that generate color experience?

8. What are the major types of color defective vision and what are their causes? What kind of color experiences might a deuteranope have (think in terms of chromatic opponent-processes)?

9. Make a color circle on a graph using the r/g chromatic opponent-process output as the horizontal axis and the y/b chromatic opponent process output as the vertical axis. Assume that a positive output means red and yellow experiences respectively. Label the colors that are generated by various combinations of opponent-process outputs. For example, what color would you experience if the r/g process was 0 and the y/b process was -10?

10. Describe the "size/distance" (size constancy) hypothesis of certain visual illusions. Pick two such illusions and explain them in terms of this hypothesis.

11. How can you enhance the impression of depth in a photograph or representational painting while viewing it? Why?

12. What perceptual experience do you have if you paralyze the eye muscles and then attempt to move them to the left? Offer an explanation in terms of Erich von Holst's Reafference Principle.