

# Assignment A4: Mathematical Morphology

***CS 6640***  
***Fall 2018***

**Assigned:** 1 October 2018

**Due:** 24 October 2018

For this problem, handin a report (PDF file) as required below as well as the Matlab .m files for the functions described by the headers below, and any help functions you write.

None of the functions should write to the interpreter, draw, etc. unless explicitly required by the header.

1. Develop a Matlab function using the erosion, dilation, and hit-or-miss transforms (or things in *bwmorph*) to provide the best set of pixels corresponding to each moving object in a given difference frame image (i.e.,  $\text{abs}(\text{background-frame})$ ). Explore pre-processing operations that may improve the results (e.g., gray scale transforms, color transforms, etc.). Test your method on the videos provided in the class web page 'data/A4' sub-directory. Discuss your work carefully.

```
function M = CS6640_MM(vidObj)
% CS6640_MM - segments moving objects in video
% On input:
%     vidObj (video object obtained by VideoReader): input video
% On output:
%     M (Matlab movie): movie of segmented moving objects
% Call:
%     vidObj = VideoReader('..../..../video.avi');
%     M = CS6640_MM(vidObj);
% Author:
%     <Your name>
```

```
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%
```

2. Develop a Matlab function to produce feature data for each moving object in each frame in a movie produced by CS6640\_MM. The features are:

1. object row mean
2. object column mean
3. row of upper left corner of bounding box
4. column of upper left corner of bounding box
5. row of lower right corner of bounding box
6. column of lower right corner of bounding box
7. number of pixels in object
8. red channel median of object pixels
9. green channel median of object pixels
10. blue channel median of object pixels

Test your method on the videos in 'data/A4' along with objects from your CS6640\_MM, and discuss your work carefully.

```
function object_data = CS6640_object_data(M,vidObj)  
%  
% On input:  
% M (Matlab movie): movie of segmented moving objects  
% vidObj (video object obtained by VideoReader): input video  
% On output:  
% object_data (struct vector): object data  
% (k).num_objects (int): number of objects in frame k  
% (k).objects (struct vector): has features for each object (p)  
% objects(p).row_mean (float): row mean
```

```
%          objects(p).col_mean (float): column mean
%          objects(p).ul_row (int): upper left row for bounding box
%          objects(p).ul_col (int): upper left col for bounding box
%          objects(p).lr_row (int): lower right row for bounding box
%          objects(p).lr_col (int): lower right col for bounding box
%          objects(p).num_pixels (int): number of pixels
%          objects(p).red_median (int): median red value for object
%          objects(p).green_median (int): median green value for object
%          objects(p).blue_median (int): median blue value for object
%
% Call:
%     obj_data = CS6640_object_data(M,vidObj);
%
% Author:
%     <Your name>
%     Fall 2018
%     UU
%
```