ECE/OPTI 532, Fall 2020

Homework 1 Assignment

Due before Thu. Sept. 3 lecture

Ungraded. Nothing to submit.

1. The human visual system (HVS) is an amazing example of a system that can process visual inputs to achieve object recognition and image understanding in real time. Thus, one approach to achieving computer vision is the develop algorithms that mimic the way the HVS operates. Watch the video at https://www.youtube.com/watch?v=hR2iE-zmu-c (2 min.) to see an example of how effective it can sometime be to mimic the way humans operate.

2. Watch the video at https://www.youtube.com/watch?v=jKUVpBJalNQ (13 min.; no audio; German captioning) to learn how the human brain can reprogram itself to successfully process a new mode of visual inputs. You may want to increase the playback speed since some of the later portions get somewhat repetitive. The video notes shown on the next page may be a helpful reference.

3. Similarly, for human vision, if the lens in one eye is corrected for near vision while the lens in the other eye is corrected for far vision, the human brain can reprogram itself to process the new visual inputs. But there may be side-effects. See the short article at https://blogs.scientificamerican.com/illusion-chasers/the-illusion-of-safety (~3 pages).

4. If you haven't used MATLAB recently, then you should review some of the introductory tutorial material at https://www.mathworks.com/help/matlab/getting-started-with-matlab.html.

5. If you're not already familiar with using MATLAB for image manipulation, review the very brief tutorial regarding image import/export at https://www.mathworks.com/help/images/image-import-and-export.html.

The Upside-Down Glasses and Seeing Upright

by Erismann and Kohler, University of Innsbruck, Austria, 1950.

https://www.youtube.com/watch?v=jKUVpBJalNQ

Time	**Notes**
0:38-1:50	trying the upside-down glasses
1:50-3:05	1st stage, 1st-3rd day: extreme awkwardness while walking
3:30-4:00	stick fighting, pouring into cup, helium balloon
4:30-5:35	2nd stage, 3rd-5th day: improved walking and stick fighting
5:38	factors that help adaptation
5:46-6:20	a. feel immediate relationship with own body
6:23-6:52	b. direct touching with stick
6:52-7:20	ground and people within reach of the long stick straighten up
7:20-7:52	c. the righting effect of severe sensations (e.g., plumb bob)
7:52-8:15	d. the usual upright picture (e.g., candle flame)
8:15-8:45	two heads in opposite positions (normal view)
8:45-9:10	and now as he sees it; perception flips at the white arrow
9:10	both heads now appear upright but still opposite – paradoxical
	impression that cannot be depicted in the picture
9:30-10:20	stage 3, 6th-10th day: safe behavior, riding bicycle
10:20-11:00	world now remains upright despite tilting head
11:00-11:14	more bike riding
11:14-11:33	painting
11:33-12:06	removal of glasses
12:06-end	after just a few minutes, he sees upright again!