

Assignment A1: Image Representation and Formation

CS 6640
Fall 2020

Assigned: 24 August 2020

Due: 10 September 2020 (handin all work on CADE)

For this problem, handin the A1 report PDF as well as any Matlab functions used to address the problems.

1. Do Chapters 1 and 2 exercises; however, even though you do not need to discuss this in the report, you are expected to know this material, and it may be used on quizzes.
2. The map of Utah (map1.jpg) in the class data directory, explore r,g,b models to segment the semantic components of the map (e.g., water bodies, forests, red roads, etc.). Use `imapprox` to reduce the number of classes (colors). Propose some performance measure and use it in your evaluation. Report what you tried and what results you got.
3. Matlab provides the `rgb2gray` function to convert from rgb images to gray level. Test the hypothesis that `rgb2gray` uses the function given in the book (p. 11, Eqn (1.1)):

$$v = \alpha r + \beta g + \gamma b$$

and if so, what the values of α , β and γ are. To do this use the backslash operator or `lsqminnorm` or `lsqlin`. If Matlab uses this approach, then each gray level value gives a linear equation in terms of rgb:

$$g = [\alpha, \beta, \gamma] \cdot [r, g, b]^T$$

Put these into a system and solve. Describe your work, and draw conclusions based on the results.

4. Do Exercise 1.5, p. 19, in the text. The Matlab function should perform as described in the header below.

For this problem, handin Matlab .m files for the functions described by the header below.

Note: DO NOT USE SCRIPTS. No function should write to the interpreter, draw, etc.

```
function slices = CS6640_slices(im)
% CS6640_slices - perform bit-slicing of gray-level image
% On input:
%   im (MxN gray level image): gray level image
% On output:
%   slices (MxNx8 binary image): bit-sliced image
%       byte is: [b7,b6,b5,b4,b3,b2,b1,b0]
%           b7 = 2^7 value (slices(:,:,1))
%           ...
%           b0 = 2^0 value (slices(:,:,8))
% Call:
%   slices = CS6640_slices(im);
% Author:
%   <Your name>
%   UU
%   Fall 2020
%
```