Problem 1-Pinhole Projector

Build your own pinhole projector from household items. The below link will help you to make a simple pinhole projector. You may choose your own items instead of the ones in this link. You must show your pinhole projector and images obtain with it in your report. Make some observation and report them in your reports. Which factors (light, aperture size, focal length...) affect your image quality and how they affects? 

![Making Pinhole Projector Steps](image1.png)

Figure 1: Making Pinhole Projector Steps

Problem 2-Image Blending

You will implement alpha blending function take foreground image, background image and alpha value as inputs and produce blended image as an output. You can do that according to the given formularization. Such a sample obtained with this formularization is given below. You must take 5 different blended images on the least with your blending function. You can blend two or more images also you can blend particular parts of images selected by you. Your results must be in your report with original images you will use and of course your comments.

\[ I_{blended} = \alpha I_{fg} + (1 - \alpha)I_{bg} \quad (0 \leq \alpha \leq 1) \]

![Original images and Blending images obtained with different alpha values](image2.png)

Figure 2: Original images and Blending images obtained with different alpha values

Original images from National Geographic
Problem 3-Big Spanish Castle Illusion (John Sadowski)* [2]

Prepare image illusion for 3 images on the least 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 e.t.c)

Comment your observations and work to explain that: What happens in our eyes exactly?

![Figure 3: Left:Inverse Image Right:Desaturated image](image)

Image from National Geographic

Problem 4(Bonus)-Accidental pinhole and pinspeck cameras [3]

In the last problem you will experiment accidental pinhole camera proposed by Torralba [3] at CVPR 2012. You will take a photo in closed environment with your camera (let’s say them image A) and after you put an occluder to front of light source e.g. you occlude window in your room, you will take same photo again (say it image B). Lastly you will subtract image B from image A and obtain difference image. This difference image will be inverse image of your window’s scene. You can find detailed information in [3].

![Figure 4: Accidental Pinhole Camera](image)

Images from Torralba’s Research Page
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) Bonus:25 Points

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

- 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 pset1.zip and submit to Department Submit System.

Each student must individually do the coding and prepare detailed report which contains a brief overview of the problems, details of implementation and the results with comments. All results you obtain must be put to your report and observations must be specified clearly. If your implementations failed to give a satisfactory results, provide a brief explanation of the reason(s).

References

