CSPB 3702 - Reckwerdt - Cognitive Science

Started on	Sunday, 8 October 2023, 5:12 PM
State	Finished
Completed on	Sunday, 8 October 2023, 5:32 PM
Time taken	20 mins 1 sec
Grade	Not yet graded

Question **1**

Complete

Mark 1.00 out of 1.00

The human eye, to a first approximation, works like which of the following?

Select one:

- a. A sketch artist.
- b. A recording device.
- c. A notebook.
- d. A pinhole camera.

Your answer is correct.

Question **2**

Complete

Mark 1.00 out of 1.00

The “piano-in-the-mirror” example illustrates which of the following ideas?

Select one:

- a. Optical illusions reveal the strengths of the human vision system.
- b. The eye’s retina is unreliable in its operation.
- c. Mirrors pose a particular challenge to the human vision system.
- d. It is impossible in principle to recover a unique three-dimensional structure from a two-dimensional projection.

Your answer is correct.

Question **3**

Complete

Mark 1.00 out of 1.00

As a very first step in treating vision as a computational problem, we can think of a retinal image as:

Select one:

- a. A line sketch of the object being attend to.
- b. A photograph.
- c. An array of pixels, where each pixel denotes a light intensity value.
- d. A small copy of the object being attended to.

Your answer is correct.

Question **4**

Complete

Mark 1.00 out of 1.00

Which of these does not represent a potential complicating factor for our “pixel-array” portrait of the retina?

Select one:

- a. Binocular vision can provide useful information for interpreting an image.
- b. Color vision can provide useful information for interpreting an image.
- c. There are many wavelengths that the eye is not responsive to.
- d. The fovea has higher resolution than the periphery of the retina, so our “evenly distributed array” portrait is inaccurate.

Your answer is correct.

Question **5**

Complete

Mark 1.00 out of 1.00

Despite the simplicity of our first model of vision – interpreting black and white photos – it is not entirely unfair because:

Select one:

- a. It is, after all, a task that we as human beings are capable of.
- b. Many animals have limited color vision.
- c. Most scenes in real life do not involve information such as motion.
- d. Binocular vision is generally of little use.

Your answer is correct.

Question **6**

Complete

Mark 1.00 out of 1.00

Optical illusions are useful tools for studying the computational view of vision because:

Select one:

- a. They show that our color vision is faulty.
- b. They are entertaining illustrations of how odd the visual world is.
- c. They highlight “gaps” in our vision algorithms – situations where the algorithms give the wrong answers.
- d. They show that we are not as good at “seeing” as we think.

Your answer is correct.

Question **7**

Complete

Mark 1.00 out of 1.00

When considering an image as a 2D array of pixels, what denotes an edge?

Select one:

- a. A line of pixels with similar intensity.
- b. A line of pixels with adjacent pixels with very different intensity levels (high and low values).
- c. A high average intensity level among surrounding pixels.
- d. A very high intensity pixel.

Your answer is correct.

Question **8**

Complete

Mark 1.00 out of 1.00

If our convolution function is centered on a low-intensity (dark) pixel along a dark-to-light transition, what kind of value will the function output?

Select one:

- a. A negative number.
- b. 0
- c. We don't have enough information to determine the answer.
- d. A positive number.

Your answer is correct.

Question **9**

Complete

Mark 1.00 out of 1.00

Which statement best represents the relationship between human vision and the convolution function approach to edge detection?

Select one:

- a. The convolution approach is not a good representation of human vision.
- b. Retinal ganglion cells do not use a convolution approach, instead, they take an average of inputs from local photoreceptors then poll nearby ganglion cells to look for differences.
- c. The retinal ganglion cells perform a similar function to the convolution function, looking for differences in signal from an area of photoreceptor cells.
- d. Photoreceptors are sensitive to transitions between high and low intensity of light, like a convolution function, rather than just intensity, like a pixel.

Your answer is correct.

