CS294-164 Report - Week 5

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1 High-Acuity Vision from Retinal Image Motion

1.1 Main Idea

The paper addresses the question, "Does fixational drift motion in the retina help in distinguishing high acuity targets" They show that this is indeed the case and the neurons in the visual cortex computer higher quality representations due to the simultaneous motion and object shape estimation. Their finding also suggest that the visual system uses techniques similar to camera motion for super resolution.

Visual features defining an object span just a few photoreceptors, but the motion of the eye helps spread these features over many photoreceptors within the temporal integration window of downstream cortical neurons.

1.2 New idea based on readings

1. The retinal image drift could confer a benefit since it can potentially improve visual acuity by averaging over inhomogeneities in the retinal sampling lattice. Can a similar behaviour be enforced in cameras to generate high resolution images? If so, what techniques have been used so far?
2. How do these eye movements help when inferring motion, or tracking a fast moving object?
3. Analysing eye movement patterns to see what they most closely relate to, lighting conditions, object shapes, etc

2 Statistics of cone responses to natural images: implications for visual coding

2.1 Main Idea

This work correlates the cone responses to natural images. They converted hyperspectral images to human quantal catches to see if there's any redundancy

present within the retinal photoreceptor array. The data showed that an orthogonal decorrelation robustly produces three principal axes corresponding to radiance, blue-yellow and red-green. A further examination revealed that these three cone space directions are spatially uncorrelated with one another in natural scenes.

2.2 New idea based on readings

Can we automatically assess a good coding technique given an image? Given the type of the image, automatically find the best coding scheme.