Homework#2 Solution Set

1. findtext.m

```
function ReadIt = FindText(IM)
ReadIt = uint8((IM == 143) | (IM == 146) | (IM == 147) | (IM==148));
idx = find(ReadIt == 1);
ReadIt(idx) = 255;
end
```

2. NLGT.m

```
function ImOut = NLGT(InIm,Interp)
if(strcmpi(Interp,'nn'))
    NN = 1;
else
    if(strcmpi(Interp,'lin'))
        NN = 0;
    else
        disp('Unrecognized interpolation method');
        return;
    end
end

paddedInIm = zeros(size(InIm)+2,'uint8');
paddedInIm(2:size(InIm,1)+1,2:size(InIm,2)+1) = InIm;
ImOut = InIm;
[nr nc] = size(InIm);

for rOutput = 1 : nr
    for cOutput = 1 : nc
        xOutput = sampledToOriginal(rOutput);
        yOutput = sampledToOriginal(cOutput);
        [xInput,yInput] = OutToIn(xOutput,yOutput);
        rInput = originalToSampled(xInput);
        cInput = originalToSampled(yInput);
        if NN
            r = round(rInput);
            c = round(cInput);
            ImOut(rOutput,cOutput) = paddedInIm(r+1,c+1);

        else
            l = floor(rInput);
            k = floor(cInput);
            a = rInput - l;
            b = cInput - k;

    ImOut(rOutput,cOutput) = floor( ((1-a)*(1-b)*paddedInIm(l+1,k+1)) + ...
                                    ((1-a)*(b)*paddedInIm(l+1,k+1+1)) + ...
                                    ((a)*(1-b)*paddedInIm(l+1+1,k+1)) + ...
                                    ((a)*(b)*paddedInIm(l+1+1,k+1+1)) );
        end
    end
end
```

```
58   end
59
60   function originalCoord = sampledToOriginal(sampledCoord)
61       originalCoord = ((sampledCoord-1)/32) - 1;
62   end
63
64   function sampledCoord = originalToSampled(originalCoord)
65       sampledCoord = (originalCoord + 1)*32 + 1;
66   end
67
68   function [xInput,yInput] = OutToIn(xOutput,yOutput)
69       xInput = (nthroot(xOutput,3) + nthroot(yOutput,3))/2;
70       yInput = (nthroot(xOutput,3) - nthroot(yOutput,3))/2;
71   end
72
73   3. hw2p3.m
74
75   InIm = imread(input('Input File name: ','s'));
76   [row,col,rgb] = size(InIm);
77   scale  = input('Please enter the Magnification Factor: ');
78   hshift = input('Please enter the Horizontal Shift: ');
79   vshift = input('Please enter the Vertical Shift: ');
80   maxrow = ceil(row*scale + vshift);
81   maxcol = ceil(col*scale + hshift) ;
82   ImOut = zeros(maxrow, maxcol, 3,'uint8');
83   for i = 1:maxrow
84       for j = 1:maxcol
85           x = (i - vshift)/scale;
86           y = (j - hshift)/scale;
87           %now interpolate
88           floorx = floor(x);
89           floory = floor(y);
90           a = x - floorx;
91           b = y - floory;
92           for k = 1:rgb
93               if 1 <= floorx && floorx <= row && ...
94                  1 <= floory && floory <= col
95                   gsULHC = InIm(floorx,floory,k);
96               else
97                   gsULHC = 0;
98               end
99
100              if 1 <= floorx && floorx <= row && ...
101                 1 <= floory+1 && floory+1 <= col
102                  gsURHC = InIm(floorx,floory+1,k);
103              else
104                  gsURHC = 0;
105              end
106
107              if 1 <= floorx+1 && floorx+1 <= row && ...
108                 1 <= floory && floory <= col
109                  gsLLHC = InIm(floorx+1,floory,k);
110              else
111                  gsLLHC = 0;
112              end
113
114              if 1 <= floorx+1 && floorx+1 <= row && ...
```

```
115                        1 <= floory+1 && floory+1 <= col
116                            gsLRHC = InIm(floorx+1,floory+1,k);
117                    else
118                        gsLRHC = 0;
119                    end
120
121                    ImOut(i,j,k) = (1-a)*(1-b)*gsULHC + (1-a)*(b)*gsURHC + (a)*(1-
122    b)*gsLLHC + (a)*(b)*gsLRHC;
123            end
124        end
125    end
126    imshow(ImOut);
127
128
129    4. WRF.m
130
131    function OutIm = WRF(InIm,w,m)
132    OutImg = InIm;
133    [nr nc] = size(InIm);
134    pad = (m-1)/2;
135    paddedImg = zeros((2*pad)+nr,(2*pad)+nc);
136    paddedImg(pad+1:pad+nr,pad+1:pad+nc) = InIm;
137
138    for i = pad+1 : nr+pad
139        for j = pad+2 : nc+pad
140            convRegion = paddedImg(i-pad:i+pad,j-pad:j+pad);
141            convVector = convRegion(:);
142            convVector = sort(convVector);
143            pixelValue = sum(convVector.*w);
144            if(pixelValue >= 0 && pixelValue <= 1)
145                OutIm(i-pad,j-pad) = pixelValue;
146            elseif(pixelValue > 1)
147                OutIm(i-pad,j-pad) = 1;
148            else
149                OutIm(i-pad,j-pad) = 0;
150            end
151        end
152    end
153    end
```