Question **10**

Complete

Mark 1.00 out of 1.00

The crucial information for "parsing" a shape into constituent geons is:

Select one:

- a. Knowing beforehand how many geons there are in the shape.
- b. Knowing beforehand how big the geons in the shape are relative to one another.
- c. Distinguishing the colors of the different geons.
- d. Finding the boundaries or junctions where geons meet.

Your answer is correct.

Question **11**

Complete

Mark 1.00 out of 1.00

Besides binocular vision, which of the following is not a cue to the distance between you and objects that you are looking at?

Select one:

- a. In hazy or smoky air, closer objects appear clearer than do distant objects.
- b. You have a rough sense of the size of an object, so if two objects of very different sizes take up the same retinal space, you have reason to believe the (apparently) smaller object is further.
- c. When one object (A) moves between you and another object (B), A occludes B from your vision; so A must be closer than B.
- d. Living objects are generally closer than are inanimate objects, so if you see an animal or plant you have reason to believe it's close.

Your answer is correct.

Question **12**

Complete

Mark 1.00 out of 1.00

The sum of the two distances between the projection of a point on the left and right retinas and the centers of those respective retinas is called:

Select one:

- a. The reflectance of the point.
- b. The projection of the point.
- c. The distance of the point.
- d. The disparity of the point.

Your answer is correct.

Question **13**

Complete

Mark 1.00 out of 1.00

To a good first approximation, our first conclusion about the relation between the distance of a point from us and its disparity is:

Select one:

- a. Disparity is proportional to distance.
- b. The square of the disparity is proportional to the distance.
- c. Disparity is proportional to the square of the distance.
- d. Disparity is inversely proportional to distance.

Your answer is correct.

Question **14**

Complete

Mark 1.00 out of 1.00

One limitation of the disparity-distance relation formula is that:

Select one:

- a. It isn't of much use as disparity gets very small.
- b. It works better for long than short distances.
- c. It involves quantities that are effectively constant for one person over time.
- d. It is too complicated for the human nervous system to computer.

Your answer is correct.

Question **15**

Complete

Mark 1.00 out of 1.00

One limitation of our initial treatment of the disparity-distance formula is that:

Select one:

- a. It only works at specific, "focal" distances.
- b. It only works for artificial situations like the "View-Master" or other stereoscopic toys.
- c. It doesn't take into account the need for identifying individual points as seen from the left and right eye.
- d. It doesn't work for biological eyes.

Your answer is correct.

Question **16**

Complete

Mark 1.00 out of 1.00

The primary visual cue that we use to identify classes of common objects (e.g., cup, bucket, suitcase) is:

Select one:

- a. Texture.
- b. Reflectance.
- c. Shape.
- d. Color.

Your answer is correct.

Question **17**

Complete

Mark 1.00 out of 1.00

One reason that geons are plausible candidates as “shape primitives” is that:

Select one:

- a. They retain their qualitative properties regardless of small changes in viewing angle or lighting.
- b. They “fit together” like Lego pieces.
- c. They are good for evolutionarily important tasks like facial recognition.
- d. There are very few (< 5) of them.

Your answer is correct.

Question **18**

Complete

Mark 1.00 out of 1.00

There are vast numbers of potential 3- or 4- geon shapes. Why does this work to our benefit in object recognition?

Select one:

- a. We have to mentally store a “visual encyclopedia” of all potential shapes, and choose from those shapes when we identify an object.
- b. We encounter many trillions of visual object categories, so we need a vast “geon space” to accommodate them.
- c. Everyone encounters his or her own highly idiosyncratic set of object categories, so collectively we need a vast “geon space” to accommodate the union of all of them.
- d. We are unlikely to confuse shapes because we encounter such a small percentage of the potential “geon space” in our own experience.

Your answer is correct.

Question **19**

Complete

Mark 1.00 out of 1.00

What can we say about geons and facial recognition?

