PROBLEM ASSIGNMENT 0

Due: March 5, 2014 (12:30pm)

The purpose of this first assignment is to make you understand the image formation process and to familiarize you with Matlab environment you will use in the following exercises. There are a total of three problems.

Problem 1: Pinhole Projector

Build your own pinhole projector from household items. For that purpose, you can follow the steps explained in [1] but you may also choose your own items instead of the ones in that tutorial. In your report, show your pinhole projector and some images obtained with it. Make some observation and report them in your reports. Which factors (light, aperture size, focal length, etc.) affect the image quality and how?

Figure 1: Making a pinhole projector (taken from [1]).

Problem 2: Accidental anti-pinhole images

In [2], Torralba and Freeman have introduced accidental pinhole and anti-pinhole (pin-speck) cameras, which are all around us everywhere. In this part, you will design an accidental anti-pinhole camera, and take pictures. Take a photo in an indoor environment (image A) and then take another photo of the same scene (image B) after putting a small occluder, e.g. just stand in front of the window. The corresponding accidental anti-pinhole image is formed by subtracting B from A and flipping the difference image vertically. See [2] for the details.

Figure 2: An accidental pinhole camera (taken from [2]).
Problem 3: Big Spanish Castle Illusion

Big Spanish Castle is an interesting optical illusion introduced by John Sadowski\cite{sadowski} where you see a black and white picture in color until you move your eyes. In this part, generate this illusion for at least 3 different images by carrying out the following steps:

1. Convert RGB values of input image to HSV color space. You can use `rgb2hsv` and `hsv2rgb` functions in Matlab.
2. Desaturate the image in HSV color space and convert back to RGB values. This will be your uncolored image.
3. Invert input image and draw a dot in the middle. This will be your illusion image.
4. Put your illusion image and uncolored image to your html report and make them rollover. You can use Javascript, CSS, etc.

Comment your observations and try to explain this phenomena. What happens in our eyes exactly?

![Desaturated and black-and-white images](https://example.com/desaturated_image)

Figure 3: Big Spanish Castle Illusion. The desaturated and black-and-white images used by J. Sadowski in his famous illusion (taken from \cite{sadowski}).

Grading

The assignment will be graded out of 100 points:

- 0 (no submission), 20 (an attempt at a solution), 40 (a partially correct solution), 60 (a mostly correct solution), 80 (a correct solution), 100 (a particularly creative or insightful solution)

Note: Preparing good report is important as well as your solutions!

What to Hand In

You are required to submit all your report along with a short webpage in HTML. For that purpose, prepare a folder containing
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- HTML/README.txt (text file containing details about your project)
- HTML/code/ (directory containing all your code)
- HTML/ (directory containing all your documents, including your images)
- HTML/data/ (including your data images)
- HTML/result/ (including your result images)
- HTML/index.html (html report)

Archive this folder as pset0.zip and email to my email address (aykut@cs.hacettepe.edu.tr).

Each student must individually do the coding and prepare detailed HTML report which contains a brief overview of the problems, details of your implementation and results with your observations. If your implementation failed to give a satisfactory results, provide a brief explanation of the reason(s).

Late Policy

You may use up to five extension days (in total) over the course of the semester for the three PSets. Any additional unapproved late submission will be weighted by 0.5.

Academic Integrity

All work on assignments must be done individually unless stated otherwise. You are encouraged to discuss with your classmates about the given assignments, but these discussions should be carried out in an abstract way. That is, discussions related to a particular solution to a specific problem (either in actual code or in the pseudocode) will not be tolerated. In short, turning in someone else’s work, in whole or in part, as your own will be considered as a violation of academic integrity. Please note that the former condition also holds for the material found on the web as everything on the web has been written by someone else.

References