You want to develop a method able to remove homogenues background from photos such as the one depicted below. In order to do so you choose to calculate the local entropy of the image in order to spot homogenues regions.

Write a MATLAB script able to perform the following steps:

a) Read the 8-bit input color image (stored in the file *'test_img.png'*), convert it to a grayscale image and visualize it.
b) Initialize as matrix full of zeros a matrix called *ent* which will contain the local entropy with the same size of the input image.
c) Consider every nonoverlapping 8x8 region inside of the image and for each one of them compute the following operations (*hint: you can use for i = start:step:end*):
    I. Calculate the 256 bins histogram of the 8x8 region and normalize it, in order to obtain *p* a vector with elements summing to 1.
    II. Calculate the region local entropy as $E = -\sum p \, log_2(p + 10^{-6})$
    III. Assign the obtained value *E* to the corresponding 8x8 region of *ent*
d) Using a linear transformation rescale the values stored in *ent* to [0,1] range and obtain *mask* binarizing *ent* with a fixed threshold of 0.5
e) Define a square structuring element with size equal to 20 and apply two morphological operations of your choice able to remove small positive regions and fill small black gaps.
f) Use *mask* in order to set to black the detected background of the color input image and visualize the result

```
%a)
img = imread('test_img.png');
img_gray = rgb2gray(img);
figure
imshow(img_gray)

%b)
ent = zeros(size(img_gray));

%c)
grid_size = 8;
for i=1:grid_size:size(img_gray,1)
    for j=1:grid_size:size(img_gray,2)
        I = img_gray(i:(i+grid_size-1),j:(j+grid_size-1));
        %c1)
        p = imhist(I);
        p = p/numel(I);
        %c2)
        entropy = -sum(p.*log2(p+1e-6));
        %c3)
        ent(i:(i+grid_size-1),j:(j+grid_size-1)) = entropy;
    end
end
%d)
ent = (ent-min(ent(:)))/(max(ent(:))-min(ent(:)));
mask = im2bw(ent,0.5);
%e)
se = strel('disk', 20);
mask = imclose(mask, se);
mask = imopen(mask, se);
%f)
img = img .* uint8(mask);
figure
imshow(img)
```