Select one:

- a. Geons are helpful for distinguishing male from female faces, but not much more than that.
- b. Geons can identify that we are looking at some human face, but they aren't especially helpful for individual face recognition.
- c. Geons are adequate to the task of individual face recognition.
- d. Geons are helpful for some features (e.g., noses) but not others (e.g., mouths).

Your answer is correct.

Question **20**

Complete

Mark 1.00 out of 1.00

Prosopagnosia, as a cognitive condition, provides evidence that:

Select one:

- a. We can recognize our own face even if we can't recognize those of others.
- b. People are uniformly good at recognizing faces.
- c. Facial recognition is mediated by geons.
- d. Facial recognition is associated with certain localized brain regions.

Your answer is correct.

Question **21**

Complete

Mark 3.00 out of 3.00

In lecture, we derived the formula for determining the distance of a point (from one's eyes) through binocular vision:

$D = fb/(\alpha + \beta)$

(The meaning of these symbols are discussed in lecture 3.3.) The denominator here is called the disparity.

Start with an object/point that is very far away (say the distance is 1,000 meters).

Is the disparity large or small?

- a. The disparity is -98.08
- b. The disparity is 36.87
- c. We cannot say anything about the disparity.
- d. small
- e. Like Goldilocks, the disparity is just right.
- f. large

Your answer is correct.

Question **22**

Complete

Mark 3.00 out of 3.00

Start with an object/point that is very far away (say the distance is 1,000 meters). Now if the object moves a relatively small distance (say 1 meter), what kind of change will this make to the disparity?

- a. Prismatic shapes will appear.
- b. no change.
- c. small
- d. 37.5
- e. -98.08
- f. large

Your answer is correct.

Question **23**

Complete

Marked out of 1.00

Since the retina is not, in fact, a smooth continuous surface, but is rather compose of neurons (which have a finite size), it has a limited resolution. Explain how this fact affects out ability to determine the distance of points that are very far from us (and thus have a tiny disparity).

As objects get farther away from us, the disparity of that object gets smaller. If this disparity gets small enough, then it becomes hard for us to perceive depth perception at distances this far away. This becomes extremely challenging because our retinas, as said in the problem statement, have limited resolution. Because of this we are basically limited to how well our retinas work at these distances.

Question **24**

Complete

Mark 3.00 out of 3.00

Start with an object/point that is very close (say distance is 5 centimeters). Select the true statements.

Select one or more:

- [ ] a.
the disparity is small.
- [x] b.
the disparity is large.
- [ ] c.
when we have an object that close to our face, the short distance makes the disparity miniscule.
- [x] d.
we cannot make much use of binocular vision when the disparity is large compared to the overall size of the retina.

Your answer is correct.

Question **25**

Complete

Mark 3.00 out of 3.00

Suppose, as a rough estimate, we say there are 20 distinct geons used for object recognition; and each neon can come in 5 classifiable qualitative sizes (tiny, small, moderate, large, huge); and a pair of geons can be placed in 10 distinct qualitative relations (geon A to upper left of geon B; geon A to the left of geon B; and so forth).

How many distinct teo-geon objects do we have in the space described above?

- a. 20,000
- b. 200,000
- c. 100,000
- d. 1,000

Your answer is correct.

Question **26**

Complete

Mark 3.00 out of 3.00

Now, suppose we add a third geon, geon C. Again, each geon comes in 20 varieties and 5 sizes. We'll start by creating a two-geon pair of A and B just like in the part above; then, we decide which of A or B the third geon (C) will be adjacent to, and then we place geon C beside either A or B in one of the 10 allowed relations. How many different three-geon objects do we have in this space?

- a. 200 milllion
- b. 300,000
- c. 300 million
- d. 20 million

Your answer is correct.

Question **27**

Complete

Mark 3.00 out of 3.00

Are these numbers (as an estimate of the "dictionary size" of potential two-geon and three-geon objects significantly bigger, smaller, or comparable to the actual size of our object vocabulary in English as discussed in lecture?

- (•) a. Vastly bigger
- ( ) b. Comparable
- ( ) c. Vastly smaller

Your answer is correct.