Lab 1: The Human Visual System **Recheck**

Laboratory Report

Fundamentals of Imaging Science

Professor Vodacek

Alex Iacob

Summary

For this lab, the focus was testing our visual system and how our eyes function. To try this, a total of 3 experiments were done:

1. A test in the natural human blind spot.
2. A test of "lens accommodation" and how the human eye focuses on objects.
3. The human eye's adaptation to the dark and light.

Methods

Experiment 1: The Blind Spot

To begin, an X was drawn on one edge of the paper. The opposite eye stared directly at the marked X while the other remained closed (Left eye for the right side of the paper, right eye or left side of the paper). After this, an object was placed over the X, more specifically a finger, and was slowly moved to the side while the eye remained focused on the X, and the face is approximately half of a meter away from the paper. Once the object is out of the eye's peripheral vision, the distance is marked. The same process is repeated for the other eye. The resulting space is how far the marked distance is from the X.

Experiment 2: Lens Accommodation

To begin, an item was placed on the wall approximately 3 meters away from the subject. The arm was immediately held parallel to the floor while holding a pencil pointed at the item. One eye was closed, and the other was focused on the pencil. While still being focused on the pencil, the wall was slowly approached until the item on the wall was in focus. The resulting distance is the distance from the tip of the pencil to the wall. For the second part of this

experiment, the pencil was held at arm's length away from the face, then slowly brought forward until the pencil was out of focus. The recorded distance for this is called the 'near point,' and it is the distance from the face to the pencil when it comes out of focus.

Experiment 3: Dark and Light Adaptation

To begin, the subject entered a dark environment from a brightly lit environment with a gray-scaled image. The visibility was recorded from 10 seconds, 20 seconds, 1 minute, and 3 minutes. Afterward, the opposite occurred; the subject entered a brightly lit environment from a previously dark environment. The visibility was recorded immediately, 5 seconds, 10 seconds, and 30 seconds. For the last part of this experiment, one eye was covered while in a brightly lit environment for approximately 3 minutes. After this, the subject walked into a dark environment while opening both eyes. Any differences were reported.

Results

Experiment 1:

- Left eye: ~17cm
- Right eye: ~19cm

Experiment 2:

- Lens accommodation: ~130cm from the tip of the pencil to the wall
- Near point: ~20cm

Experiment 3:

- Bright to dark
    - 10s: Can differentiate from 1 - 9

        - 20s: Can differentiate from 1 - 11
        - 1min: Can differentiate from 1 - 12
        - 3min: Can differentiate from 1 - 12
- Dark to bright
    - Immediately: Can differentiate from 7- 12
    - 5s: Can differentiate from 1 - 12
    - 10s: Can differentiate from 1 - 12
    - 30s: Can differentiate from 1 - 12
- Closed eyes
    - The main difference in closing only one eye is that it took my closed eye approximately 5 seconds to get accustomed to the bright environment. In contrast, my open eye could easily differentiate everything.

Discussion

1.1) The eyes are bilaterally symmetric with respect to the center of the head.

1.2) Both eyes are not symmetric with respect to the center of each eye.

1.3) You are generally not aware of blind spots due to a lack of receptors and nerves in that specific area. This is also because the opposite eye fills the missing information.

1.4) The blindspot is 1.5 degrees below horizontal, 7.5 degrees high, and 5.5 degrees wide. Source: http://everyspec.com/MIL-STD/MIL-STD-1400-1499/MIL-STD-1472F_208/

1.5) The blind spot's physical location in the retina is in the optic disk and closer to the nasal portion.

2.1) The eyes bring objects of different ranges simultaneously by changing the eye's lens shape. The limit to the range is ~6 meters ahead of the eye.

2.2) My near point is ~20cm ahead of me.

3.1) The eye uses cones in the dark because cones are more sensitive than rods in the dark.

3.2) The adaptation is independent of the other because each eye has its retinal sensitivity. The open eye could instantly differentiate the gradient while it took the closed eye a few seconds to match.