

Homework #1 (20p)

In your first homework you will start building a tool for representing a video sequence by a small number of image frames. You will use histograms to compare the gray/color frames of the sequence. There are several stages to this homework:

1. (2p) Collect a short color image sequence: 50–60 frames at 320×240 should be enough. You can download an image sequence from the course web page.
2. (8p) Computing gray-level edges. You should use the programs provided with this description to gain experience and some intuition with edge detection. You should apply these programs to several different images. Those programs are BiSmooth.m (binomial smoothing), Gradient.m (gradient computation), NMS.m (non-maxima suppression), and Hysteresis.m (hysteresis thresholding as in Canny edge detector). These programs work for gray-level images only. You should read the programs to become familiar with some simple Matlab functions used in them. In addition you should use Matlab function quiver to display image gradients. Here is an example:

```
> A = imread('fr05.tif');
> A1 = BiSmooth(A,8);
> [Gx,Gy] = Gradient(A1);
> m1=NMS2(Gx,Gy,3);
> m1 = Hysteresis(m1,3);
> [I,J] = find(m1>0); % row and column indexes
> In = find(m1>0); % indexes in a vector form
> [M,N] = size(m1);
> quiver(J,M-I+1,Gx(In),Gy(In),1)
```

Create a web page and post the original and gradient images (vector fields) - email the URL to me at zduric@cs.gmu.edu. You can save your figures using print command in jpeg format. You should post the results for at least three different images.

3. (10p) Build color histograms for all images in the sequence. Color histogram should be 4096-bin: $[(r/16) * 256 + (g/16) * 16 + b/16]$ will convert a color value into an index. You should use *bitshift* function in Matlab for integer division and multiplication.

Submitting your homework

You will email your program and a report that will include the following: i. description of all algorithms used in your program, ii. examples of color images used in your homework, and iii. examples of histogram displays produced by your program, iv. discussion of possible applications

for your program. In support of your technical report you can post the results on your web page and submit the url. Please do not post your code on the web page.