## SYDE 677 Computer Vision – **Assignment #5 (Image Representation)**

Due date: *Oct 30, 2006*

Instructor: Prof. H.R.Tizhoosh

1. Read test image into variable I
   (http://pami.uwaterloo.ca/tizhoosh/images.htm)

2. Threshold the image I to generate the binary image
   I_{bin} (use the **Otsu method** provided in appendix)

3. Use I_{bin}. Produce the eroded and dilated images I_{E1},
   I_{E2}, I_{D1} and I_{D2} using two different structuring
   elements S_1 and S_2 of your choice. Discuss the
   effect of the structuring element based on your
   results.

4. Now use the original image I again. Extract the
   edges I_{M_EDGE} using a proper chain of morphological operations. Compare your result with edges
   delivered by Sobel I_{sobel_EDGE}.

5. Now consider the new test image with four objects.
   (http://pami.uwaterloo.ca/tizhoosh/segment.htm)
   Design a hit-and-miss operator to extract all objects'
   corners. (Note: an optimal thresholding will be crucial!)
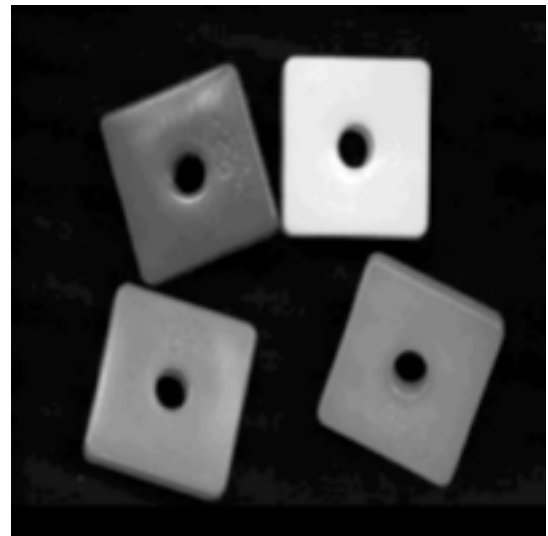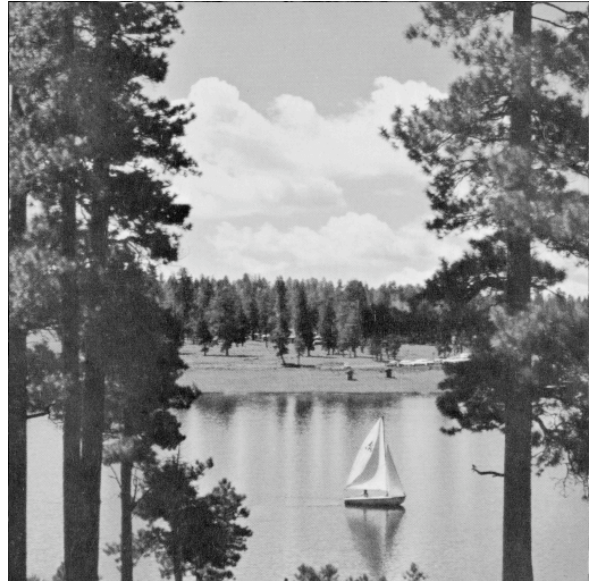
Deliverable: MatLab codes + image samples + results +
analysis

Appendix

```
% This fucntion calcualtes a threshold for an image
% Input: hist (the histogram of the image)
% Output: Thr (a threshold)
% Author: H.R.Tizhoosh
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function Thr =Otsu(hist)


sum = 0.0;

for x=1:length(hist)
    sum =sum+ hist(x);
end

for x=1:length(hist)
    p(x) = hist(x) / sum;
end

start = 1;
for x=1:length(hist)
   if ( p(x) ~= 0)
     start = x;
     break;
    end
end

w(start) = p(start);
m(start) = p(start);
ende = length(hist);

for x=start+1:length(hist)
  w(x) = w(x-1) + p(x);
    m(x) = m(x-1) + p(x)*x;
    if( w(x) ==  1.0)
      ende = x;
      break;
    end
end

Thr = 0;
maxval = 0.0;

for x=start+2:ende-1
  tem = m(ende) * w(x) - m(x);
  tem = tem*tem;
  tem = tem/( (1.0 - w(x)) * w(x));
  if (tem > maxval)
    maxval = tem;
    Thr = x;
  end
end
```