Lab 2 Log Book

Part 1 - Seeing Colours and Shapes

Task 1 - Find your blind spot

At a specific distance, the non-focused symbol **completely disappears** from view.

Task 2 - Ishihara Colour Test

`12， 74， 6， 16， 2， 29， 7， 45， 5， 97， 8， 43， 3`

Task 3 - Reverse colour

After staring at the American flag (yellow, black, and green) of the opposite colors in the picture for a period of time, the photoreceptor cells on the retina will experience adaptive fatigue due to long-term stimulation. Therefore, when the gaze is suddenly shifted to a white background, the previously suppressed color channels are activated, resulting in the perception of "inverted colors" (i.e., the normal colors of the American flag).

Task 4 - Troxler's Fading

After looking at the black cross in the middle for a while, suddenly there appeared moving blue-green spots, and as the spots rotated, the pale purple spots gradually disappeared, leaving only one blue-green spot rotating. Moreover, after taking the eyes off the image, overlapping spots of the two colors can be seen.

The second test, when I commented out the black dot in the middle, the surrounding light blue halo gradually disappeared.

Task 5 - Brain sees what it expects

The blue table looks longer and narrower, while the red table looks shorter and wider. However, after measuring, I found that the tops of the two tables are actually the same size.

The illusion occurs because our brain interprets the perspective cues in the image, making us perceive the tables as having different dimensions.

Task 6 - The Grid Illusion

The intensity of a point in the visual system is not just the result of a single receptor, but the result of a group of receptors that respond to stimuli in what is called the receptor field. Retinal ganglion cells aggregate the inputs of several photoreceptors in a retinal area; the physical spatial area of the photoreceptor response is the "receptive field" of the ganglion cell. At the center of the so-called central receptor field, a single photoreceptor triggers the ganglion cell when it detects an increase in brightness; photoreceptors in the surrounding area inhibit the ganglion cell. Therefore, due to the fact that the intensity area at the intersection is more than the intensity area surrounded by the point in the middle of the line, and due to the increased inhibition, the intersection appears darker.

Task 7 - Cafe Wall Illusion

Visually, they are not parallel.

The illusion is mainly attributed to the irradiation illusion (the white area is significantly larger than the black area), and the image disappears when black and white are replaced by different colors of the same brightness. However, even when all optical and retinal components are excluded, the components of the illusion still exist. The contrast polarity seems to be the decisive factor in determining the tilt direction.

Task 9 - the Incomplete Triangles

I seem to see a white downward-pointing triangle, but it actually does not exist.

Perception is not always equal to reality—sometimes, our visual system can mislead us, seeing things that do not exist. Vision is not simply a process of "recording" external information, but rather an active interpretation and construction by the brain. This explains why we can see "ghostly" white triangles, even though they are not actually present in the image.

Part 2 - Exploring Colours in Matlab

Task 10 - Convert RGB image to Grayscale

```
RGB = imread('peppers.png');
imshow(RGB)
```

The formula to perform this mapping is: `I = 0.299 * R + 0.587 * G + 0.114 * B`

```
I = rgb2gray(RGB);
figure          % start a new figure window
imshow(I)
```

```
[R,G,B] = imsplit(RGB);
montage({R, G, B},'Size',[1 3])
```

Task 11 - Splitting an RGB image into separate channels

```
[R,G,B] = imsplit(RGB);
montage({R, G, B},'Size',[1 3])
```

RGB: Dimensions: `(M × N × 3)` **Data Type:** `uint8` (range from 0 - 255)

I: **Dimensions:** `(M × N)` **Data Type:** `uint8`

Task 12 - Map RGB image to HSV space and into separate channels

```
RGB = imread('peppers.png');
HSV = rgb2hsv(RGB);
[H, S, V] = imsplit(HSV);
montage({H,S,V}, 'Size', [1 3])
```

Task 13 - Map RGB image to XYZ space

```
RGB = imread('peppers.png');
XYZ = rgb2xyz(RGB);
montage({XYZ(:,:,1), XYZ(:,:,2), XYZ(:,:,3)}, 'Size', [1 3]);
```

X Channel (XYZ(:,:,1)): Represents a weighted sum of RGB components.

Y Channel (XYZ(:,:,2)): Represents luminance (brightness perception).

Z Channel (XYZ(:,:,3)): Represents blue-yellow opponent colors.